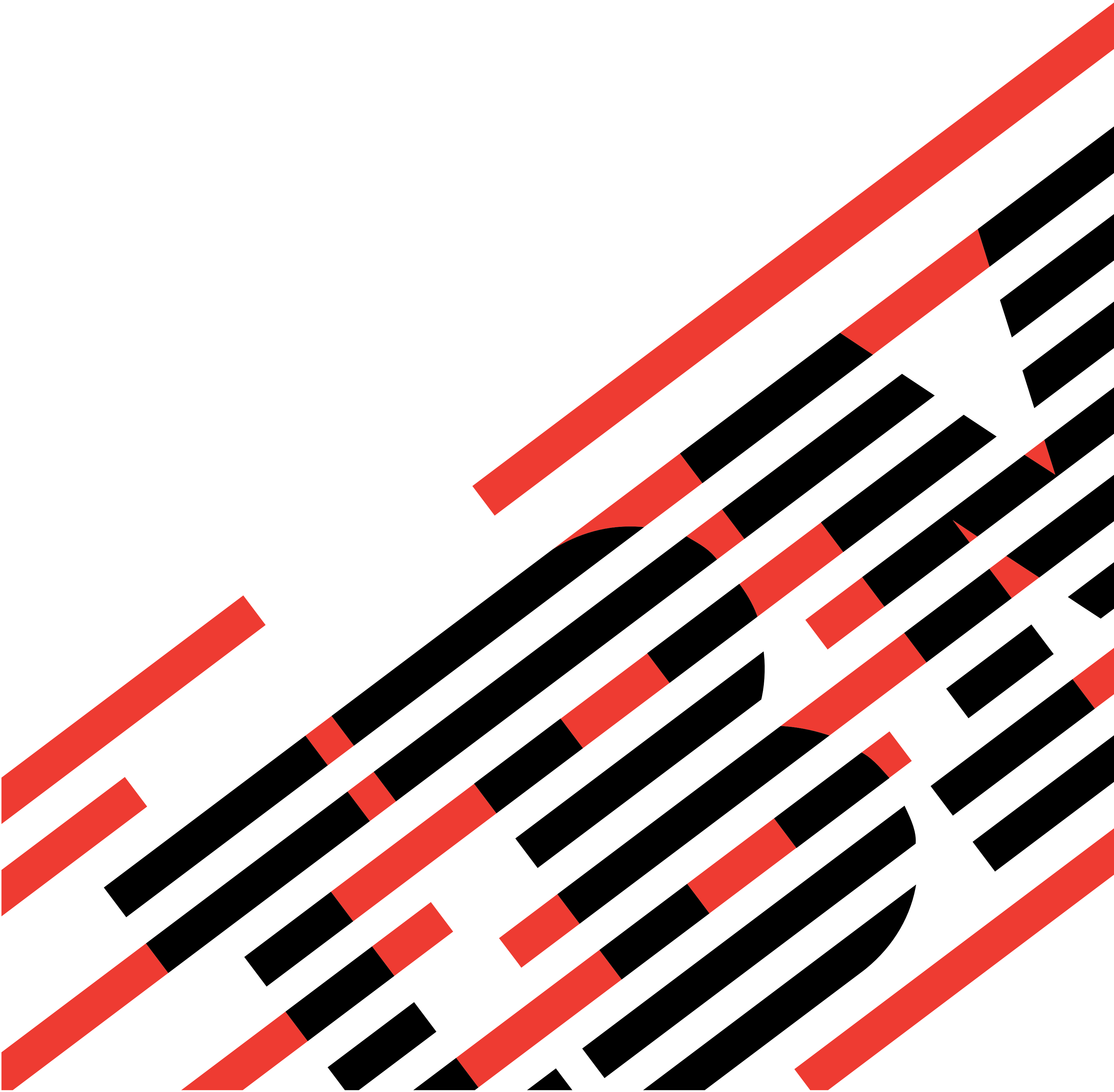
IBM Systems - iSeries

iSeries Access for Windows: Programming

Version 5 Release 4



IBM Systems - iSeries

iSeries Access for Windows: Programming

Version 5 Release 4

Note

Before using this information and the product it supports, read the information in "Notices," on page 553.

Seventh Edition (February 2006)

This edition applies to version 5, release 4, modification 0 of IBM eServer™ iSeries Access for Windows (product number 5722-XE1) and to all subsequent releases and modifications until otherwise indicated in new editions. This version does not run on all reduced instruction set computer (RISC) models nor does it run on CISC models.

Contents

iSeries Access for Windows: Programming

As an iSeries™ application developer, explore this topic to reference and use iSeries Access for Windows® technical programming information, tools, and techniques.

This information includes programming concepts, capabilities, and examples that are useful when writing applications to access the resources of an iSeries server. Using this topic, client/server applications are developed and tailored to the needs of your business. Various programming techniques are described so you can connect, manage, and take advantage of the rich functions provided by the server. You can access this information by selecting from the topics listed below.

If a basic working knowledge of iSeries Access for Windows and its components is needed see the **Welcome Wizard** and the **User's Guide**, which are shipped with iSeries Access for Windows. If you do not see either of the components in your iSeries Access for Windows folder, it is not installed. Run **Selective Setup** to install it. See Installation and setup for related information. **Welcome Wizard** is installed as part of the base function while the **User's Guide** is selectively installed.

Note: To launch components from a Windows PC, select **Start** → **Programs** → **IBM iSeries Access for Windows**, and select the component.

Note: By using the code examples, you agree to the terms of the "Code license and disclaimer information" on page 552.

What's new

This page highlights changes to iSeries Access for Windows programming topic for V5R4.

For V5R4, database programming now offers support for the following:

- 2MB SQL statements
- 128-byte column names
- The ability to pass an eWLM correlator to the iSeries database to enable Application Response Measurement instrumentation

In addition to the above, the .NET Data Provider also includes the following enhancements:

- Support for LOB data types
- Support for Library List and System Naming
- IntelliSense to aid in code development
- Support for multiple active result sets per connection
- Support for handling Char for Bit Data, Date, Time, TimeStamp, Decimal, and Numeric values as strings
- Sample programs

The OLE DB provider now includes support for Library List and System Naming.

How to see what's new or changed

To help you see where technical changes have been made, this information uses:

- The » image to mark where new or changed information begins.
- The « image to mark where new or changed information ends.

To find other information about what's new or changed this release, see the Memo to Users.

Printable PDFs

Use this to view and print a PDF of this information.

To view or download the PDF version of this document, select iSeries Access for Windows Programming (about 3,901 KB).

Saving PDF files

To save a PDF on your workstation for viewing or printing:

1. Right-click the PDF in your browser (right-click the link above).
2. Click the option that saves the PDF locally.
3. Navigate to the directory in which you want to save the PDF.
4. Click **Save**.

Downloading Adobe Reader

You need Adobe Reader installed on your system to view or print these PDFs. You can download a free copy from the Adobe Web site (www.adobe.com/products/acrobat/readstep.html) .

iSeries Access for Windows C/C++ APIs

iSeries Access for Windows provides C/C++ application programming interfaces (APIs) for accessing iSeries resources.

These APIs are intended primarily for C/C++ programmers. However, they also may be called from other languages that support calling C-style APIs.

Note: By using the code examples, you agree to the terms of the "Code license and disclaimer information" on page 552.

iSeries Access for Windows C/C++ APIs overview

See the following topics for iSeries Access for Windows C/C++ APIs overview information.

API groups, header files, import libraries, and DLLs

Access interface definition files for all iSeries Access for Windows C/C++ API groups in the iSeries Access for Windows **Programmer's Toolkit**.

For each iSeries Access for Windows C/C++ API group, the table below provides:

- Links to the API documentation
- Required interface definition (header) files, where applicable
- Associated import library files, where applicable
- Associated Dynamic Link Library (DLL) files

How to access iSeries Access for Windows header files in the Toolkit:

1. Find the **Programmer's Toolkit** icon in your iSeries Access for Windows program directory and launch it. If it is not displayed in the program directory, install the Toolkit.
2. In the left navigation panel, select the appropriate API group.

Note: Names of some API categories in the Programmer's Toolkit differ from the names that are used in iSeries Access for Windows programming:

To find this iSeries Access for Windows programming API group header file:	Select this Programmer's Toolkit topic:
Administration	Client Information
Data transformation	Data Manipulation
National language support	
LDAP	Directory
Serviceability	Error Handling
AS/400® Object	AS/400 Operations
System Object Access	

3. Select the **C/C++ APIs** subtopic in the left navigation panel.
4. In the right display panel, find the header (.h) file and select it.

Note: In addition to interface descriptions and definitions, the iSeries Access for Windows API group topics in the Toolkit include links to other information resources.

About import libraries:

The import libraries that are shipped with the Programmer'sToolkit were built with the Microsoft® Visual C++ compiler. As a result, they are in the Common Object File Format (COFF). Some compilers, such as Borland's C compiler, do not support COFF. To access the iSeries Access for Windows C/C++ APIs from these compilers, you must create Object Model Format (OMF) import libraries by using the IMPLIB tool. For example:

```
implib cwbdq.lib %windir%\system32\cwbdq.dll
```

Note: As of V5R1, the format for the cwbapi.lib import library has changed to make the file size smaller. This library will not work with Microsoft Visual C++ 5.0 or earlier. If you need to call the APIs from Microsoft Visual C++ 5.0 or earlier, you can can get the import library built using the old format at import libraries .(www.ibm.com/eserver/iseries/access/toolkit/importlibraries.htm)

Table 1. iSeries Access for Windows C/C++ API groups, header files, library files, and DLL files

API group	Header file	Import library	DLL
Administration	cwbad.h	cwbapi.lib	cwbad.dll
Communications and Security	cwbcosys.h cwbco.h cwb.h	cwbapi.lib	cwbco.dll
Data Queues	cwbdq.h	cwbapi.lib	cwbdq.dll
Data transformation	cwbdt.h	cwbapi.lib	cwbdt.dll
Directory Update	cwbup.h	cwbapi.lib	cwbup.dll
Emulation (Standard HLLAPI interface)	hapi_c.h	pscal32.lib	pcshll.dll pcshll32.dll
Emulation (Enhanced HLLAPI interface)	ehlapi32.h	ehlapi32.lib	ehlapi32.dll
Emulation (Windows EHLLAPI interface)	whllapi.h	whllapi.lib	whllapi.dll
		whlapi32.lib	whllapi32.dll
Emulation (HACL interface)	eclall.hpp	pcseclva.lib	pcseclva.dll
		pcseclvc.lib	pcseclvc.dll

Table 1. iSeries Access for Windows C/C++ API groups, header files, library files, and DLL files (continued)

API group	Header file	Import library	DLL
Emulation (PCSAPI interface)	pcsapi.h	pcscal32.lib	pcsapi.dll pcsapi32.dll
National language support (General NLS)	cwbnl.h	cwbapi.lib	cwbnl.dll
National language support (Conversion NLS)	cwbnlcnv.h	cwbapi.lib	cwbnl1.dll
National language support (Dialog-box NLS)	cwbnldlg.h	cwbapi.lib	cwbnldlg.dll
iSeries objects	cwbobj.h	cwbapi.lib	cwbobj.dll
ODBC	sql.h sqlext.h sqltypes.h sqlucode.h	odbc32.lib	odbc32.dll
Database APIs (Optimized SQL) **Note:** Choose this link for important information regarding these APIs.	cwbdb.h	cwbapi.lib	cwbdb.dll
OLE DB Provider	ad400.h da400.h		cwbzzodb.dll See the OLE DB Section of the Microsoft Universal Data Access Web Site for more information
Remote Command/Distributed Program Call	cwbrc.h	cwbapi.lib	cwbrc.dll
Serviceability	cwbsv.h	cwbapi.lib	cwbsv.dll
System Object Access	cwbsoapi.h	cwbapi.lib	cwbsoapi.dll

Programmer's Toolkit

Find header files and complete information to develop applications using iSeries Access for Windows.

The iSeries Access for Windows Programmer's Toolkit is an installable component of iSeries Access for Windows and is the primary source of information needed to develop iSeries Access for Windows applications. This includes programming with iSeries Access for Windows ActiveX Automation Objects, ADO/OLE DB, .NET, and Java™. The Programmer's Toolkit contains links to header files, sample programs, and complete documentation.

Notes:

- No portion of the Toolkit or the iSeries Access for Windows product may be redistributed with the resulting applications.
- By using the code examples, you agree to the terms of the "Code license and disclaimer information" on page 552

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The Programmer's Toolkit consists of two parts:

- Programmer's Toolkit component of iSeries Access for Windows, which includes:
  - Online help information for the Toolkit and other online help for the product.
  - C/C++ header files
  - C import libraries
  - ActiveX automation type libraries
  - iSeries ADO Wizards for Visual Basic for the iSeries Access for Windows OLE DB provider
- Programmer's Toolkit Web site which includes sample applications and tools that are useful for developing iSeries Access for Windows applications. The site is updated regularly. Check it periodically for new information.

  Related information

  iSeries Access for Windows database APIs

Install the Programmer's Toolkit:

To install the Programmer's Toolkit, follow these instructions.

1. If you are installing iSeries Access for Windows for the first time, perform an iSeries Access for Windows Custom Install. If iSeries Access for Windows already is installed, select **Start** → **Programs** → **IBM iSeries Access for Windows** → **Selective Setup**.
2. Follow the prompts until the **Component Selection** dialog displays.
3. Select the **Programmer's Toolkit** option, and follow the prompts to completion.

Launch the Programmer's Toolkit:

To launch the Programmer's Toolkit, follow these instructions.

Select **Start** → **Programs** → **IBM iSeries Access for Windows** → **Programmer's Toolkit**.

Note: The iSeries Access for Windows installation program does not create the Toolkit icon unless you have installed the Programmer's Toolkit on your personal computer.

iSeries system name formats for connection APIs

APIs that take an iSeries system name as a parameter accept names in the following formats.

- TCP/IP network name (system.network.com)
- System name without a network identifier (SYSTEM)
- IP address (1.2.3.4)

  Related reference

  "iSeries Access for Windows Administration APIs" on page 30
  iSeries Access for Windows Administration APIs provide functions that access information about the iSeries Access for Windows code that is installed on the PC.

  "iSeries Access for Windows Communications and Security APIs" on page 41
  The iSeries Access for Windows Communications and Security topic shows you how to use iSeries Access for Windows application programming interfaces (APIs)

  "iSeries Access for Windows Data Queues APIs" on page 117
  Use iSeries Access for Windows Data Queues application programming interfaces (APIs) to provide easy access to iSeries data queues. Data queues allow you to create client/server applications that do not require the use of communications APIs.

  "iSeries Access for Windows data transformation APIs" on page 163
  iSeries Access for Windows**data transformation** application programming interfaces (APIs) enable your client/server applications to transform numeric data between iSeries server and PC formats. Transformation may be required when you send and receive numeric data to and from the iSeries server. Data transformation APIs support transformation of many numeric formats.

“iSeries Access for Windows national language support (NLS) APIs” on page 180
iSeries Access for Windows **national language support** APIs enable your applications to get and save (query and change) the iSeries Access for Windows settings that are relevant to national language support.

“iSeries Access for Windows Directory Update APIs” on page 207
The iSeries Access for Windows Directory Update function allows users to specify PC directories for updating from a configured network server or from multiple networked servers. This permits users to load non-iSeries Access for Windows software products on a server in the network, and to keep those files updated on PCs. Directory Update is an optionally installable iSeries Access for Windows component.

“iSeries Objects APIs for iSeries Access for Windows” on page 227
iSeries Objects for iSeries Access for Windows application programming interfaces (APIs) allow you to work with iSeries print-related objects. These APIs make it possible to work with iSeries spooled files, writer jobs, output queues, printers, and more.

“iSeries Access for Windows Remote Command/Distributed Program Call APIs” on page 324
The iSeries Access for Windows Remote Command/Distributed Program Call APIs allow the PC application programmer to access functions on the iSeries system. User program and system commands can be called without requiring an emulation session. A single iSeries program serves commands and programs, so only one iSeries job is started for both.

“iSeries Access for Windows System Object Access (SOA) APIs” on page 393
System Object Access enables you to view and manipulate iSeries objects through a graphical user interface.

OEM, ANSI, and Unicode considerations

Most of the iSeries Access for Windows C/C++ APIs that accept string parameters exist in three forms: OEM, ANSI, or Unicode.

The generic version of the iSeries Access for Windows C/C++ APIs follows the same form as the default OEM version. Only a single name for each function appears in this information, but there are three different system entry points. For example:

```
cwbNL_GetLang();

 compiles to:

cwbNL_GetLang();    //CWB_OEM or undefined

  or:

cwbNL_GetLangA();   //CWB_ANSI defined

  or:

cwbNL_GetLangW();   //CWB_UNICODE defined
```

Table 2. API types, name formats, and pre-processor definitions

API type	API name format (if it exists)	Pre-processor definition
OEM	cwbXX_xxx	None (may specify CWB_OEM explicitly)
ANSI	cwbXX_xxxA	CWB_ANSI
UNICODE	cwbXX_xxxW	CWB_UNICODE

Note:

- Data transformation APIs **(cwbDT_xxx)** do not follow the ″A″ and ″W″ suffix conventions. The generic version of the APIs uses ″String″ as part of the function name. The ANSI/OEM version uses ″ASCII″ as part of the function name. The Unicode version uses ″Wide″ as part of the function name. There is no difference between OEM and ANSI character sets in **cwbDT_xxx** APIs, which handle numeric strings. Therefore, ANSI and OEM versions of the relevant APIs are the same. For example:

```
cwbDT_HexToString();

 compiles to:

cwbDT_HexToASCII();   //CWB_UNICODE not defined

  or:

cwbDT_HexToWide();    //CWB_UNICODE defined
```

See the data transformation **cwbdt.h** header file for more details.

- For Unicode APIs that take a buffer and a length for passing strings (for example, **cwbCO_GetUserIDExW**), the length is treated as the number of bytes. It is not treated as the number of characters.

Related reference

"iSeries Access for Windows Administration APIs" on page 30
iSeries Access for Windows Administration APIs provide functions that access information about the iSeries Access for Windows code that is installed on the PC.

"iSeries Access for Windows Communications and Security APIs" on page 41
The iSeries Access for Windows Communications and Security topic shows you how to use iSeries Access for Windows application programming interfaces (APIs)

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Use a single iSeries Access for Windows API type:

To restrict your application to a particular type of iSeries Access for Windows API, you must define one, and only one preprocessor definitions.

The preprocessor definitions are as follows:

- CWB_OEM_ONLY
- CWB_ANSI_ONLY
- CWB_UNICODE_ONLY

For example, when writing a pure ANSI application, you specify both CWB_ANSI_ONLY and CWB_ANSI. Refer to the individual Programmer's Toolkit header files for details of these preprocessor definitions and API names. See API groups, header files, import libraries, and DLLs for more information.

Use mixed iSeries Access for Windows API types:

You can mix ANSI, OEM, and Unicode APIs by using explicit API names.

For example, you can write an ANSI iSeries Access for Windows application by specifying the CWB_ANSI preprocessor definition, but still call a Unicode version of an API by using the ″W″ suffix.

Write a generic iSeries Access for Windows application:

Generic applications allow maximum portability because the same source code can be compiled for OEM, ANSI, and Unicode.

Generic applications are built by specifying different preprocessor definitions, and by using the generic version of the iSeries access for Windows APIs (the ones without the ″A″ or ″W″ suffixes). Following is a short list of guidelines for writing a generic application:

- Instead of including the usual <string.h> for manipulating strings, include <TCHAR.H>.
- Use generic data types for characters and strings. Use 'TCHAR' for 'char' in your source code.
- Use the _TEXT macro for literal characters and strings. For example, `TCHAR A[]=_TEXT("A Generic String")`.
- Use generic string manipulation functions. For example, use `_tcscpy` instead of `strcpy`.
- Be especially careful when using the 'sizeof' operator - always remember that a Unicode character occupies two bytes. When determining the number of characters in a generic TCHAR array A, instead of the simple `sizeof(A)`, use `sizeof(A)/sizeof(TCHAR)`.
- Use proper preprocessor definitions for compilation. When compiling your source for Unicode in Visual C++, you should also use the preprocessor definitions `UNICODE` and `_UNICODE`. Instead of defining `_UNICODE` in the MAK file, you may want to define it at the beginning of your source code as:

```
#ifdef UNICODE
  #define _UNICODE
#endif
```

For a complete description of these guidelines, see the following resources:

1. Richter, J. *Advanced Windows: The Developer's Guide to the Win32 API for Windows NT® 3.5 and Windows 95*, Microsoft Press, Redmond, WA, 1995.
2. Kano, Nadine *Developing International Software for Windows 95 and Windows NT: a handbook for software design*, Microsoft Press, Redmond, WA, 1995.
3. Microsoft Knowledge Base articles
4. MSDN Library

Obsolete iSeries Access for Windows APIs

Some of the APIs that were provided by Client Access have been replaced with new APIs. While these older, obsolete APIs are still supported, it is recommended that you use the newer iSeries Access for Windows APIs.

Following is a list, by function, of obsolete Client Access APIs and iSeries Access for Windows APIs. For each Client Access obsolete API, a link to the newer iSeries Access for Windows replacement API is provided, when available.

Note: All of the APIs for the following functions are obsolete and are no longer supported for iSeries Access for Windows:

- **APPC**
- **License Management**
- **Ultimedia System Facilities (USF)**
- **Messaging Application Programming Interface (MAPI)**

Obsolete iSeries Access APIs list:

Obsolete Communications APIs:

cwbCO_IsSystemConfigured

iSeries Access for Windows does not require pre-configuration of an iSeries server connection to connect to and use that system. For this reason, programs that need to connect to an iSeries server (either explicitly, by calling cwbCO_Connect, or implicitly, as the result of a call to a different API such as cwbRC_RunCmd) do not need to check to see if the connection has been pre-configured. Therefore, the above API no longer should be necessary.

cwbCO_IsSystemConnected

Use "cwbCO_IsConnected" on page 52.

Most iSeries Access for Windows APIs work with iSeries System Objects, rather than with iSeries server names. There can be multiple iSeries System Objects created and connected to the same iSeries server within the same process. The cwbCO_IsSystemConnected API will return an indication of whether at least one System Object is connected to the iSeries server, within the current process. The cwbCO_IsConnected API is used to determine if a specific iSeries System Object is connected.

cwbCO_GetUserID

Use "cwbCO_GetUserIDEx" on page 64.

Most iSeries Access for Windows APIs work with iSeries System Objects, rather than with iSeries server names. There can be multiple iSeries System Objects created and connected to the same iSeries server, within the same process, but using different user IDs. The cwbCO_GetUserID API will return the user ID of the first iSeries System Object, in the current process, for the specified iSeries server. The cwbCO_GetUserIDEx API will return the user ID for a specific iSeries System Object.

cwbCO_GetHostVersion

Use "cwbCO_GetHostVersionEx" on page 81.

The behavior of these APIs is the same. However, use of the cwbCO_GetHostVersionEx API is more efficient.

Obsolete Data Queues APIs:

cwbDQ_Create

Use "cwbDQ_CreateEx" on page 120

cwbDQ_Delete
Use “cwbDQ_DeleteEx” on page 122

cwbDQ_Open
Use “cwbDQ_OpenEx” on page 123

cwbDQ_StartSystem
Use “cwbCO_Connect” on page 48

Note: To achieve the same effect as cwbDQ_StartSystem when you use cwbCO_Connect, you must connect to the data queue’s service. See “cwbCO_Connect” on page 48 for details.

cwbDQ_StopSystem
Use “cwbCO_Disconnect” on page 50

Note: To achieve the same effect as cwbDQ_StopSystem when you use cwbCO_Disconnect, you must disconnect from the data queue’s service. See “cwbCO_Disconnect” on page 50 for details.

Obsolete Remote Command/Distributed Program Call APIs:

cwbRC_StartSys
Use “cwbRC_StartSysEx” on page 327

cwbRC_GetSysName
Use “cwbCO_GetSystemName” on page 84

Obsolete Security APIs:

cwbSY_CreateSecurityObj
Use “cwbCO_CreateSystem” on page 46

cwbSY_DeleteSecurityObj
Use “cwbCO_DeleteSystem” on page 48

cwbSY_SetSys
Use “cwbCO_CreateSystem” on page 46 and pass a system name on the call

cwbSY_VerifyUserIDPwd
Use “cwbCO_VerifyUserIDPassword” on page 74

cwbSY_ChangePwd
Use “cwbCO_ChangePassword” on page 56

cwbSY_GetUserID
Use “cwbCO_GetUserIDEx” on page 64

cwbSY_Logon
Use “cwbCO_Signon” on page 72

cwbSY_LogonUser
Use “cwbCO_SetUserIDEx” on page 70, “cwbCO_SetPassword” on page 68, or “cwbCO_Signon” on page 72

cwbSY_GetDateTimeCurrentSignon
Use “cwbCO_GetSignonDate” on page 62

cwbSY_GetDateTimeLastSignon
Use “cwbCO_GetPrevSignonDate” on page 61

cwbSY_GetDateTimePwdExpires
Use “cwbCO_GetPasswordExpireDate” on page 60

cwbSY_GetFailedAttempts
Use “cwbCO_GetFailedSignons” on page 59

Obsolete Serviceability APIs:

The following Serviceability APIs for reading problem log service records are obsolete:

cwbSV_GetCreatedBy
Not available

cwbSV_GetCurrentFix
Not available

cwbSV_GetFailMethod
Not available

cwbSV_GetFailModule
Not available

cwbSV_GetFailPathName
Not available

cwbSV_GetFailProductID
Not available

cwbSV_GetFailVersion
Not available

cwbSV_GetOriginSystemID
Not available

cwbSV_GetOriginSystemIPAddr
Not available

cwbSV_GetPreviousFix
Not available

cwbSV_GetProblemID
Not available

cwbSV_GetProblemStatus
Not available

cwbSV_GetProblemText
Not available

cwbSV_GetProblemType
Not available

cwbSV_GetSeverity
Not available

cwbSV_GetSymptomString
Not available

Obsolete System Object Access (SOA) API:

CWBSO_CreateListHandle
Use "CWBSO_CreateListHandleEx" on page 408

Obsolete National Language Support APIs:

cwbNL_CreateConverter
Use "cwbNL_CreateConverterEx" on page 194

cwbNL_ConvertCodePages
Use "cwbNL_ConvertCodePagesEx" on page 190

Obsolete Database APIs:

Note: By using the code examples, you agree to the terms of the "Code license and disclaimer information" on page 552.

Return codes and error messages

The iSeries Access for Windows C/C++ application programming interfaces (APIs) support the return of an integer return code on most functions. The return codes indicate how the function completed.

iSeries Access for Windows logs error messages in the History Log, and on the iSeries System.

Error messages in the History Log:

Starting the History Log:
By default, the History Log is not active. To ensure that error messages are written to this file, History logging must be started. See the iSeries Access for Windows User's Guide, which is shipped with iSeries Access for Windows, for information on starting the History Log

Viewing logged messages:
To view messages that have been logged in the History Log, select **Start** → **Programs** → **iSeries Access for Windows** → **Service** → **History Log**.

The entries in the History Log consist of messages with and without message IDs. Messages with message IDs have online help available. Messages without message IDs do not have online help available. To display the cause and recovery information associated with a message that has a message ID, double-click on it. You also can view any message that has a message ID by selecting the Message topic in the online iSeries Access for Windows User's Guide.

Error messages on the iSeries system:

iSeries Access for Windows also has associated messages that are logged on the iSeries server. These messages begin with PWS or IWS. To display a specific PWSxxxx or IWSxxxx message, type the appropriate command at the iSeries command line prompt, where xxxx is the number of the message:

```
DSPMSGD RANGE(IWSxxxx) MSGF(QIWS/QIWSMSG)

DSPMSGD RANGE(PWSxxxx) MSGF(QIWS/QIWSMSG)
```

iSeries Access for Windows return codes that correspond to operating system errors:

```
0       CWB_OK
          Successful completion.
1       CWB_INVALID_FUNCTION
          Function not supported.
2       CWB_FILE_NOT_FOUND
          File not found.
3       CWB_PATH_NOT_FOUND
          Path not found.
4       CWB_TOO_MANY_OPEN_FILES
          The system cannot open the file.
5       CWB_ACCESS_DENIED
          Access is denied.
6       CWB_INVALID_HANDLE
          The list handle is not valid.
8       CWB_NOT_ENOUGH_MEMORY
          Insufficient memory, may have failed to allocate a temporary buffer.
15      CWB_INVALID_DRIVE
          The system cannot find the drive specified.
18      CWB_NO_MORE_FILES
          No more files are found.
21      CWB_DRIVE_NOT_READY
          The device is not ready.
31      CWB_GENERAL_FAILURE
          General error occurred.
32      CWB_SHARING_VIOLATION
```

```
          The process cannot access the file because it is being used by
          another process.
33      CWB_LOCK_VIOLATION
          The process cannot access the file because another process has
          locked a portion of the file.
38      CWB_END_OF_FILE
          End of file has been reached.
50      CWB_NOT_SUPPORTED
          The network request is not supported.
53      CWB_BAD_NETWORK_PATH
          The network path was not found.
54      CWB_NETWORK_BUSY
          The network is busy.
55      CWB_DEVICE_NOT_EXIST
          The specified network resource or device is no longer available.
59      CWB_UNEXPECTED_NETWORK_ERROR
          An unexpected network error occurred.
65      CWB_NETWORK_ACCESS_DENIED
           Network access is denied.
80      CWB_FILE_EXISTS
          The file exists.
85      CWB_ALREADY_ASSIGNED
          The local device name is already in use.
87      CWB_INVALID_PARAMETER
          A parameter is invalid.
88      CWB_NETWORK_WRITE_FAULT
          A write fault occurred on the network.
110     CWB_OPEN_FAILED
          The system cannot open the device or file specified.
111     CWB_BUFFER_OVERFLOW
          Not enough room in the output buffer. Use *bufferSize to determine
          the correct size.
112     CWB_DISK_FULL
          There is not enough space on the disk.
115     CWB_PROTECTION_VIOLATION
          Access is denied.
124     CWB_INVALID_LEVEL
          The system call level is not correct.
142     CWB_BUSY_DRIVE
          The system cannot perform a JOIN or SUBST at this time.
252     CWB_INVALID_FSD_NAME
          The device name is incorrect.
253     CWB_INVALID_PATH
          The network path specified is incorrect.
```

iSeries Access return codes:

Global iSeries Access return codes:

```
4000    CWB_USER_CANCELLED_COMMAND
          Command cancelled by user.
4001    CWB_CONFIG_ERROR
          A configuration error has occurred.
4002    CWB_LICENSE_ERROR
          A license error has occurred.
4003    CWB_PROD_OR_COMP_NOT_SET
          Internal error due to failure to properly register and use a
          product or component.
4004    CWB_SECURITY_ERROR
          A security error has occurred.
4005    CWB_GLOBAL_CFG_FAILED
          The global configuration attempt failed.
4006    CWB_PROD_RETRIEVE_FAILED
          The product retrieve failed.
4007    CWB_COMP_RETRIEVE_FAILED
          The computer retrieve failed.
4008    CWB_COMP_CFG_FAILED
```

```
          The computer configuration failed.
4009    CWB_COMP_FIX_LEVEL_UPDATE_FAILED
          The computer fix level update failed.
4010    CWB_INVALID_API_HANDLE
          Invalid request handle.
4011    CWB_INVALID_API_PARAMETER
          Invalid parameter specified.
4012    CWB_HOST_NOT_FOUND
          The server is inactive or does not exist.
4013    CWB_NOT_COMPATIBLE
          Client Access program or function not at correct level.
4014    CWB_INVALID_POINTER
          A pointer is NULL.
4015    CWB_SERVER_PROGRAM_NOT_FOUND
          The server application not found.
4016    CWB_API_ERROR
          General API failure.
4017    CWB_CA_NOT_STARTED
          Client Access has not been started.
4018    CWB_FILE_IO_ERROR
          Record could not be read.
4019    CWB_COMMUNICATIONS_ERROR
          A communications error occurred.
4020    CWB_RUNTIME_CONSTRUCTOR_FAILED
          The C Run-time contstructor failed.
4021    CWB_DIAGNOSTIC
          Unexpected error. Record the message number and data in the
          message and contact IBM Support.
4022    CWB_COMM_VERSION_ERROR
          Data queues will not run with this version of communications.
4023    CWB_NO_VIEWER
          The viewer support for Client Access/400 was not installed.
4024    CWB_MODULE_NOT_LOADABLE
          A filter DLL was not loadable.
4025    CWB_ALREADY_SETUP
          Object has already been set up.
4026    CWB_CANNOT_START_PROCESS
          Attempt to start process failed. See other error code(s).
4027    CWB_NON_REPRESENTABLE_UNICODE_CHAR
          One or more input UNICODE characters have no representation in the
          code page that is being used.
8998    CWB_UNSUPPORTED_FUNCTION
          The function is unsupported.
8999    CWB_INTERNAL_ERROR
          An internal error occurred.
```

Related reference

"iSeries Access for Windows Communications and Security APIs" on page 41
The iSeries Access for Windows Communications and Security topic shows you how to use iSeries Access for Windows application programming interfaces (APIs)

iSeries Access for Windows -specific return codes:

Security return codes:

8001	CWB_UNKNOWN_USERID
8002	CWB_WRONG_PASSWORD
8003	CWB_PASSWORD_EXPIRED
8004	CWB_INVALID_PASSWORD
8006	CWB_INCORRECT_DATA_FORMAT
8007	CWB_GENERAL_SECURITY_ERROR
8011	CWB_USER_PROFILE_DISABLED
8013	CWB_USER_CANCELLED
8014	CWB_INVALID_SYSNAME
8015	CWB_INVALID_USERID
8016	CWB_LIMITED_CAPABILITIES_USERID
8019	CWB_INVALID_TP_ON_HOST

8022	CWB_NOT_LOGGED_ON
8026	CWB_EXIT_PGM_ERROR
8027	CWB_EXIT_PGM_DENIED_REQUEST
8050	CWB_TIMESTAMPS_NOT_SET
8051	CWB_KERB_CLIENT_CREDENTIALS_NOT_FOUND
8052	CWB_KERB_SERVICE_TICKET_NOT_FOUND
8053	CWB_KERB_SERVER_CANNOT_BE_CONTACTED
8054	CWB_KERB_UNSUPPORTED_BY_HOST
8055	CWB_KERB_NOT_AVAILABLE
8056	CWB_KERB_SERVER_NOT_CONFIGURED
8057	CWB_KERB_CREDENTIALS_NOT_VALID
8058	CWB_KERB_MAPPED_USERID_FAILURE
8059	CWB_KERB_MAPPED_USERID_SUCCESS
8070	CWB_PROFILE_TOKEN_INVALID
8071	CWB_PROFILE_TOKEN_MAXIMUM
8072	CWB_PROFILE_TOKEN_NOT_REGENERABLE
8257	CWB_PW_TOO_LONG
8258	CWB_PW_TOO_SHORT
8259	CWB_PW_REPEAT_CHARACTER
8260	CWB_PW_ADJACENT_DIGITS
8261	CWB_PW_CONSECUTIVE_CHARS
8262	CWB_PW_PREVIOUSLY_USED
8263	CWB_PW_DISALLOWED_CHAR
8264	CWB_PW_NEED_NUMERIC
8266	CWB_PW_MATCHES_OLD
8267	CWB_PW_NOT_ALLOWED
8268	CWB_PW_CONTAINS_USERID
8270	CWB_PW_LAST_INVALID_PWD
8271	CWB_PW_STAR_NONE
8272	CWB_PW_QPWDVLDPGM

Communications return codes:

8400	CWB_INV_AFTER_SIGNON
8401	CWB_INV_WHEN_CONNECTED
8402	CWB_INV_BEFORE_VALIDATE
8403	CWB_SECURE_SOCKETS_NOTAVAIL
8404	CWB_RESERVED1
8405	CWB_RECEIVE_ERROR
8406	CWB_SERVICE_NAME_ERROR
8407	CWB_GETPORT_ERROR
8408	CWB_SUCCESS_WARNING
8409	CWB_NOT_CONNECTED
8410	CWB_DEFAULT_HOST_CCSID_USED
8411	CWB_USER_TIMEOUT
8412	CWB_SSL_JAVA_ERROR
8413	CWB_USER_TIMEOUT_SENDRCV
8414	CWB_FIPS_UNAVAILABLE

Configuration return codes:

8500	CWB_RESTRICTED_BY_POLICY
8501	CWB_POLICY_MODIFY_MANDATED_ENV
8502	CWB_POLICY_MODIFY_CURRENT_ENV
8503	CWB_POLICY_MODIFY_ENV_LIST
8504	CWB_SYSTEM_NOT_FOUND
8505	CWB_ENVIRONMENT_NOT_FOUND
8506	CWB_ENVIRONMENT_EXISTS
8507	CWB_SYSTEM_EXISTS
8508	CWB_NO_SYSTEMS_CONFIGURED
8580	CWB_CONFIGERR_RESERVED_START
8599	CWB_CONFIGERR_RESERVED_END

Automation Object return codes:

8600	CWB_INVALID_METHOD_PARM
8601	CWB_INVALID_PROPERTY_PARM
8602	CWB_INVALID_PROPERTY_VALUE

```
8603   CWB_OBJECT_NOT_INITIALIZED
8604   CWB_OBJECT_ALREADY_INITIALIZED
8605   CWB_INVALID_DQ_ORDER
8606  CWB_DATA_TRANSFER_REQUIRED
8607   CWB_UNSUPPORTED_XFER_REQUEST
8608  CWB_ASYNC_REQUEST_ACTIVE
8609   CWB_REQUEST_TIMED_OUT
8610   CWB_CANNOT_SET_PROP_NOW
8611  CWB_OBJ_STATE_NO_LONGER_VALID
```

WINSOCK return codes:

```
10024    CWB_TOO_MANY_OPEN_SOCKETS
10035    CWB_RESOURCE_TEMPORARILY_UNAVAILABLE
10038    CWB_SOCKET_OPERATION_ON_NON_SOCKET
10047    CWB_PROTOCOL_NOT_INSTALLED
10050    CWB_NETWORK_IS_DOWN
10051    CWB_NETWORK_IS_UNREACHABLE
10052    CWB_NETWORK_DROPPED_CONNECTION_ON_RESET
10053    CWB_SOFTWARE_CAUSED_CONNECTION_ABORT
10054    CWB_CONNECTION_RESET_BY_PEER
10055    CWB_NO_BUFFER_SPACE_AVAILABLE
10057    CWB_SOCKET_IS_NOT_CONNECTED
10058    CWB_CANNOT_SEND_AFTER_SOCKET_SHUTDOWN
10060    CWB_CONNECTION_TIMED_OUT
10061    CWB_CONNECTION_REFUSED
10064    CWB_HOST_IS_DOWN
10065    CWB_NO_ROUTE_TO_HOST
10091    CWB_NETWORK_SUBSYSTEM_IS_UNAVAILABLE
10092    CWB_WINSOCK_VERSION_NOT_SUPPORTED
11001    CWB_HOST_DEFINITELY_NOT_FOUND
           The iSeries system name was not found during TCP/IP
           address lookup.
11002    CWB_HOST_NOT_FOUND_BUT_WE_ARE_NOT_SURE
           The iSeries system name was not found during TCP/IP
           address lookup.
11004    CWB_VALID_NAME_BUT_NO_DATA_RECORD
           The iSeries service name was not found in the local
           SERVICES file.
```

SSL return codes:

```
Key Database error codes

20001 - An unknown error occurred.
20002 - An asn.1 encoding/decoding error occurred.
20003 - An error occurred while initializing asn.1 encoder/decoder.
20004 - An asn.1 encoding/decoding error occurred because of an out-of-range
        index or nonexistent optional field.
20005 - A database error occurred.
20006 - An error occurred while opening the database file.
20007 - An error occurred while re-opening the database file.
20008 - Database creation failed.
20009 - The database already exists.
20010 - An error occurred while deleting the database file.
20011 - Database has not been opened.
20012 - An error occurred while reading the database file.
20013 - An error occurred while writing data to the database file.
20014 - A database validation error occurred.
20015 - An invalid database version was encountered.
20016 - An invalid database password was encountered.
20017 - An invalid database file type was encountered.
20018 - The database has been corrupted.
20019 - An invalid password was encountered or the database is not valid.
20020 - A database key entry integrity error occurred.
20021 - A duplicate key already exists in the database.
20022 - A duplicate key already exists in the database (Record ID).
20023 - A duplicate key already exists in the database (Label).
```

```
20024 - A duplicate key already exists in the database (Signature).
20025 - A duplicate key already exists in the database (Unsigned Certificate).
20026 - A duplicate key already exists in the database (Issuer and Serial Number).
20027 - A duplicate key already exists in the database (Subject Public Key Info).
20028 - A duplicate key already exists in the database (Unsigned CRL).
20029 - The label has been used in the database.
20030 - A password encryption error occurred.
20031 - An LDAP related error occurred.
20032 - A cryptographic error occurred.
20033 - An encryption/decryption error occurred.
20034 - An invalid cryptographic algorithm was found.
20035 - An error occurred while signing data.
20036 - An error occurred while verifying data.
20037 - An error occurred while computing digest of data.
20038 - An invalid cryptographic parameter was found.
20039 - An unsupported cryptographic algorithm was encountered.
20040 - The specified input size is greater than the supported modulus size.
20041 - An unsupported modulus size was found
20042 - A database validation error occurred.
20043 - Key entry validation failed.
20044 - A duplicate extension field exists.
20045 - The version of the key is wrong
20046 - A required extension field does not exist.
20047 - The validity period does not include today or does not fall within its
        issuer's validity period.
20048 - The validity period does not include today or does not fall within its
        issuer's validity period.
20049 - An error occurred while validating validity private key usage extension.
20050 - The issuer of the key was not found.
20051 - A required certificate extension is missing.
20052 - The key signature validation failed.
20053 - The key signature validation failed.
20054 - The root key of the key is not trusted.
20055 - The key has been revoked.
20056 - An error occurred while validating authority key identifier extension.
20057 - An error occurred while validating private key usage extension.
20058 - An error occurred while validating  subject alternative name extension.
20059 - An error occurred while validating  issuer alternative name extension.
20060 - An error occurred while validating  key usage extension.
20061 - An unknown critical extension was found.
20062 - An error occurred while validating key pair entries.
20063 - An error occurred while validating CRL.
20064 - A mutex error occurred.
20065 - An invalid parameter was found.
20066 - A null parameter or memory allocation error was encountered.
20067 - Number or size is too large or too small.
20068 - The old password is invalid.
20069 - The new password is invalid.
20070 - The password has expired.
20071 - A thread related error occurred.
20072 - An error occurred while creating threads.
20073 - An error occurred while a thread was waiting to exit.
20074 - An I/O error occurred.
20075 - An error occurred while loading CMS.
20076 - A cryptography hardware related error occurred.
20077 - The library initialization routine was not successfully called.
20078 - The internal database handle table is corrupted.
20079 - A memory allocation error occurred.
20080 - An unrecognized option was found.
20081 - An error occurred while getting time information.
20082 - Mutex creation error occurred.
20083 - An error occurred while opening message catalog.
20084 - An error occurred while opening error message catalog.
20085 - An null file name was found.
20086 - An error occurred while opening files, check for file existence and permissions.
20087 - An error occurred while opening files to read.
20088 - An error occurred while opening files to write.
```

```
20089 - There is no such file.
20090 - The file cannot be opened because of its permission setting.
20091 - An error occurred while writing data to files.
20092 - An error occurred while deleting files.
20093 - Invalid Base64-encoded data was found.
20094 - An invalid Base64 message type was found.
20095 - An error occurred while encoding data with Base64 encoding rule.
20096 - An error occurred while decoding Base64-encoded data.
20097 - An error occurred while getting a distinguished name tag.
20098 - The required common name field is empty.
20099 - The required country name field is empty.
20100 - An invalid database handle was found.
20101 - The key database does not exist.
20102 - The request key pair database does not exist.
20103 - The password file does not exist.
20104 - The new password is identical to the old one.
20105 - No key was found in the key database.
20106 - No request key was found.
20107 - No trusted CA was found
20108 - No request key was found for the certificate.
20109 - There is no private key in the key database
20110 - There is no default key in the key database.
20111 - There is no private key in the key record.
20112 - There is no certificate in the key record.
20113 - There is no CRL entry.
20114 - An invalid key database file name was found.
20115 - An unrecognized private key type was found.
20116 - An invalid distinguished name input was found.
20117 - No key entry was found that has the specified key label.
20118 - The key label list has been corrupted.
20119 - The input data is not valid PKCS12 data.
20120 - The password is invalid or the PKCS12 data has been corrupted or been
        created with later version of PKCS12.
20121 - An unrecognized key export type was found.
20122 - An unsupported password-based encryption algorithm was found.
20123 - An error occurred while converting the keyring file to a CMS key database.
20124 - An error occurred while converting the CMS key database to a keyring file.
20125 - An error occurred while creating a certificate for the certificate request.
20126 - A complete issuer chain cannot be built.
20127 - Invalid WEBDB data was found.
20128 - There is no data to be written to the keyring file.
20129 - The number of days that you entered extends beyond the permitted validity period.
20130 - The password is too short; it must consist of at least  characters.
20131 - A password must contain at least one numeric digit.
20132 - All characters in the password are either alphabetic or numeric characters.
20133 - An unrecognized or unsupported signature algorithm was specified.
20134 - An invalid key database type was specified.
20135 - The secondary key database is currently a secondary key database to another
        primary key database.
20136 - The key database does not have a secondary key database associated with it.
20137 - A cryptographic token with label  cannot be found.
20138 - A cryptographic token password was not specified but is required.
20139 - A cryptographic token password was specified but is not required.
20140 - The cryptographic module cannot be loaded.  Cryptographic token support will
        not be available.
20141 - The function is not supported for cryptographic tokens.
20142 - The cryptographic token function failed.

SSL error codes


25001 - The handle is not valid.
25002 - The dynamic link library is not available.
25003 -  An internal error occurred.
25004 - Main memory is insufficient to perform the operation.
25005 - The handle is not in a valid state for operation.
25006 - The key label is not found.
```

```
25007 - The certificate is not available.
25008 - Certificate validation error.
25009 - Error processing cryptography.
25010 - Error validating ASN fields in certificate.
25011 - Error connecting to LDAP server.
25012 - Internal unknown error. Report problem to service.
25101 - An error occurred processing the cipher.
25102 - I/O error reading key file.
25103 - Key file has an invalid internal format. Re-create key file.
25104 - Key file has two entries with the same key. Use iKeyman to remove the duplicate key.
25105 - Key file has two entries with the same label. Use iKeyman to remove the duplicate label.
25106 - The key file password is used as an integrity check. Either the key file has
        become corrupted or the password ID is incorrect.
25107 - The default key in the key file has an expired certificate. Use iKeyman to remove
        certificates that are expired.
25108 - There was an error loading one of the dynamic link libraries.
25109 - A connection is trying to be made after environment has been closed.
25201 - The key file could not be initialized.
25202 - Unable to open the key file. Either the path was specified incorrectly or the file
        permissions did not allow the file to be opened.
25203 - Unable to generate a temporary key pair.
25204 - A User Name object was specified that is not found.
25205 - A Password used for an LDAP query is not correct.
25206 - An index into the Fail Over list of LDAP servers was not correct.
25301 - An error occurred on close.
25401 - The system date was set to an invalid value.
25402 - Neither SSLV2 nor SSLV3 is enabled.
25403 - The required certificate was not received from partner.
25404 - The received certificate was formatted incorrectly.
25405 - The received certificate type was not supported.
25406 - An IO error occurred on a data read or write.
25407 - The specified label in the key file could not be found.
25408 - The specified key-file password is incorrect. The key file could not be
        used. The key file may also be corrupt.
25409 - In a restricted cryptography environment, the key size is too long to be supported.
25410 - An incorrectly formatted SSL message was received from the partner.
25411 - The message authentication code (MAC) was not successfully verified.
25412 - The operation is unsupported.
25413 - The received certificate contained an incorrect signature.
25414 - The server certificate is not trusted. This usually occurs when you have
        not downloaded the certificate authority for the server certificate. Use the
        iSeries Digital Certificate Manager to obtain the certificate authority and
        use the PC IBM Key Management utility to place the certificate authority in
        your local key database. See CWBCO1050 for additional information
25415 - The remote system information is not valid.
25416 - Access denied.
25417 - The self-signed certificate is not valid.
25418 - The read failed.
25419 - The write failed.
25420 - The partner closed the socket before the protocol completed. This could mean the
        partner is configured for SSL Client Authentication and no client certificate was
        sent to the partner.
25421 - The specified V2 cipher is not valid.
25422 - The specified V3 cipher is not valid.
25425 - The handle could not be created.
25426 - Initialization failed.
25427 - When validating a certificate, unable to access the specified LDAP directory.
25428 - The specified key did not contain a private key.
25429 - A failed attempt was made to load the specified PKCS11 shared library.
25430 - The PKCS #11 driver failed to find the token specified by the caller.
25431 - The PKCS #11 token is not present in the slot.
25432 - The password/pin to access the PKCS #11 token is invalid.
25433 - The SSL header received was not a properly SSLV2 formatted header.
25434 - Unable to access the hardware-based cryptographic service provider (CSP).
25435 - Attribute setting conflict
25436 - The requested function is not supported on the platform that the application is running
25437 - An IPv6 connection is detected
```

```
25438 - Incorrect value is returned from the reset session type callback function
25501 - The buffer size is negative or 0.
25502 - Used with non-blocking I/O.
25601 - SSLV3 is required for reset_cipher, and the connection uses SSLV2.
25602 - An invalid ID was specified for  the function call.
25701 - The function call has an invalid ID.
25702 - The attribute has a negative length, which is invalid.
25703 - The enumeration value is invalid for the specified enumeration type.
25704 - Invalid parameter list for replacing the SID cache routines.
25705 - When setting a numeric attribute, the specified value is invalid for the
        specific attribute being set.
25706 - Conflicting parameters have been set for additional certificate validation.
25707 - The cipher spec included an AES cipher spec that is not supported on the
        system of execution.
25708 - The length of the peer ID is incorrect. It must be less than or equal to 16 bytes
```

iSeries Access for Windows component-specific return codes:

Administration APIs return code:

```
6001    CWBAD_INVALID_COMPONENT_ID
          The component ID is invalid.
```

Related reference

"iSeries Access for Windows Administration APIs" on page 30
iSeries Access for Windows Administration APIs provide functions that access information about the iSeries Access for Windows code that is installed on the PC.

Communications APIs return codes:

```
6001    CWBCO_END_OF_LIST
          The end of system list has been reached. No system name was returned.
6002    CWBCO_DEFAULT_SYSTEM_NOT_DEFINED
          The setting for the default system has not been defined.
6003    CWBCO_DEFAULT_SYSTEM_NOT_CONFIGURED
          The default system is defined, but no connection to it is
          configured.
6004    CWBCO_SYSTEM_NOT_CONNECTED
          The specified system is not currently connected in the current process.
6005    CWBCO_SYSTEM_NOT_CONFIGURED
          The specified system is not currently configured.
6007    CWBCO_INTERNAL_ERROR
          Internal error.
6008    CWBCO_NO_SUCH_ENVIRONMENT
          The specified environment does not exist.
```

Related reference

"iSeries Access for Windows Communications and Security APIs" on page 41
The iSeries Access for Windows Communications and Security topic shows you how to use iSeries Access for Windows application programming interfaces (APIs)

Database APIs return codes:

Note: See the iSeries Access for Windows database APIs topic for important information regarding database APIs.

```
6001    CWBDB_CANNOT_CONTACT_SERVER
          An error was encountered which prevented the Data Access server from
          being started.
6002    CWBDB_ATTRIBUTES_FAILURE
          An error was encountered during attempt to set the Data Access
          server attributes.
6003    CWBDB_SERVER_ALREADY_STARTED
          An attempt to start the Data Access server was made while a valid
          server was running. Stop the server before restarting it.
6004    CWBDB_INVALID_DRDA_PKG_SIZE
```

```
          The valid submitted for the DRDA package size was invalid.
6005    CWBDB_REQUEST_MEMORY_ALLOCATION_FAILURE
          A memory allocation attempt by a request handle failed.
6006    CWBDB_REQUEST_INVALID_CONVERSION
          A Request handle failed in an attempt to convert data.
6007    CWBDB_SERVER_NOT_ACTIVE
          The Data Access server is not started. It must be started before
          continuing.
6008    CWBDB_PARAMETER_ERROR
          Attempt to set a parameter failed. Re-try. If error persists, there
          may be a lack of available memory.
6009    CWBDB_CLONE_CREATION_ERROR
          Could not create a clone request.
6010    CWBDB_INVALID_DATA_FORMAT_FOR_CONNECTION
          The data format object was not valid for this connection.
6011    CWBDB_DATA_FORMAT_IN_USE
          The data format object is already being used by another request.
6012    CWBDB_INVALID_DATA_FORMAT_FOR_DATA
          The data format object does not match the format of the data.
6013    CWBDB_STRING_ARG_TOO_LONG
          The string provided was too long for the parameter.
6014    CWBDB_INVALID_INTERNAL_ARG
          Invalid internally generated argument (not user supplied).
6015    CWBDB_INVALID_NUMERIC_ARG
          Value of numeric argument is invalid.
6016    CWBDB_INVALID_ARG
          Value of argument is invalid.
6017    CWBDB_STMT_NOT_SELECT
          The statement provided was not a SELECT statement. This call requires
          a SELECT statement.
6018    CWBDB_STREAM_FETCH_NOT_COMPLETE
          The connection is in stream fetch mode. Cannot perform desired
          operation until stream fetch has ended.
6019    CWBDB_STREAM_FETCH_NOT_ACTIVE
          The connection is not in stream fetch mode and must be in order to
          perform the desired operation.
6020    CWBDB_MISSING_DATA_PROCESSOR
          Pointer to data processor in request object is null.
6021    CWBDB_ILLEGAL_CLONE_REQUEST_TYPE
          Cannot create a clone of an attributes request.
6022    CWBDB_UNSOLICITED_DATA
          Data were received from the server, but none were requested.
6023    CWBDB_MISSING_DATA
          Data were requested from the server, but not all were received.
6024    CWBDB_PARM_INVALID_BITSTREAM
          Bitstream within a parameter is invalid.
6025    CWBDB_CONSISTENCY_TOKEN_ERROR
          The data format used to interpret the data from the iSeries does not
          match the data returned.
6026    CWBDB_INVALID_FUNCTION
          The function is invalid for this type of request.
6027    CWBDB_FORMAT_INVALID_ARG
          A parameter value passed to the API was not valid.
6028    CWBDB_INVALID_COLUMN_POSITION
          The column position passed to the API was not valid.
6029    CWBDB_INVALID_COLUMN_TYPE
          The column type passed to the API was not valid.
6030    CWBDB_ROW_VECTOR_NOT_EMPTY
          Invalid or corrupted format handle.
6031    CWBDB_ROW_VECTOR_EMPTY
          Invalid or corrupted format handle.
6032    CWBDB_MEMORY_ALLOCATION_FAILURE
          An error occurred while attempting to allocate memory.
6033    CWBDB_INVALID_CONVERSION
          An invalid type conversion was attempted.
6034    CWBDB_DATASTREAM_TOO_SHORT
          The data stream received from the host was too short.
```

```
6035    CWBDB_SQL_WARNING
          The database server received a warning from an SQL operation.
6036    CWBDB_SQL_ERROR
          The database server received an error from an SQL operation.
6037    CWBDB_SQL_PARAMETER_WARNING
          The database server received a warning about a parameter used in an
          SQL operation.
6038    CWBDB_SQL_PARAMETER_ERROR
          The database server received an error about a parameter used in an
          SQL operation.
6039    CWBDB_LIST_SERVER_WARNING
          The database server returned a warning from a catalog operation.
6040    CWBDB_LIST_SERVER_ERROR
          The database server returned an error from a catalog operation.
6041    CWBDB_LIST_PARAMETER_WARNING
          The database server returned a warning about a parameter used in a
          catalog operation.
6042    CWBDB_LIST_PARAMETER_ERROR
          The database server returned an error about a parameter used in a
          catalog operation.
6043    CWBDB_NDB_FILE_SERVER_WARNING
          The database server returned a warning from a file processing
          operation.
6044    CWBDB_NDB_FILE_SERVER_ERROR
          The database server returned an error from a file processing operation.
6045    CWBDB_FILE_PARAMETER_WARNING
          The database server returned a warning about a parameter used in a
          file processing operation.
6046    CWBDB_FILE_PARAMETER_ERROR
          The database server returned an error about a parameter used in a
          file processing operation.
6047    CWBDB_GENERAL_SERVER_WARNING
          The database server returned a general warning.
6048    CWBDB_GENERAL_SERVER_ERROR
          The database server returned a general error.
6049    CWBDB_EXIT_PROGRAM_WARNING
          The database server returned a warning from an exit program.
6050    CWBDB_EXIT_PROGRAM_ERROR
          The database server returned an error from an exit program.
6051    CWBDB_DATA_BUFFER_TOO_SMALL
          Target data buffer is smaller than source buffer.
6052    CWBDB_NL_CONVERSION_ERROR
          Received error back from PiNlConverter.
6053    CWBDB_COMMUNICATIONS_ERROR
          Received a communications error during processing.
6054    CWBDB_INVALID_ARG_API
          Value of argument is invalid - API level.
6055    CWBDB_MISSING_DATA_HANDLER
          Data handler not found in data handler list.
6056    CWBDB_REQUEST_DATASTREAM_NOT_VALID
          Invalid datastream in catalog request.
6057    CWBDB_SERVER_UNABLE
          Server incapable of performing desired function.

The following return codes are returned by the
cwbDB_StartServerDetailed API:

6058    CWBDB_WORK_QUEUE_START_ERROR
          Unable to start server because of client work queue problem.
6059    CWBDB_WORK_QUEUE_CREATE_ERROR
          Unable to start server because of client work queue problem.
6060    CWBDB_INITIALIZATION_ERROR
          Unable to start server because of client initialization problem.
6061    CWBDB_SERVER_ATTRIBS_ERROR
          Unable to start server because of server attribute problem.
6062    CWBDB_CLIENT_LEVEL_ERROR
          Unable to start server because of set client level problem.
```

```
6063    CWBDB_CLIENT_LFC_ERROR
          Unable to start server because of set client language feature
          code problem.
6064    CWBDB_CLIENT_CCSID_ERROR
          Unable to start server because of set client CCSID problem.
6065    CWBDB_TRANSLATION_INDICATOR_ERROR
          Unable to start server because of set translation indicator error.
6066    CWBDB_RETURN_SERVER_ATTRIBS_ERROR
          Unable to start server because of return server attribute problem.
6067    CWBDB_SERVER_ATTRIBS_REQUEST
          Unable to start server because of missing server attributes request
          object.
6068    CWBDB_RETURN_ATTRIBS_ERROR
         Unable to start server because of return attribute problem.
6069    CWBDB_SERVER_ATTRIBS_MISSING
          Unable to start server because returned server attributes too short
          (missing data).
6070    CWBDB_SERVER_LFC_CONVERSION_ERROR
          Unable to start server because of data conversion error on server
          language feature code field of server attributes.
6071    CWBDB_SERVER_LEVEL_CONVERSION_ERROR
          Unable to start server because of data conversion error on server
          functional level field of server attributes.
6072    CWBDB_SERVER_LANGUAGE_TABLE_ERROR
          Unable to start server because of data conversion error on server
          language table ID field of server attributes.
6073    CWBDB_SERVER_LANGUAGE_LIBRARY_ERROR
          Unable to start server because of data conversion error on server
          language library ID field of server attributes.
6074    CWBDB_SERVER_LANGUAGE_ID_ERROR
          Unable to start server because of data conversion error on server
          language ID field of server attributes.
6075    CWBDB_COMM_DEQUEUE_ERROR
          Unable to start server because of communications error.
6076    CWBDB_COMM_ENQUEUE_ERROR
          Unable to start server because of communications error.
6077    CWBDB_UNSUPPORTED_COLUMN_TYPE
          An unsupported column type was found in the data.
6078    CWBDB_SERVER_IN_USE
          A connection to the database server for the given connection
          handle is already being used by another connection handle which
          was created with the same system object handle.
6079    CWBDB_SERVER_REL_DB_CONVERSION_ERROR
          Unable to start server because of data conversion error on
          server relational DB field of server attributes. There is no
          message or help text for this return code.
6080    CWBDB_SERVER_FUNCTION_NOT_AVAILABLE
          This function is not available on this version of the host server.
6081    CWBDB_FUNCTION_NOT_VALID_AFTER_CONNECT
          This function is not valid after connecting to the host server.
6082    CWBDB_INVALID_INITIAL_REL_DB_NAME
          The initial relational DB name (IASP) was invalid.
6099    CWBDB_LAST_STREAM_CHUNK
          Stream fetch complete.
          NOTE: Informational, not an error. There is not a message or help text
          for this return code.
```

Related reference

"iSeries Access for Windows database APIs" on page 550
The iSeries Access for Windows proprietary C/C++ Database APIs provide support for iSeries database and catalog functions, in addition to SQL access to iSeries database files. Choose this link for important information regarding these APIs.

Data Queues APIs return codes:

6000 CWBDQ_INVALID_ATTRIBUTE_HANDLE
Invalid attributes handle.

6001 CWBDQ_INVALID_DATA_HANDLE
Invalid data handle.

6002 CWBDQ_INVALID_QUEUE_HANDLE
Invalid queue handle.

6003 CWBDQ_INVALID_READ_HANDLE
Invalid data queue read handle.

6004 CWBDQ_INVALID_QUEUE_LENGTH
Invalid maximum record length for a data queue.

6005 CWBDQ_INVALID_KEY_LENGTH
Invalid key length.

6006 CWBDQ_INVALID_ORDER
Invalid queue order.

6007 CWBDQ_INVALID_AUTHORITY
Invalid queue authority.

6008 CWBDQ_INVALID_QUEUE_TITLE
Queue title (description) is too long or cannot be converted.

6009 CWBDQ_BAD_QUEUE_NAME
Queue name is too long or cannot be converted.

6010 CWBDQ_BAD_LIBRARY_NAME
Library name is too long or cannot be converted.

6011 CWBDQ_BAD_SYSTEM_NAME
System name is too long or cannot be converted.

6012 CWBDQ_BAD_KEY_LENGTH
Length of key is not correct for this data queue or key length is greater than 0 for a LIFO or FIFO data queue.

6013 CWBDQ_BAD_DATA_LENGTH
Length of data is not correct for this data queue. Either the data length is zero or it is greater than the maximum allowed of 31744 bytes (64512 bytes for V4R5 and later versions of i5/OS).
Note: The maximum allowed data lengh when connected to i5/OS V4R5MO and later systems has been increased to 64512 bytes. When connected to earlier releases of i5/OS, 64512 bytes of data may be written to a data queue, but the maximum length of data that may be read from a data queue is 31744 bytes.

6014 CWBDQ_INVALID_TIME
Wait time is not correct.

6015 CWBDQ_INVALID_SEARCH
Search order is not correct.

6016 CWBDQ_DATA_TRUNCATED
Returned data was truncated.

6017 CWBDQ_TIMED_OUT
Wait time has expired and no data has been returned.

6018 CWBDQ_REJECTED_USER_EXIT
Command rejected by user exit program.

6019 CWBDQ_USER_EXIT_ERROR
Error in user exit program or invalid number of exit programs.

6020 CWBDQ_LIBRARY_NOT_FOUND
Library not found on system.

6021 CWBDQ_QUEUE_NOT_FOUND
Queue not found on system.

6022 CWBDQ_NO_AUTHORITY
No authority to library or data queue.

6023 CWBDQ_DAMAGED_QUEUE
Data queue is in an unusable state.

6024 CWBDQ_QUEUE_EXISTS
Data queue already exists.

6025 CWBDQ_INVALID_MESSAGE_LENGTH
Invalid message length - exceeds queue maximum record length.

6026 CWBDQ_QUEUE_DESTROYED
Queue destroyed while waiting to read or peek a record.

6027 CWBDQ_NO_DATA
No data was received.

6028 CWBDQ_CANNOT_CONVERT
Data cannot be converted for this data queue. The data queue

```
          can be used but data cannot be converted between ASCII and EBCDIC.
          The convert flag on the data object will be ignored.
6029    CWBDQ_QUEUE_SYNTAX
          Syntax of the data queue name is incorrect. Queue name must follow
          iSeries object syntax. First character must be alphabetic and all
          following characters alphanumeric.
6030    CWBDQ_LIBRARY_SYNTAX
          Syntax of the library name is incorrect. Library name must follow
          iSeries object syntax. First character must be alphabetic and all
          following characters alphanumeric.
6031    CWBDQ_ADDRESS_NOT_SET
          Address not set. The data object was not set with cwbDQ_SetDataAddr(),
          so the address cannot be retrieved. Use cwbDQ_GetData() instead of
          cwbDQ_GetDataAddr().
6032    CWBDQ_HOST_ERROR
          Host error occurred for which no return code is defined. See the
          error handle for the message text.
6033    CWBDQ_INVALID_SYSTEM_HANDLE
          System handle is invalid.
6099    CWBDQ_UNEXPECTED_ERROR
          Unexpected error.
```

Related reference

"iSeries Access for Windows Data Queues APIs" on page 117
Use iSeries Access for Windows Data Queues application programming interfaces (APIs) to provide easy access to iSeries data queues. Data queues allow you to create client/server applications that do not require the use of communications APIs.

Directory Update APIs return codes:

```
6000    CWBUP_ENTRY_NOT_FOUND
          No update entry matched search value.
6001    CWBUP_SEARCH_POSITION_ERROR
          Search starting position is not valid.
6002    CWBUP_PACKAGE_NOT_FOUND
          The package file was not found.
6003    CWBUP_POSITION_INVALID
          Position that is given is not in range.
6004    CWBUP_TOO_MANY_ENTRIES
          The maximum number of update entries already exist. No more can be
          created.
6005    CWBUP_TOO_MANY_PACKAGES
          Maximum number of package files already exists for this entry.
6006    CWBUP_STRING_TOO_LONG
          The text string parameter passed in is longer than CWBUP_MAX_LENGTH.
6007    CWBUP_ENTRY_IS_LOCKED
          Another application is currently changing the update entry list. No
          changes are allowed at this time.
6008    CWBUP_UNLOCK_WARNING
          Application did not have the update entries locked.
```

Related reference

"iSeries Access for Windows Directory Update APIs" on page 207
The iSeries Access for Windows Directory Update function allows users to specify PC directories for updating from a configured network server or from multiple networked servers. This permits users to load non-iSeries Access for Windows software products on a server in the network, and to keep those files updated on PCs. Directory Update is an optionally installable iSeries Access for Windows component.

National language support APIs return codes:

```
6101    CWBNL_ERR_CNV_UNSUPPORTED
          An attempt was made to convert character data from a code page to
          another code page but this conversion is not supported.
6102    CWBNL_ERR_CNV_TBL_INVALID
          A conversion table is in a format that is not recognized.
```

```
6103    CWBNL_ERR_CNV_TBL_MISSING
          An attempt was made to use a conversion table, but the table was not
          found.
6104    CWBNL_ERR_CNV_ERR_GET
          A code page conversion table was being retrieved from the server
          when an error occurred.
6105    CWBNL_ERR_CNV_ERR_COMM
          A code page conversion table was being retrieved from the server
          when a communications error occurred.
6106    CWBNL_ERR_CNV_ERR_SERVER
          A code page conversion table was being retrieved from the server
          when a server error occurred.
6107    CWBNL_ERR_CNV_ERR_STATUS
          While converting character data from one code page to another, some
          untranslatable characters were encountered.
6108    CWBNL_ERROR_CONVERSION_INCOMPLETE_MULTIBYTE_INPUT_CHARACTER
          While converting character data an incomplete multibyte character
          was found.
6109    CWBNL_ERR_CNV_INVALID_SISO_STATUS
          The SISO parameter is incorrect.
6110    CWBNL_ERR_CNV_INVALID_PAD_LENGTH
          The pad length parameter is incorrect.
```

```
The following return codes are for language APIs:
```

```
6201    CWBNL_ERR_STR_TBL_INVALID
          Message file not in a recognized format. It has been corrupted.
6202    CWBNL_ERR_STR_TBL_MISSING
          Message file could not be found.
6203    CWBNL_ERR_STR_NOT_FOUND
          The message file is missing a message.
6204    CWBNL_ERR_NLV_NO_CONFIG
           The language configuration is missing.
6205    CWBNL_ERR_NLV_NO_SUBDIR
           The language subdirectory is missing.
6206    CWBNL_DEFAULT_HOST_CCSID_USED
          A default server CCSID (500) is used.
```

```
The following return codes are for locale APIs:
```

```
6301    CWBNL_ERR_LOC_TBL_INVALID
6302    CWBNL_ERR_LOC_TBL_MISSING
6303    CWBNL_ERR_LOC_NO_CONFIG
6304    CWBNL_ERR_LOC_NO_LOCPATH
```

iSeries Object APIs return codes:

```
6000    CWBOBJ_RC_HOST_ERROR
          Host error occurred.  Text may be in errorHandle.
6001    CWBOBJ_RC_INVALID_TYPE
          Incorrect object type.
6002    CWBOBJ_RC_INVALID_KEY
          Incorrect key.
6003    CWBOBJ_RC_INVALID_INDEX
          Bad index to list.
6004    CWBOBJ_RC_LIST_OPEN
          The list is already opened.
6005    CWBOBJ_RC_LIST_NOT_OPEN
          The list has not been opened.
6006    CWBOBJ_RC_SEEKOUTOFRANGE
          Seek offset is out of range.
6007    CWBOBJ_RC_SPLFNOTOPEN
          Spooled file has not been opened.
6007    CWBOBJ_RC_RSCNOTOPEN
          Resource has not been opened.
6008    CWBOBJ_RC_SPLFENDOFFILE
          End of file was reached.
```

```
6008    CWBOBJ_RC_ENDOFFILE
          End of file was reached.
6009    CWBOBJ_RC_SPLFNOMESSAGE
          The spooled file is not waiting on a message.
6010    CWBOBJ_RC_KEY_NOT_FOUND
          The parameter list does not contain the specified key.
6011    CWBOBJ_RC_NO_EXIT_PGM
          No exit program registered.
6012    CWBOBJ_RC_NOHOSTSUPPORT
          Host does not support function.
```

Related reference

"iSeries Objects APIs for iSeries Access for Windows" on page 227
iSeries Objects for iSeries Access for Windows application programming interfaces (APIs) allow you to work with iSeries print-related objects. These APIs make it possible to work with iSeries spooled files, writer jobs, output queues, printers, and more.

Remote Command/Distributed Program Call APIs return codes:

```
6000    CWBRC_INVALID_SYSTEM_HANDLE
          Invalid system handle.
6001    CWBRC_INVALID_PROGRAM
          Invalid program handle.
6002    CWBRC_SYSTEM_NAME
          System name is too long or cannot be converted.
6003    CWBRC_COMMAND_STRING
          Command string is too long or cannot be converted.
6004    CWBRC_PROGRAM_NAME
          Program name is too long or cannot be converted.
6005     CWBRC_LIBRARY_NAME
          Library name is too long or cannot be converted.
6006    CWBRC_INVALID_TYPE
          Invalid parameter type specified.
6007    CWBRC_INVALID_PARM_LENGTH
          Invalid parameter length.
6008    CWBRC_INVALID_PARM
          Invalid parameter specified.
6009    CWBRC_TOO_MANY_PARMS
          Attempt to add too many parameters to a program.
6010    CWBRC_INDEX_RANGE_ERROR
          Index is out of range for this program.
6011    CWBRC_REJECTED_USER_EXIT
          Command rejected by user exit program.
6012    CWBRC_USER_EXIT_ERROR
          Error in user exit program.
6013    CWBRC_COMMAND_FAILED
          Command failed.
6014    CWBRC_PROGRAM_NOT_FOUND
          Program not found or could not be accessed.
6015    CWBRC_PROGRAM_ERROR
          Error occurred when calling the program.
6016    CWBRC_COMMAND_TOO_LONG
          Command string is too long.
6099    CWBRC_UNEXPECTED_ERROR
          Unexpected error.
```

Related reference

"iSeries Access for Windows Remote Command/Distributed Program Call APIs" on page 324
The iSeries Access for Windows Remote Command/Distributed Program Call APIs allow the PC application programmer to access functions on the iSeries system. User program and system commands can be called without requiring an emulation session. A single iSeries program serves commands and programs, so only one iSeries job is started for both.

Security APIs return codes:

```
6000    CWBSY_UNKNOWN_USERID
          User ID does not exist.
6002    CWBSY_WRONG_PASSWORD
          Password is not correct for specified user ID.
6003    CWBSY_PASSWORD_EXPIRED
          Password has expired.
6004    CWBSY_INVALID_PASSWORD
          One or more characters in the password are not valid or the password
          is too long.
6007    CWBSY_GENERAL_SECURITY_ERROR
          A general security error occurred. The user profile does not have a
          password or the password validation program found an error in the
          password.
6009    CWBSY_INVALID_PROFILE
          The server user profile is not valid.
6011    CWBSY_USER_PROFILE_DISABLED
          The iSeries user profile (user ID) has been set to disabled.
6013    CWBSY_USER_CANCELLED
          The user cancelled from the user ID/password prompt.
6015    CWBSY_INVALID_USERID
          One or more characters in the user ID is not valid or the user ID is
          too long.
6016    CWBSY_UNKNOWN_SYSTEM
          The system specified is unknown.
6019    CWBSY_TP_NOT_VALID
          The PC could not validate the iSeries security server. This could
          indicate tampering with the IBM supplied security server program on
          the iSeries.
6022    CWBSY_NOT_LOGGED_ON
          There is no user currently logged on for the specified system.
6025    CWBSY_SYSTEM_NOT_CONFIGURED
          The system specified in the security object has not been configured.
6026    CWBSY_NOT_VERIFIED
          The user ID and password defined in the object has not yet been
          verified. You must verify using cwbSY_VerifyUserIDPwd API.
6255    CWBSY_INTERNAL_ERROR
          Internal error. Contact IBM Service.
```

The following return codes are for change password APIs:

```
6257    CWBSY_PWD_TOO_LONG
          The new password contains too many characters. The maximum number of
          characters allowed is defined by the iSeries system value, QPWDMAXLEN.
6258    CWBSY_PWD_TOO_SHORT
          The new password does not contain enough characters. The minimum
          number of characters allowed is defined by the iSeries system value,
          QPWDMINLEN.
6259    CWBSY_PWD_REPEAT_CHARACTER
          The new password contains a character used more than once. The iSeries
          configuration (system value QPWDLMTREP) does not allow passwords to
          contain a repeat character.
6260    CWBSY_PWD_ADJACENT_DIGITS
          The new password contains two numbers next to each other. The iSeries
          configuration (system value QPWDLMTAJC) does not allow passwords to
          contain consecutive digits.
6261    CWBSY_PWD_CONSECUTIVE_CHARS
          The new password contains a character repeated consecutively. The
          iSeries configuration (system value QPWDLMTREP) does not allow a
          password to contain a character repeated consecutively.
6262    CWBSY_PWD_PREVIOUSLY_USED
          The new password matches a previously used password. The iSeries
          configuration (system value QPWDRQDDIF) requires new passwords to be
          different than any previous password.
6263    CWBSY_PWD_DISALLOWED_CHAR
          The new password uses an installation disallowed character. iSeries
          configuration (system value QPWDLMTCHR) restricts certain characters
          from being used in new passwords.
```

```
6264    CWBSY_PWD_NEED_NUMERIC
          The new password must contain a number. The iSeries configuration
          (system value QPWDRQDDGT) requires new passwords contain one or more
          numeric digits.
6266    CWBSY_PWD_MATCHES_OLD
          The new password matches an old password in one or more character
          positions. The server configuration (system value QPWDPOSDIF) does
          not allow the same character to be in the same position as a
          previous password.
6267    CWBSY_PWD_NOT_ALLOWED
          The password was rejected.
6268    CWBSY_PWD_MATCHES_USERID
          The password matches the user ID.
6269    CWBSY_PWD_PRE_V3
          The old password was created on a pre-V3 system which used a
          different encryption technique. Password must be changed manually on
          the server.
6270    CWBSY_LAST_INVALID_PASSWORD
          The next invalid will disable the user profile.
```

Related reference

"iSeries Access for Windows Communications and Security APIs" on page 41
The iSeries Access for Windows Communications and Security topic shows you how to use iSeries Access for Windows application programming interfaces (APIs)

Serviceability APIs return codes:

```
6000    CWBSV_INVALID_FILE_TYPE
          Unusable file type passed-in.
6001    CWBSV_INVALID_RECORD_TYPE
          Unusable record type passed-in.
6002    CWBSV_INVALID_EVENT_TYPE
          Unusable event type detected.
6003    CWBSV_NO_ERROR_MESSAGES
          No error messages associated with error handle.
6004    CWBSV_ATTRIBUTE_NOT_SET
          Attribute not set in current message.
6005    CWBSV_INVALID_MSG_CLASS
          Unusable message class passed-in.
6006    CWBSV_LOG_NOT_STARTED
          The requested log could not be started.
```

Related reference

"iSeries Access for Windows Serviceability APIs" on page 342
The iSeries Access for Windows Serviceability application programming interfaces (APIs) allow you to log service file messages and events within your program.

System Object Access APIs return codes:

```
0    CWBSO_NO_ERROR
          No error occurred.
1    CWBSO_ERROR_OCCURRED
          An error occurred.  Use error handle for more information.
2    CWBSO_LOW_MEMORY
          Not enough memory is available for the request.
3    CWBSO_BAD_LISTTYPE
          The value specified for type of list is not valid.
4    CWBSO_BAD_HANDLE
          The handle specified is not valid.
5    CWBSO_BAD_LIST_HANDLE
          The list handle specified is not valid.
6    CWBSO_BAD_OBJ_HANDLE
          The object handle specified is not valid.
7    CWBSO_BAD_PARMOBJ_HANDLE
          The parameter object handle specified is not valid.
8    CWBSO_BAD_ERR_HANDLE
```

```
          The error handle specified is not valid.
9     CWBSO_BAD_LIST_POSITION
          The position in list specified does not exist.
10    CWBSO_BAD_ACTION_ID
          An action ID specified is not valid for the type of list.
11    CWBSO_NOT_ALLOWED_NOW
          The action requested is not allowed at this time.
12    CWBSO_BAD_INCLUDE_ID
          The filter ID specified is not valid for this list.
13    CWBSO_DISP_MSG_FAILED
          The request to display the message failed.
14    CWBSO_GET_MSG_FAILED
          The error message text could not be retrieved.
15    CWBSO_BAD_SORT_ID
          A sort ID specified is not valid for the type of list.
16    CWBSO_INTERNAL_ERROR
          An internal processing error occurred.
17    CWBSO_NO_ERROR_MESSAGE
          The error handle specified contains no error message.
18    CWBSO_BAD_ATTRIBUTE_ID
          The attribute key is not valid for this object.
19    CWBSO_BAD_TITLE
          The title specified is not valid.
20    CWBSO_BAD_FILTER_VALUE
          The filter value specified is not valid.
21    CWBSO_BAD_PROFILE_NAME
          The profile name specified is not valid.
22    CWBSO_DISPLAY_FAILED
          The window could not be created.
23    CWBSO_SORT_NOT_ALLOWED
          Sorting is not allowed for this type of list.
24    CWBSO_CANNOT_CHANGE_ATTR
          Attribute is not changeable at this time.
25    CWBSO_CANNOT_READ_PROFILE
          Cannot read from the specified profile file.
26    CWBSO_CANNOT_WRITE_PROFILE
          Cannot write to the specified profile file.
27    CWBSO_BAD_SYSTEM_NAME
          The system name specified is not a valid iSeries system name.
28    CWBSO_SYSTEM_NAME_DEFAULTED
          No system name was specified on the "CWBSO_CreateListHandle" call
          for the list.
29    CWBSO_BAD_FILTER_ID
          The filter ID specified is not valid for the type of list.
```

Related reference

"iSeries Access for Windows System Object Access (SOA) APIs" on page 393
System Object Access enables you to view and manipulate iSeries objects through a graphical user interface.

"About System Object Access errors" on page 402
All System Object Access APIs use return codes to report error conditions.

iSeries Access for Windows Administration APIs

iSeries Access for Windows Administration APIs provide functions that access information about the iSeries Access for Windows code that is installed on the PC.

Administration APIs allow you to determine:

- The version and service level of iSeries Access for Windows
- The install status of individual components
- The install status of iSeries Navigator plug-ins

iSeries Access for Windows Administration APIs required files:

Header file	Import library	Dynamic Link Library
cwbad.h	cwbapi.lib	cwbad.dll

Programmer's Toolkit:

The Programmer's Toolkit provides Administration APIs documentation, access to the cwbad.h header file, and links to sample programs. To access this information, open the Programmer's Toolkit and select **Client Information** → **C/C++ APIs**.

iSeries Access for Windows Administration APIs topics:

Note: By using the code examples, you agree to the terms of the "Code license and disclaimer information" on page 552.

Related reference

"Administration APIs return code" on page 20

"iSeries system name formats for connection APIs" on page 5
APIs that take an iSeries system name as a parameter accept names in the following formats.

"OEM, ANSI, and Unicode considerations" on page 6
Most of the iSeries Access for Windows C/C++ APIs that accept string parameters exist in three forms: OEM, ANSI, or Unicode.

Administration APIs list

The following APIs are used in Administration.

cwbAD_GetClientVersion:

Purpose

Get the version of the iSeries Access for Windows product that currently is installed on a PC.

Syntax

```
unsigned int CWB_ENTRY cwbAD_GetClientVersion(
                             unsigned long      *version
                             unsigned long      *release
                             unsigned long      *modificationLevel);
```

Parameters

unsigned long *version - output
Pointer to a buffer where the version level of the iSeries Access for Windows product is returned.

unsigned long *release - output
Pointer to a buffer where the release level of the iSeries Access for Windows product is returned.

unsigned long *modificationLevel - output
Pointer to a buffer where the modification level of the iSeries Access for Windows product is returned.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_POINTER
One or more pointer parameters are null.

Usage

If the return code is not CWB_OK, the values in version, release, and modificationLevel are meaningless.

cwbAD_GetProductFixLevel:

Purpose

Returns the current fix level of iSeries Access for Windows.

Syntax

```
unsigned int CWB_ENTRY cwbAD_GetProductFixLevel(
                             char              *szBuffer
                             unsigned long     *ulBufLen);
```

Parameters

char *szBuffer - output
Buffer into which the product fix level string will be written.

unsigned long * ulBufLen - input/output
Size of szBuffer, including space for the NULL terminator. On output, will contain the length of the fix level string, including the terminating NULL.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_BUFFER_OVERFLOW
Buffer overflow. The required length is returned in ulBufLen.

CWB_INVALID_POINTER
Invalid pointer.

Usage

Returns the fix level of the iSeries Access for Windows product. Returns an empty string if fixes have not been applied.

cwbAD_IsComponentInstalled:

Purpose

Indicates whether a specific iSeries Access for Windows component is installed.

Syntax

```
unsigned long CWB_ENTRY cwbAD_IsComponentInstalled(
                             unsigned long      ulComponentID,
                             cwb_Boolean       *bIndicator);
```

Parameters

unsigned long ulComponentID - input
Must be set to one of the following component IDs:

CWBAD_COMP_SSL
Secure Sockets Layer

CWBAD_COMP_SSL_128_BIT
Secure Sockets Layer 128 bit

Note: This constant is defined to be the same as CWBAD_COMP_SSL.

CWBAD_COMP_SSL_56_BIT
Secure Sockets Layer 56 bit

Note: This constant is defined to be the same as CWBAD_COMP_SSL.

CWBAD_COMP_SSL_40_BIT
Secure Sockets Layer 40 bit

Note: This constant is defined to be the same as CWBAD_COMP_SSL.

CWB_COMP_BASESUPPORT
iSeries Access for Windows required programs

CWBAD_COMP_OPTIONAL_COMPS
iSeries Access for Windows Optional Components

CWBAD_COMP_DIRECTORYUPDATE
Directory Update

CWBAD_COMP_IRC
Incoming Remote Command

CWBAD_COMP_OUG
User's Guide

CWBAD_COMP_OPNAV
iSeries Navigator

CWBAD_COMP_DATA_ACCESS
Data Access

CWBAD_COMP_DATA_TRANSFER
Data Transfer

CWBAD_COMP_DT_BASESUPPORT
Data Transfer Base Support

CWBAD_COMP_DT_EXCEL_ADDIN
Data Transfer Excel Add-in

CWBAD_COMP_DT_WK4SUPPORT
Data Transfer WK4 file support

CWBAD_COMP_ODBC
ODBC

CWBAD_COMP_OLEDB
OLE DB Provider

CWBAD_COMP_MP
.NET Data Provider

CWBAD_COMP_AFP_VIEWER
AFP™ Workbench Viewer

CWBAD_COMP_JAVA_TOOLBOX
Java Toolbox

CWBAD_COMP_PC5250
PC5250 Display and Printer Emulator

PC5250 Display and Printer Emulator subcomponents:

- CWBAD_COMP_PC5250_BASE_KOREAN
- CWBAD_COMP_PC5250_PDFPDT_KOREAN
- CWBAD_COMP_PC5250_BASE_SIMPCHIN
- CWBAD_COMP_PC5250_PDFPDT_SIMPCHIN
- CWBAD_COMP_PC5250_BASE_TRADCHIN
- CWBAD_COMP_PC5250_PDFPDT_TRADCHIN
- CWBAD_COMP_PC5250_BASE_STANDARD
- CWBAD_COMP_PC5250_PDFPDT_STANDARD
- CWBAD_COMP_PC5250_FONT_ARABIC
- CWBAD_COMP_PC5250_FONT_BALTIC
- CWBAD_COMP_PC5250_FONT_LATIN2
- CWBAD_COMP_PC5250_FONT_CYRILLIC
- CWBAD_COMP_PC5250_FONT_GREEK
- CWBAD_COMP_PC5250_FONT_HEBREW
- CWBAD_COMP_PC5250_FONT_LAO
- CWBAD_COMP_PC5250_FONT_THAI
- CWBAD_COMP_PC5250_FONT_TURKISH
- CWBAD_COMP_PC5250_FONT_VIET
- CWBAD_COMP_PC5250_FONT_HINDI

CWBAD_COMP_PRINTERDRIVERS
Printer Drivers

CWBAD_COMP_AFP_DRIVER
AFP printer driver

CWBAD_COMP_SCS_DRIVER
SCS printer driver

CWBAD_COMP_OP_CONSOLE
Operations Console

CWBAD_COMP_TOOLKIT
Programmer's Toolkit

CWBAD_COMP_TOOLKIT_BASE
Headers, Libraries, and Documentation

CWBAD_COMP_TOOLKIT_VBW
Visual Basic Wizard

CWBAD_COMP_EZSETUP
EZ Setup

CWBAD_COMP_TOOLKIT_JAVA_TOOLS
Programmer's Toolkit Tools for Java

CWBAD_COMP_SCREEN_CUSTOMIZER_ENABLER
Screen Customizer Enabler

CWBAD_COMP_OPNAV_BASESUPPORT
iSeries Navigator Base Support

CWBAD_COMP_OPNAV_BASE_OPS
iSeries Navigator Basic Operations

CWBAD_COMP_OPNAV_JOB_MGMT
iSeries Navigator Job Management

CWBAD_COMP_OPNAV_SYS_CFG
iSeries Navigator System Configuration

CWBAD_COMP_OPNAV_NETWORK
iSeries Navigator Networks

CWBAD_COMP_OPNAV_SECURITY
iSeries Navigator Security

CWBAD_COMP_OPNAV_USERS_GROUPS
iSeries Navigator Users and Groups

CWBAD_COMP_OPNAV_DATABASE
iSeries Navigator Database

CWBAD_COMP_OPNAV_BACKUP
iSeries Navigator Backup

CWBAD_COMP_OPNAV_APP_DEV
iSeries Navigator Application Development

CWBAD_COMP_OPNAV_APP_ADMIN
iSeries Navigator Application Administration

CWBAD_COMP_OPNAV_FILE_SYSTEMS
iSeries Navigator File Systems

CWBAD_COMP_OPNAV_MGMT_CENTRAL
iSeries Navigator Management Central

CWBAD_COMP_OPNAV_MGMT_COMMANDS
iSeries Navigator Management Central - Commands

CWBAD_COMP_OPNAV_MGMT_PACK_PROD
iSeries Navigator Management Central - Packages and Products

CWBAD_COMP_OPNAV_MGMT_MONITORS
iSeries Navigator Management Central - Monitors

CWBAD_COMP_OPNAV_LOGICAL_SYS
iSeries Navigator Logical Systems

CWBAD_COMP_OPNAV_ADV_FUNC_PRES
iSeries Navigator Advanced Function Presentation™

cwb_Boolean *bIndicator - output
Will contain CWB_TRUE if the component is installed. Will return CWB_FALSE if the component is not installed. Will not be set if an error occurs.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_POINTER
Invalid pointer.

CWB_INVALID_COMPONENT_ID
The component ID is invalid for this release.

cwbAD_IsOpNavPluginInstalled:

Purpose

Indicates whether a specific iSeries Navigator plug-in is installed.

Syntax

```
unsigned long CWB_ENTRY cwbAD_IsOpNavPluginInstalled(
                             const char       *szPluginName,
                             cwb_Boolean      *bIndicator);
```

Parameters

const char* szPluginName - input
Pointer to a null-terminated string that contains the name of the plug-in.

cwb_Boolean *bIndicator - output
Will contain CWB_TRUE if the plug-in is installed. Will return CWB_FALSE if the component is not installed. Will not be set if an error occurs.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_POINTER
One of the pointer parameters is NULL.

Usage

If the return value is not CWB_OK, the value in bIndicator is meaningless.

Example: Administration APIs

This example demonstrates how an application might use iSeries Access for Windows Administration APIs.

In this example, the APIs are used to get and display:

- The current iSeries Access for Windows Version/Release/Modification level
- The current service pack (fix) level
- The components that currently are installed on the PC

The user then is allowed to enter iSeries Navigator plug-in names, and is informed whether the plug-in is installed.

Usage notes:

Include cwbad.h *

Link with cwbapi.lib

Example

```
#include <windows.h>
#include <stdio.h>

#include "cwbad.h"


/*
 *  This is the highest numbered component ID known (it is
 *  the ID of the last component defined in cwbad.h).
 */
#define LAST_COMPID_WE_KNOW_ABOUT       (CWBAD_COMP_SSL_40_BIT)


/*
 *  Array of component names, taken from comments for component IDs
 *  in cwbad.h, so human-readable component descriptions are displayed .
 *  In the compDescr array, the component ID for a component must match
 *  the index in the array of that component's description.
 *
 *  For a blank or unknown component name, a string is provided to display
 *  an indication that the component ID is unknown, and what that ID is.
 */
static char* compDescr[ LAST_COMPID_WE_KNOW_ABOUT + 1 ] = {
                              "",                            // #0 is not used
                              "Required programs",
                              "Optional Components",
                              "Directory Update",
                              "Incoming Remote Command",
                              "", // not used,
                              "Online User's Guide",
                              "iSeries Navigator",
                              "Data Access",
                              "Data Transfer",
                              "Data Transfer Base Support",
                              "Data Transfer Excel Add-in",
                              "Data Transfer WK4 file support",
                              "ODBC",
                              "OLE DB Provider",
                              "AFP Workbench Viewer",
                              "iSeries Java Toolbox",
                              "5250 Display and Printer Emulator",
                              "Printer Drivers",
                              "AFP printer driver",
                              "SCS printer driver",
                              "iSeries Operations Console",
                              "iSeries Access Programmer's Toolkit",
                              "Headers, Libraries, and Documentation",
                              "Visual Basic Wizards",
                              "EZ Setup",
                              "Java Toolkit",
                              "Screen customizer",
                              ".NET Data Provider",
                              "",                       //-------------#29
                              "", "", "", "", "",       //             #30-34
                              "", "", "", "", "",       //             #35-39
                              "", "", "", "", "",       //             #40-44
                              "", "", "", "", "",       //             #45-49
                              "", "", "", "", "",       //   not       #50-54
                              "", "", "", "", "",       //             #55-59
                              "", "", "", "", "",       //             #60-64
                              "", "", "", "", "",       //             #65-69
                              "", "", "", "", "",       //   used      #70-74
                              "", "", "", "", "",       //             #75-79
                              "", "", "", "", "",       //             #80-84
                              "", "", "", "", "",       //             #85-89
                              "", "", "", "", "",       //             #90-94
                              "", "", "", "", "",       //------------ #95-99
                              "iSeries Navigator Base Support",
                              "iSeries Navigator Basic Operations",
                              "iSeries Navigator Job Management",
                              "iSeries Navigator System Configuration",
                              "iSeries Navigator Networks",
                              "iSeries Navigator Security",
                              "iSeries Navigator Users and Groups",
                              "iSeries Navigator Database",
                              "",                       // not used      #108
                              "iSeries Navigator Backup",
                              "iSeries Navigator Application Development",
                              "iSeries Navigator Application Administrat",
                              "iSeries Navigator File Systems",
                              "iSeries Navigator Management Central",
                              "iSeries Navigator Management Central - Commands",
                              "iSeries Navigator Management Central - Packages and Products",
                              "iSeries Navigator Logical Systems",
                              "iSeries Navigator Advanced Function Presentation",
                              "",""                 //-------------#118-119
                              "", "", "", "", "",   //  not        #120-124
                              "", "", "", "", "",   //             #125-129
                              "", "", "", "", "",   //             #130-134
                              "", "", "", "", "",   //  used       #135-139
                              "", "", "", "", "",   //             #140-144
                              "", "", "", "", "",   //------------ #145-149
                              "PC5250: BASE_KOREAN",
                              "PC5250: PDFPDT_KOREAN",
                              "PC5250: BASE_SIMPCHIN",
                              "PC5250: PDFPDT_SIMPCHIN",
                              "PC5250: BASE_TRADCHIN",
                              "PC5250: PDFPDT_TRADCHIN",
                              "PC5250: BASE_STANDARD",
                              "PC5250: PDFPDT_STANDARD",
                              "PC5250: FONT_ARABIC",
                              "PC5250: FONT_BALTIC",
                              "PC5250: FONT_LATIN2",
                              "PC5250: FONT_CYRILLIC",
                              "PC5250: FONT_GREEK",
                              "PC5250: FONT_HEBREW",
                              "PC5250: FONT_LAO",
                              "PC5250: FONT_THAI",
                              "PC5250: FONT_TURKISH",
                              "PC5250: FONT_VIET",
                              "PC5250: FONT_HINDI",
                              "",                   //------------ #169
                              "", "", "", "", "",   //             #170-174
                              "", "", "", "", "",   //  not        #175-179
                              "", "", "", "", "",   //             #180-184
                              "", "", "", "", "",   //  used       #185-189
                              "", "", "", "", "",   //             #190-194
                              "", "", "", "", "",   //------------ #195-199
                              "Secure Sockets Layer (SSL)" } ;       // last one defined
static char  unknownComp[] = "unknown, ID=          ";
static char* pInsertID     = &amp;( unknownComp[12] );          // insert ID here!



/**************************************************************************
 *  Show the iSeries Access for Windows Version/Release/Modification level
 **************************************************************************/
void showCA_VRM()
{
   ULONG  caVer, caRel, caMod;
   UINT   rc;
   char   fixlevelBuf[ MAX_PATH ];
   ULONG  fixlevelBufLen = sizeof( fixlevelBuf );

   printf( "iSeries Access level installed:\n\n" );

   rc = cwbAD_GetClientVersion( &caVer;, &caRel;, &caMod; );
   if ( rc != CWB_OK )
   {
      printf( "   Error %u occurred when calling cwbAD_GetClientVersion()\n\n",
         rc );
   }
   else
   {
      printf( "   Version %lu, Release %lu, Modification %lu\n\n",
         caVer, caRel, caMod );

      printf( "iSeries Access service pack level installed:\n\n" );
      rc = cwbAD_GetProductFixLevel( fixlevelBuf, &fixlevelBufLen; );
      if ( rc != CWB_OK )
      {
         printf( "   Error %u occurred when calling "
            "cwbAD_GetProduceFixLevel()\n\n", rc );
      }
      else if ( fixlevelBuf[0] == '\0' )  // empty, no service packs applied
      {
         printf( "   None\n\n" );
      }
      else
      {
         printf( "   %s\n\n", fixlevelBuf );
      }
   }
}



/**************************************************************************
 *  Call iSeries Access for Windows API to determine if the component is installed,
 *  and pass back:
 *      NULL if the component is not installed or an error occurs,
 *             OR
 *      A string indicating the component name is unknown if the
 *      component ID is higher than we know about OR the component
 *      description is blank,
 *             OR
 *      The human-readable component description if known.
 *************************************************************************/
char* isCompInstalled( ULONG compID )
{
   cwb_Boolean bIsInstalled;
   char*       pCompName;

   UINT rc = cwbAD_IsComponentInstalled( compID, &bIsInstalled; );

   /*
    *  Case 1:  Error OR component not installed, return NULL to
    *           indicate not installed.
    */
   if ( ( rc != CWB_OK ) || ( bIsInstalled == CWB_FALSE ) )
   {
      pCompName = NULL;
   }

   /*
    *  Case 2:  Component IS installed, but its name is not known,
    *           return component name unknown string.
    */
   else if ( ( compID > LAST_COMPID_WE_KNOW_ABOUT ) ||
             ( compDescr[ compID ][ 0 ] == '\0' ) )
   {
      pCompName = unknownComp;
      sprintf( pInsertID, "%lu", compID );
   }

   /*
    *  Case 3:  Component IS installed, and a name is known, return it
    */
   else
   {
      pCompName = compDescr[ compID ];
   }

   return pCompName;
}



/**************************************************************************
 *  List the iSeries Access for Windows components that currently are installed.
 **************************************************************************/
void showCA_CompInstalled()
{
   ULONG compID;
   char* compName;

   printf( "iSeries Access components installed:\n\n" );

   /*
    *  Try all known components, plus a bunch more in case some
    *  have been added (via service pack).
    */
   for ( compID = 0;
         compID &lt; (LAST_COMPID_WE_KNOW_ABOUT + 50);
         compID++ )
   {
      compName = isCompInstalled( compID );
      if ( compName != NULL )
      {
         printf( "   %s\n", compName );
      }
   }

   printf( "\n" );
}



/**************************************************************************
 *  MAIN PROGRAM BODY
 **************************************************************************/
void main(void)
{
   UINT         rc;
   char         pluginName[ MAX_PATH ];
   cwb_Boolean  bPluginInstalled;

   printf( "=======================================\n");
   printf( "iSeries Access What's Installed Reporter\n" );
   printf( "=======================================\n\n");

   showCA_VRM();
   showCA_CompInstalled();

   /*
    *  Allow user to ask by name what plug-ins are installed.
    */
   while ( TRUE )  /* REMINDER: requires a break to exit the loop! */
   {
      printf( "Enter plug-in to check for, or DONE to quit:\n" );
      gets( pluginName );
      if ( stricmp( pluginName, "DONE" ) == 0 )
      {
         break;    /* exit from the while loop, DONE at user's request */
      }

      rc = cwbAD_IsOpNavPluginInstalled( pluginName, &bPluginInstalled; );
      if ( rc == CWB_OK )
      {
         if ( bPluginInstalled == CWB_TRUE )
         {
            printf( "The plug-in '%s' is installed.\n\n", pluginName );
         }
         else
         {
            printf( "The plug-in '%s' is NOT installed.\n\n", pluginName );
         }
      }
      else
      {
         printf(
           "Error %u occurred when calling cwbAD_IsOpNavPluginInstalled.\n\n",
           rc );
      }
   }  // end while (TRUE)

   printf( "\nEnd of program.\n\n" );
}
```

iSeries Access for Windows Communications and Security APIs

The iSeries Access for Windows Communications and Security topic shows you how to use iSeries Access for Windows application programming interfaces (APIs)

You can use these APIs to:

- Get, use, and delete an iSeries **system object**. Various iSeries Access for Windows APIs require a system object. It holds information about connecting to, and validating security (user ID, password, and signon date and time) on, an iSeries system.
- Obtain information about environments and connections that are configured in the **system list** when you use iSeries Access for Windows. The system list is a list of all currently configured environments, and of systems within those environments. The system list is stored and managed ″per user,″ and is not available to other users.

  Note: It is not necessary for you to explicitly configure new systems to add them to the system list. They are added automatically when you connect to a new system.

iSeries Access for Windows Communications and Security APIs required files:

Header file		Import library	Dynamic Link Library
System object APIs	**System list APIs**	cwbapi.lib	cwbco.dll
cwbcosys.h	cwbco.h		

Programmer's Toolkit:

The Programmer's Toolkit provides Communications and Security documentation, access to the cwbco.h and cwbcosys.h header files, and links to sample programs. To access this information, open the Programmer's Toolkit and select **Communications and Security** → **C/C++ APIs**.

iSeries Access for Windows Communications and Security topics:

Note: By using the code examples, you agree to the terms of the "Code license and disclaimer information" on page 552.

Related reference

"Communications APIs return codes" on page 20

"Security APIs return codes" on page 27

"Global iSeries Access return codes" on page 13

"iSeries system name formats for connection APIs" on page 5
APIs that take an iSeries system name as a parameter accept names in the following formats.

"OEM, ANSI, and Unicode considerations" on page 6
Most of the iSeries Access for Windows C/C++ APIs that accept string parameters exist in three forms: OEM, ANSI, or Unicode.

System object attributes

System object attributes affect the behavior of signing on and communicating with the iSeries system that the system object represents.

Most attributes can be changed until a successful signon has occurred (either as the result of a successful call to "cwbCO_Signon" on page 72 or to "cwbCO_Connect" on page 48). After the signon has taken place successfully, calling the API that tries to change the value of such an attribute will fail with return code CWB_INV_AFTER_SIGNON. The only two attributes that can be changed after a successful signon are the Window Handle and Connect Timeout.

Some values and the ability to change them may be controlled via **policies**. Policies are controls that a systems administrator can set up to mandate default attribute values, and to prohibit changes to attributes. The default values that are specified in the **System object attributes list** topic (link below) are used under the following conditions:

- If policies do not specify or suggest different values
- If a value for such an attribute has not been configured explicitly for the iSeries system in the system list

If an attribute's default value may be set by policy, this also is noted. If changing an attribute's value can be prohibited by policy, then:

- An API is provided to check for the attribute's modifiability.
- A specific return code is provided by the attribute's set method if the set fails because of such a policy.

System object attributes list:

Following is a list of system object attributes. It includes descriptions, requirements, and considerations.

Also listed with each attribute are:

- The APIs that you can use to get and to set it
- What its default value is when the system object is created

Note: The attributes' settings apply ONLY to the system object for which they are set, NOT to any other system objects, even if other system objects have the same iSeries system name.

iSeries system name:

The iSeries system with which to communicate and use by way of this instance of a system object. This can be set only at the time cwbCO_CreateSystem or cwbCO_CreateSystemLike is called. Note that the system name is used as the unique identifier when validating security information for a specific user ID: If two different system objects contain different system names that represent the same physical iSeries system, the user ID and password require separate validation for the two system objects. For example, this applies if the system names ″SYS1″ and ″SYS1.ACME.COM″ represent the same iSeries system. This may result in double prompting, and the use of different default user IDs when connecting.

Get by using cwbCO_GetSystemName

Default:

There is no default, since this is explicitly set when the system object is created.

Description

Description of the configured connection to the iSeries system.

Set using iSeries Navigator.

Retrieve using cwbCO_GetDescription

The description is stored with each system object, and never changed for that system object. If the description is changed using iSeries Navigator, system objects for that system that existed before the change was made are not changed. Only new system objects will contain the new description.

Default:

Blank. This may be overridden by policies.

User ID:

The user ID used to logon to the iSeries system.

Get by using cwbCO_GetUserIDEx

Set by using cwbCO_SetUserIDEx

Default:

The first time that you connect to the iSeries system which is named in the system object, you may be prompted:

- To specify a default user ID
- To specify that the default user ID should be the same as your Windows user ID
- That no default will be used

On subsequent connection attempts, the default user ID that is used will depend on which option you chose when prompted during the first connection attempt.

Password:

The password used to signon to the iSeries system.

Set by using cwbCO_SetPassword

Default:

Blank (no password set) if the user ID that is set in the system object never has signed on to the iSeries system that is named in the system object. If a previous successful signon or connection has been made to the iSeries system that is named in the system object, that password may be used for the next signon or connection attempt. The system will no longer cache a password in the iSeries Access for Windows volatile password cache if the password comes in through the cwbCO_SetPassword( ) API. Previously, this would have gone into the volatile (i.e. session) password cache.

Default user mode:

Controls behavior that is associated with the default user ID, including where to obtain it and whether to use it. If it is not set (if the value is CWBCO_DEFAULT_USER_MODE_NOT_SET), the user may be prompted to choose which behavior is desired at the time a signon is attempted.

Get by using cwbCO_GetDefaultUserMode

Set by using cwbCO_SetDefaultUserMode

Check for modify restriction by using cwbCO_CanModifyDefaultUserMode

Default:

CWBCO_DEFAULT_USER_MODE_NOT_SET

Note: The default may be overridden by policies.

Prompt mode:

Controls when iSeries Access for Windows will prompt the user for user ID and password. See the declaration comments for cwbCO_SetPromptMode for possible values and for associated behaviors.

Get by using cwbCO_GetPromptMode

Set by using cwbCO_SetPromptMode

Default:

CWBCO_PROMPT_IF_NECESSARY

Window handle:

The window handle of the calling application. If this is set, any prompting that iSeries Access for Windows does related to iSeries signon will use the window handle, and will be modal to the associated window. This means that the prompt never will be hidden UNDER the main application window if its handle is associated with the system object. If no window handle is set, the prompt might be hidden behind the main application window, if one exists.

Get by using cwbCO_GetWindowHandle

Set by using cwbCO_SetWindowHandle

Default:

NULL (not set)

Validate mode:

Specifies, when validating user ID and password, whether communication with the iSeries system to perform this validation actually occurs. See the declaration comments for cwbCO_SetValidateMode and cwbCO_GetValidateMode for possible values and for associated behaviors.

Get by using cwbCO_GetValidateMode

Set by using cwbCO_SetValidateMode

Default:

CWBCO_VALIDATE_IF_NECESSARY

Use Secure Sockets:

Specifies whether iSeries Access for Windows will use secure sockets to authenticate the server (iSeries system) and to encrypt data that is sent and received. There are some cases where secure sockets cannot be used (for example, when the software support for Secure Sockets has not been installed on the PC). Accordingly, an application or user request for secure sockets use may fail, either at the time the cwbCO_UseSecureSockets API is called, or at connect time. If no such failure occurs, then secure sockets is being used, and cwbCO_IsSecureSockets will return CWB_TRUE.

Get by using cwbCO_IsSecureSockets

Set by using cwbCO_UseSecureSockets

Check for modify restriction by using cwbCO_CanModifyUseSecureSockets

Default:
Whatever has been configured for this iSeries system in the System List will be used. If no configuration for this iSeries system exists, or if the configuration specifies to use the iSeries Access default, then secure sockets will not be used (CWB_FALSE).

Note: The default may be overridden by policies.

Port lookup mode:
Specifies how to retrieve the remote port for an iSeries host service. It specifies whether to look it up locally (on the PC), on the iSeries system, or to simply use the default (″standard″) port for the specified service. If local lookup is selected, the standard TCP/IP method of lookup in the SERVICES file on the PC is used. If server lookup is specified, a connection to the iSeries system server mapper is made to retrieve the port number by lookup from the iSeries system service table. If either the local or server lookup method fails, then connecting to the service will fail. For more information and for possible values, see the API declaration for cwbCO_SetPortLookupMode.

Get by using cwbCO_GetPortLookupMode

Set by using cwbCO_SetPortLookupMode

Check for modify restriction by using cwbCO_CanModifyPortLookupMode

Default:
Whatever has been configured for this iSeries system in the System List will be used. If no configuration for this iSeries system exists, the default is CWBCO_PORT_LOOKUP_SERVER.

Note: The default may be overridden by policies.

Persistence mode:
Specifies whether the iSeries system named in this system object may be added to the System List (if not already in the list) once a successful call to cwbCO_Connect has completed. See cwbCO_SetPersistenceMode for more information and for possible values.

Get by using cwbCO_GetPersistenceMode

Set by using cwbCO_SetPersistenceMode

Check for modify restriction by using cwbCO_CanModifyPersistenceMode

Default:
CWBCO_MAY_MAKE_PERSISTENT

Note: The default may be overridden by policies.

Connect timeout
Specifies how long iSeries Access for Windows will wait for a connection attempt to complete. This setting does not affect how long the TCP/IP communications stack will wait before giving up. The TCP/IP communications stack might timeout before the iSeries Access connection timeout has expired. See cwbCO_SetConnectTimeout for more information and possible values. This value may be changed for a system object at any time.

get using cwbCO_GetConnectTimeout

set using cwbCO_SetConnectTimeout

Default:
CWBCO_CONNECT_TIMEOUT_DEFAULT

Note: The default may be overridden by policies.

Communications and security: Create and delete APIs

These APIs are used for creating and deleting a system object

cwbCO_CreateSystem:

Purpose

Create a new system object and return a handle to it that can be used with subsequent calls. The system object has many attributes that can be set or retrieved. See“System object attributes” on page 42 for more information.

Syntax

```
UINT CWB_ENTRY cwbCO_CreateSystem(
                          LPCSTR              systemName,
                          cwbCO_SysHandle    *system);
```

Parameters

LPCSTR systemName - input
Pointer to a buffer that contains the NULL-terminated name of the iSeries system. This can be its host name, or the iSeries system's dotted-decimal IP address itself. It must not be zero length and must not contain blanks. If the name specified is not a valid iSeries system host name or IP address string (in the form ″nnn.nnn.nnn.nnn″), any connection attempt or security validation attempt will fail.

cwbCO_SysHandle *system - output
The system object handle is returned in this parameter.

Return Codes

The following list shows common return values:

CWB_OK
Successful completion.

CWB_INVALID_POINTER
One of the pointer parameters is NULL.

CWB_INVALID_SYSNAME
The system name is not valid.

CWB_RESTRICTED_BY_POLICY
A policy exists that prohibits the user from creating a system object for a system not already defined in the System List.

CWB_NON_REPRESENTABLE_UNICODE_CHAR
One or more input Unicode characters have no representation in the codepage that is being used.

Usage

When you are done using the system object, you must call cwbCO_DeleteSystem to free resources the system object is using. If you want to create a system object that is like one you already have, use cwbCO_CreateSystemLike.

cwbCO_CreateSystemLike:

Purpose

Create a new system object that is similar to a given system object. You may either provide a specific system name for the new system object, or specify NULL to use the given system object's name. All attributes of the given system object are copied into the new one, with the following exceptions:

- User ID
- Password
- System name, if a different one is specified
- IP address, when the system names are different.

  See "System object attributes list" on page 42 for a list of system object attributes.

Syntax

```
UINT CWB_ENTRY cwbCO_CreateSystemLike(
                             cwbCO_SysHandle     systemToCopy,
                             LPCSTR              systemName
                             cwbCO_SysHandle    *system);
```

Parameters

cwbCO_SysHandle systemToCopy - input
Handle that was returned by a previous call to either cwbCO_CreateSystem or cwbCO_CreateSystemLike. It identifies the iSeries system. This is the object that will be ″copied.″

LPCSTR systemName - input
Pointer to a buffer that contains the NULL-terminated name of the iSeries system to use in the new system object. If NULL or the empty string is passed, the name from the given system object is copied into the new system object. If a system name is specified, it can be the host name, or the iSeries system's dotted-decimal IP address. If the name that is specified is not a valid iSeries system host name or IP address string (in the form ″nnn.nnn.nnn.nnn″), any connection attempt or security validation attempt will fail.

cwbCO_SysHandle *newSystem - output
The system object handle of the new system object is returned in this parameter.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_POINTER
A pointer that is supplied to the API is not valid.

CWB_INVALID_SYSNAME
The system name is not valid.

CWB_RESTRICTED_BY_POLICY
A policy exists that prohibits the user from creating a system object for a system not already defined in the System List.

CWB_NON_REPRESENTABLE_UNICODE_CHAR
One or more input Unicode characters have no representation in the codepage that is being used.

Usage

When you are done using the new system object, you must call cwbCO_DeleteSystem to free resources that the system object is using.

The state of the new system object might not be the same as that of the given system object, since user ID and password validation has not been performed yet for the new one. Also, the new system object has no connections associated with it, whereas the given system object may. Because of this, even though you might not be able to change attributes of the given system object because of its state, you might be able to change the attributes of the new system object because of its possibly different state.

cwbCO_DeleteSystem:

Purpose

Deletes the system object that is specified by its handle, and frees all resources the system object has used.

Syntax

```
UINT CWB_ENTRY cwbCO_DeleteSystem(
                             cwbCO_SysHandle     system);
```

Parameters

cwbCO_SysHandle system - input
Handle that was returned by a previous call to either cwbCO_CreateSystem or cwbCO_CreateSystemLike. It identifies the iSeries system.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_API_HANDLE
Invalid system handle.

Usage

Before the system object resources are freed, if there are any connections that were made using the specified system object, they will be ended, forcefully if necessary. To determine if there are active connections, call cwbCO_IsConnected. If you want to know whether disconnecting any existing connections was successful, call cwbCO_Disconnect explicitly before calling this API.

Communications and security: Connect and disconnect APIs

These APIs allow you to connect to and disconnect from the iSeries system, and for related behavior

cwbCO_Connect:

Purpose

Connect to the specified iSeries host service.

Syntax

```
UINT CWB_ENTRY cwbCO_Connect(
                             cwbCO_SysHandle     system,
                             cwbCO_Service       service,
                             cwbSV_ErrHandle     errorHandle );
```

Parameters

cwbCO_SysHandle system - input
Handle returned previously from cwbCO_CreateSystem or cwbCO_CreateSystemLike. It identifies the iSeries system to connect to.

cwbCO_Service service - input
The service to connect to on the iSeries system. Valid values are those listed in “Defines for cwbCO_Service” on page 91, except for the values CWBCO_SERVICE_ANY and CWBCO_SERVICE_ALL. Only one service may be specified for this API, unlike for cwbCO_Disconnect, which can disconnect multiple services at once.

cwbSV_ErrHandle errorHandle - input/output
Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle API. The messages may be retrieved through the cwbSV_GetErrText API. If the parameter is set to zero, or if the errorHandle is invalid, no messages will be retrieved.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_API_HANDLE
Invalid system handle.

CWB_SERVICE_NAME_ERROR
The service identifier is not a valid value, or was a combination of values (only a single value is allowed for this API).

CWB_CONNECTION_TIMED_OUT
It took too long to find the iSeries system, so the attempt timed out.

CWB_CONNECTION_REFUSED
The iSeries system refused to accept our connection attempt.

CWB_NETWORK_IS_DOWN
A network error occurred, or TCP/IP is not configured correctly on the PC.

CWB_NETWORK_IS_UNREACHABLE
The network segment to which the iSeries system is connected currently is not reachable from the segment to which the PC is connected.

CWB_USER_TIMEOUT
The connect timeout value associated with the system object expired before the connection attempt completed, so we stopped waiting.

CWB_FIPS_UNAVAILABLE
This connection is configured for SSL and FIPS-compliant mode is enabled, however, SSL cannot be used because FIPS support is not available. For recovery information, see message CWBCO1060, using the following path:

Start → **iSeries Access for Windows folder** → **Service** → **Error and Trace Message Help** → **iSeries Access for Windows messages** → **CWBCO1060**

Note: Other return codes may be commonly returned as the result of a failed security validation attempt. See the list of common return codes in the comments for cwbCO_Signon.

Usage

If signon to the iSeries system has not yet occurred, the signon will be performed first when cwbCO_Connect is called. If you want the signon to occur at a separate time, call cwbCO_Signon first, then call cwbCO_Connect at a later time. For more information about signon and its behavior, see comments for cwbCO_Signon. If the signon attempt fails, a connection to the specified service will not be established.

If the iSeries system as named in the specified system object does not exist in the System List, and the system object Persistence Mode is set appropriately, then when cwbCO_Connect or cwbCO_Signon is first successfully called, the iSeries system, as named in the system object, will be added to the System List. For more information about the Persistence Mode, see the comments for cwbCO_SetPersistenceMode.

If a connection to the specified service already exists, no new connection will be established, and CWB_OK will be returned. Each time this API is successfully called, the usage count for the connection to the specified service will be incremented.

Each time cwbCO_Disconnect is called for the same service, the usage count will be decremented. When the usage count reaches zero, the actual connection is ended.

Therefore, it is VERY IMPORTANT that for every call to the cwbCO_Connect API there is a later paired call to the cwbCO_Disconnect API, so that the connection can be ended at the appropriate time. The alternative is to call the cwbCO_Disconnect API, specifying CWBCO_SERVICE_ALL, which will disconnect all existing connections to ALL services made through the specified system object, and reset all usage counts to 0.

If the return code is CWB_USER_TIMEOUT, you may want to increase the connect timeout value for this system object, by calling cwbCO_SetConnectTimeout, and try connecting again. If you want iSeries Access to not give up until the TCP/IP communication stack itself does, set the connect timeout to CWBCO_CONNECT_TIMEOUT_NONE, and try connecting again.

cwbCO_Disconnect:

Purpose

Disconnect from the specified iSeries host service.

Syntax

```
UINT CWB_ENTRY cwbCO_Disconnect(
                             cwbCO_SysHandle     system,
                             cwbCO_Service       service,
                             cwbSV_ErrHandle     errorHandle );
```

Parameters

cwbCO_SysHandle system - input
Handle that was returned by a previous call to either cwbCO_CreateSystem or cwbCO_CreateSystemLike. It identifies the iSeries system from which to disconnect.

cwbCO_Service service - input
The service from which to disconnect on the iSeries system. Valid values are those listed at the start of this file, except for the value CWBCO_SERVICE_ANY. If CWBCO_SERVICE_ALL is specified, the connections to ALL connected services will be ended, and all connection usage counts reset back to zero.

cwbSV_ErrHandle errorHandle - input/output
Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle API. The messages may be retrieved through the cwbSV_GetErrText API. If the parameter is set to zero, or if the errorHandle is invalid, no messages will be retrieved.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_API_HANDLE
Invalid system handle.

CWB_SERVICE_NAME_ERROR
The service identifier is invalid.

CWB_NOT_CONNECTED
The single service was not connected.

Usage

This function should be called when a connection that is established by using cwbCO_Connect no longer is needed.

If any service specified cannot be disconnected, the return code will indicate this error. If more than one error occurs, only the first one will be returned as the API return code.

Usage Notes® for individual service disconnect:
This function will cause the usage count for this system object's specified service to be decremented, and may or may not end the actual connection. For more information, read the Usage Notes for the cwbCO_Connect API.

Disconnecting a service that is not currently connected results in CWB_NOT_CONNECTED.

An individual service is gracefully disconnected.

Usage Notes for CWBCO_SERVICE_ALL:
The return code CWB_NOT_CONNECTED is not returned when CWBCO_SERVICE_ALL is specified, regardless of the number of connected services.

Requesting that all active services be disconnected may generate messages on the iSeries.

cwbCO_GetConnectTimeout:

Purpose

This function gets, for the specified system object, the connection timeout value, in seconds, currently set.

Syntax

```
UINT CWB_ENTRY cwbCO_GetConnectTimeout(
                             cwbCO_SysHandle             system,
                             PULONG                      timeout );
```

Parameters

cwbCO_SysHandle system - input
Handle returned previously from cwbCO_CreateSystem or cwbCO_CreateSystemLike. It identifies the iSeries system.

PULONG timeout - output
Returns the timeout value, in seconds. This value will be from CWBCO_CONNECT_TIMEOUT_MIN to CWBCO_CONNECT_TIMEOUT_MAX, or will be CWBCO_CONNECT_TIMEOUT_NONE if no connection timeout is desired.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_API_HANDLE
Invalid system handle.

CWB_INVALID_POINTER
The timeout pointer is NULL.

Usage

None.

cwbCO_GetPersistenceMode:

Purpose

This function gets, for the specified system object, if the system it represents, along with its attributes, will be added to the System List (if not already in the list) once a successful signon has occurred.

Syntax

```
UINT CWB_ENTRY cwbCO_GetPersistenceMode(
                             cwbCO_SysHandle        system,
                             cwbCO_PersistenceMode *mode );
```

Parameters

cwbCO_SysHandle system - input
Handle that previously was returned from cwbCO_CreateSystem or cwbCO_CreateSystemLike. It identifies the iSeries system.

cwbCO_PersistenceMode * mode - output
Returns the persistence mode. See comments for cwbCO_SetPersistenceMode for possible values and their meanings.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_API_HANDLE
Invalid system handle.

CWB_INVALID_POINTER
The mode pointer is NULL.

Usage

None.

cwbCO_IsConnected:

Purpose

Find out if any, and how many, connections to the iSeries system that are using the specified system object currently exist.

Syntax

```
UINT CWB_ENTRY cwbCO_IsConnected(
                            cwbCO_SysHandle     system,
                            cwbCO_Service       service,
                            PULONG              numberOfConnections );
```

Parameters

cwbCO_SysHandle system - input
Handle returned previously from cwbCO_CreateSystem or cwbCO_CreateSystemLike. It identifies the iSeries system.

cwbCO_Service service - input
The service to check for a connection. Any of the cwbCO_Service values listed in "Defines for cwbCO_Service" on page 91 are valid. To find out if ANY service is connected, specify CWBCO_SERVICE_ANY. To find out how many services are connected using this system object, specify CWBCO_SERVICE_ALL.

PULONG numberOfConnections - output
Used to return the number of connections active for the service(s) that are specified. If the service specified is not CWBCO_SERVICE_ALL, the value returned will be either 0 or 1, since there can be at most one active connection per service per system object. If CWBCO_SERVICE_ALL is specified, this could be from zero to the possible number of services, since one connection per service might be active.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion, all services specified are connected, or if CWBCO_SERVICE_ANY is specified, at least one service is connected.

CWB_NOT_CONNECTED
If a single service was specified, that service is not connected. If the value CWBCO_SERVICE_ANY was specified, there are NO active connections. If the value CWBCO_SERVICE_ALL was specified, there is at least one service that is NOT connected.

CWB_INVALID_API_HANDLE
Invalid system handle.

CWB_SERVICE_NAME_ERROR
The service identifier is invalid.

CWB_INVALID_POINTER
The numberOfConnections parameter is NULL.

Usage

If CWBCO_SERVICE_ALL was specified and CWB_NOT_CONNECTED is returned, there may be some active connections, and the count of active connections still will be passed back. To find out how many connections through the specified system object exist, call this API and specify CWBCO_SERVICE_ALL. If the return code is either CWB_OK or CWB_NOT_CONNECTED, the number of connections that exist is stored in numberOfConnections.

cwbCO_SetConnectTimeout:

Purpose

This function sets, for the specified system object, the number of seconds iSeries Access for Windows will wait before giving up on a connection attempt and returning an error.

Syntax

```
UINT CWB_ENTRY cwbCO_SetConnectTimeout(
                             cwbCO_SysHandle           system,
                             ULONG                     timeout );
```

Parameters

cwbCO_SysHandle system - input
Handle returned previously from cwbCO_CreateSystem or cwbCO_CreateSystemLike. It identifies the iSeries system.

ULONG timeout - input
Specifies the connection timeout value, in seconds. The value must be from CWBCO_CONNECT_TIMEOUT_MIN to CWBCO_CONNECT_TIMEOUT_MAX, or if no timeout is desired, use CWBCO_CONNECT_TIMEOUT_NONE. If the value is below the minimum, then CWBCO_CONNECT_TIMEOUT_MIN will be used; if it is above the maximum, CWBCO_CONNECT_TIMEOUT_MAX will be used.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_API_HANDLE
Invalid system handle.

Usage

If no timeout value has been suggested by policy, and none has been explicitly set using this API, the connect timeout used is CWBCO_CONNECT_TIMEOUT_DEFAULT.

cwbCO_SetPersistenceMode:

Purpose

This function sets for the specified system object if the system it represents (as named in the system object), along with its attributes, may be added to the System List (if not already in the list) once a signon successfully has occurred.

Syntax

```
UINT CWB_ENTRY cwbCO_SetPersistenceMode(
                             cwbCO_SysHandle       system,
                             cwbCO_PersistenceMode  mode );
```

Parameters

cwbCO_SysHandle system - input
Handle returned previously from cwbCO_CreateSystem or cwbCO_CreateSystemLike. It identifies the iSeries system.

cwbCO_PersistenceMode mode - input
Specifies the persistence mode. Possible values are:

CWBCO_MAY_MAKE_PERSISTENT
If the system that is named in the specified system object is not yet in the System List, add it to the list once a successful signon has completed. This will make the system, as defined by this system object, available for selection by this AND other applications running, now or in the future, on this personal computer (until the system is deleted from this list).

CWBCO_MAY_NOT_MAKE_PERSISTENT
The system that is named in the specified system object (along with its attributes) may NOT be added to the System List.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_API_HANDLE
Invalid system handle.

CWB_INVALID_PARAMETER
The mode parameter is an invalid value.

CWB_RESTRICTED_BY_POLICY
A policy exists that prohibits the user from changing this value.

CWB_INV_AFTER_SIGNON
Signon successfully has occurred by using the specified system object, so this setting no longer may be changed.

Usage

This API cannot be used after a successful signon has occurred for the specified system object. A signon has occurred if either cwbCO_Signon or cwbCO_Connect has been called successfully for this system object.

If the system as named in the system object already is in the System List, this setting has no effect.

cwbCO_Verify:

Purpose

Verifies that a connection can be made to a specific host service on an iSeries system.

Syntax

```
UINT CWB_ENTRY cwbCO_Verify(
                             cwbCO_SysHandle     system,
                             cwbCO_Service       service,
                             cwbSV_ErrHandle     errorHandle );
```

Parameters

cwbCO_SysHandle system - input
Handle previously returned from cwbCO_CreateSystem or cwbCO_CreateSystemLike. It identifies the iSeries system to which to verify connectability.

cwbCO_Service service - input
The service to verify connectability to on the iSeries system. Valid values are those listed in “Defines

for cwbCO_Service” on page 91, except for the value CWBCO_SERVICE_ANY. To verify connectability of ALL services, specify CWBCO_SERVICE_ALL.

cwbSV_ErrHandle errorHandle - input/output
Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle API. The messages may be retrieved through thecwbSV_GetErrText API. If the parameter is set to zero, or if the errorHandle is invalid, no messages will be retrieved.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_API_HANDLE
Invalid system handle.

CWB_SERVICE_NAME_ERROR
The service identifier is invalid.

CWB_USER_TIMEOUT
The connect timeout value associated with the system object expired before the connection verification attempt completed, so we stopped waiting.

CWB_COMMUNICATIONS_ERROR
An error occurred attempting to verify a connection to the service.

Usage

This API does not require user ID and password to be set, nor will it cause a signon to occur, thus it will never prompt for this information. It does not change the state of the system object in any way.

If a connection to any specified service already exists, no new connection will be established, and connectability will be considered verified for that service.

If CWBCO_SERVICE_ALL is specified for verification, the return code will be CWB_OK only if ALL services can be connected to. If any one verification attempt fails, the return code will be that from the first failure, although verification of the other services still will be attempted.

Since this API does not establish a usable connection, it automatically will disconnect when the verification is complete; therefore, do NOT call cwbCO_Disconnect to end the connection.

Communication and security: Security validation and data APIs

These APIs provide security validation and data.

cwbCO_ChangePassword:

Purpose

Changes the password of the specified user on the iSeries system from a specified old to a specified new value. This API does NOT use the user ID and password that currently are set in the given system object, nor does it change these values.

Syntax

```
UINT CWB_ENTRY cwbCO_ChangePassword(
                             cwbCO_SysHandle       system,
                             LPCSTR                userID,
                             LPCSTR             oldPassword,
                             LPCSTR             newPassword,
                             cwbSV_ErrHandle    errorHandle);
```

Parameters

cwbCO_SysHandle system - input
Handle returned previously from cwbCO_CreateSystem or cwbCO_CreateSystemLike. It identifies the iSeries system.

LPCSTR userID - input
A pointer to an ASCIIZ string that contains the user ID. The maximum length is CWBCO_MAX_USER_ID + 1 characters, including the null terminator.

LPCSTR oldPassword - input
A pointer to a buffer which contains the old password. The maximum length is CWBCO_MAX_PASSWORD + 1 bytes, including the null terminator.

LPCSTR newPassword - input
A pointer to a buffer which contains the new password. The maximum length is CWBCO_MAX_PASSWORD + 1 bytes, including the null terminator.

cwbSV_ErrHandle errorHandle - input/output
Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle API. The messages may be retrieved through the cwbSV_GetErrText API. If the parameter is set to zero, or if the errorHandle is invalid, no messages will be retrieved.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_API_HANDLE
Invalid system handle.

CWB_INVALID_POINTER
A pointer parameter is NULL.

CWB_GENERAL_SECURITY_ERROR
A general security error occurred. The user profile does not have a password or the password validation program found an error in the password.

CWB_INVALID_PASSWORD
One or more characters in the new password is invalid or the password is too long.

CWB_INVALID_USERID
One or more characters in the user ID is invalid or the user ID is too long.

CWB_UNKNOWN_USERID
The supplied user ID is not known to this system.

CWB_WRONG_PASSWORD
Password is not correct.

CWB_USER_PROFILE_DISABLED
The user ID has been disabled.

CWB_PW_TOO_LONG
New password longer than maximum accepted length.

CWB_PW_TOO_SHORT
New password shorter than minimum accepted length.

CWB_PW_REPEAT_CHARACTER
New password contains a character used more than once.

CWB_PW_ADJACENT_DIGITS
New password has adjacent digits.

CWB_PW_CONSECUTIVE_CHARS
New password contains a character repeated consecutively.

CWB_PW_PREVIOUSLY_USED
New password was previously used.

CWB_PW_DISALLOWED_CHAR
New password uses an installation-disallowed character.

CWB_PW_NEED_NUMERIC
New password must contain at least one numeric.

CWB_PW_MATCHES_OLD
New password matches old password in one or more character positions.

CWB_PW_NOT_ALLOWED
New password exists in a dictionary of disallowed passwords.

CWB_PW_CONTAINS_USERID
New password contains user ID as part of the password.

CWB_PW_LAST_INVALID_PWD
The next invalid password will disable the user profile.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory; may have failed to allocate temporary buffer.

CWB_NON_REPRESENTABLE_UNICODE_CHAR
One or more input Unicode characters have no representation in the codepage being used.

CWB_API_ERROR
General API failure.

Usage

Valid password lengths depend on the current setting of the iSeries system password level. Password levels 0 and 1 allow passwords up to 10 characters in length. Password levels 2 and 3 allow passwords up to 128 characters in length.

cwbCO_GetDefaultUserMode:

Purpose

This function gets, for the specified system object, the default user mode that currently is set.

Syntax

```
UINT CWB_ENTRY cwbCO_GetDefaultUserMode(
                          cwbCO_SysHandle        system,
                          cwbCO_DefaultUserMode  *mode );
```

Parameters

cwbCO_SysHandle system - input
Handle returned previously from cwbCO_CreateSystem or cwbCO_CreateSystemLike. It identifies the iSeries system.

cwbCO_DefaultUserMode * mode - output
Returns the default user mode for this system object. See comments for cwbCO_SetDefaultUserMode for the list of possible values and their meanings.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_API_HANDLE
Invalid system handle.

CWB_INVALID_POINTER
The mode pointer is NULL.

Usage

None.

cwbCO_GetFailedSignons:

Purpose

Retrieves the number of unsuccessful security validation attempts since the last successful attempt.

Syntax

```
UINT CWB_ENTRY cwbCO_GetFailedSignons(
                            cwbCO_SysHandle       system,
                            PUSHORT               numberFailedAttempts);
```

Parameters

cwbCO_SysHandle system - input
Handle returned previously from cwbCO_CreateSystem or cwbCO_CreateSystemLike. It identifies the iSeries system.

PUSHORT numberFailedAttempts - output
A pointer to a short that will contain the number of failed logon attempts if this call is successful.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_API_HANDLE
Invalid system handle.

CWB_INVALID_POINTER
The numberFailedAttempts pointer is NULL.

CWB_INV_BEFORE_VALIDATE
The user ID and password that were set in the specified system object have not been validated yet, so this information is not available.

Usage

You successfully must have called cwbCO_VerifyUserIDPassword, cwbCO_Signon, or cwbCO_Connect before using this API. If you want to ensure that the value that is returned is recent, you either must call cwbCO_VerifyUserIDPassword explicitly, or set the Validate Mode to CWBCO_VALIDATE_ALWAYS before you call cwbCO_Signon or cwbCO_Connect.

cwbCO_GetPasswordExpireDate:

Purpose

Retrieves the date and time the password will expire for the user ID that is set in the given system object on the iSeries system that it represents.

Syntax

```
UINT CWB_ENTRY cwbCO_GetPasswordExpireDate(
                             cwbCO_SysHandle       system,
                             cwb_DateTime         *expirationDateTime);
```

Parameters

cwbCO_SysHandle system - input
Handle returned previously from cwbCO_CreateSystem or cwbCO_CreateSystemLike. It identifies the iSeries system.

cwb_DateTime * expirationDateTime - output
A pointer to a structure that contains the date and time at which the password will expire for the current user ID, in the following format:

Bytes	Content
1 - 2	Year (Example: 1998 = 0x07CF)
3	Month (January = 0x01)
4	Day (First day = 0x01;31st day = 0x1F)
5	Hour (Midnight = 0x00;23rd hour = 0x17)
6	Minute (On the hour = 0x00; 59th minute = 0x3B)
7	Second (On the minute = 0x00; 59th second = 0x3B)
8	One-hundredth of a second (on the second = 0x00; maximum = 0x63)

Note: On a given day, the maximum time is 23 hours, 59 minutes, and 59.99 seconds. Midnight is 0 hours, 0 minutes, and 0.0 seconds on the following day.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_API_HANDLE
Invalid system handle.

CWB_INVALID_POINTER
The pointer to the cwb_DateTime structure is NULL.

CWB_INV_BEFORE_VALIDATE

The user ID and password that were set in the specified system object have not been validated (so the password expire date is not available), or validation has occurred and the user profile password expiration interval is set to *NOMAX.

Usage

You successfully must have called cwbCO_VerifyUserIDPassword, cwbCO_Signon, or cwbCO_Connect before using this API. If you want to ensure that the value that is returned is recent, you either must call cwbCO_VerifyUserIDPassword explicitly, or set the Validate Mode to CWBCO_VALIDATE_ALWAYS before you call cwbCO_Signon or cwbCO_Connect.

If the user profile password expiration interval is set to *NOMAX, a password expire date does not exist. To detect this case, first validate the user ID and password as noted above, and then, if successful, call cwbCO_GetPasswordExpireDate. A return code of CWBCO_INV_BEFORE_VALIDATE means that the password expiration interval is set to *NOMAX.

cwbCO_GetPrevSignonDate:

Purpose

Retrieves the date and time of the previous successful security validation.

Syntax

```
UINT CWB_ENTRY cwbCO_GetPrevSignonDate(
                             cwbCO_SysHandle       system,
                             cwb_DateTime         *signonDateTime);
```

Parameters

cwbCO_SysHandle system - input

Handle returned previously from cwbCO_CreateSystem or cwbCO_CreateSystemLike. It identifies the iSeries system.

cwb_DateTime * signonDateTime - output

A pointer to a structure that contains the date and time at which the previous signon occurred, in the following format:

Bytes	Content
1 - 2	Year (Example: 1998 = 0x07CF)
3	Month (January = 0x01)
4	Day (First day = 0x01;31st day = 0x1F)
5	Hour (Midnight = 0x00;23rd hour = 0x17)
6	Minute (On the hour = 0x00; 59th minute = 0x3B)
7	Second (On the minute = 0x00; 59th second = 0x3B)
8	One-hundredth of a second (on the second = 0x00; maximum = 0x63)

Note: On a given day, the maximum time is 23 hours, 59 minutes, and 59.99 seconds. Midnight is 0 hours, 0 minutes, and 0.0 seconds on the following day.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_API_HANDLE
Invalid system handle.

CWB_INVALID_POINTER
The pointer to the cwb_DateTime structure is NULL.

CWB_INV_BEFORE_VALIDATE
The user ID and password that were set in the specified system object have not been validated yet, so this information is not available.

Usage

You successfully must have called cwbCO_VerifyUserIDPassword, cwbCO_Signon, or cwbCO_Connect before using this API. If you want to ensure that the value that is returned is recent, you either must call cwbCO_VerifyUserIDPassword explicitly, or set the Validate Mode to CWBCO_VALIDATE_ALWAYS before you call cwbCO_Signon or cwbCO_Connect.

cwbCO_GetPromptMode:

Purpose

This function gets, for the specified system object, the prompt mode that currently is set.

Syntax

```
UINT CWB_ENTRY cwbCO_GetPromptMode(
                             cwbCO_SysHandle       system,
                             cwbCO_PromptMode     *mode );
```

Parameters

cwbCO_SysHandle system - input
Handle that previously was returned from cwbCO_CreateSystem or cwbCO_CreateSystemLike. It identifies the iSeries system.

cwbCO_PromptMode * mode - output
Returns the prompt mode. See comments for cwbCO_SetPromptMode for possible values and their meanings.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_API_HANDLE
Invalid system handle.

CWB_INVALID_POINTER
The mode pointer is NULL.

Usage

None.

cwbCO_GetSignonDate:

Purpose

Retrieves the date and time of the current successful security validation.

Syntax

```
UINT CWB_ENTRY cwbCO_GetSignonDate(
                             cwbCO_SysHandle       system,
                             cwb_DateTime         *signonDateTime);
```

Parameters

cwbCO_SysHandle system - input
Handle returned previously from cwbCO_CreateSystem or cwbCO_CreateSystemLike. It identifies the iSeries system.

cwb_DateTime * signonDateTime - output
A pointer to a structure that will contain the date and time at which the current signon occurred, in the following format:

Bytes	Content
1 - 2	Year (Example: 1998 = 0x07CF)
3	Month (January = 0x01)
4	Day (First day = 0x01;31st day = 0x1F)
5	Hour (Midnight = 0x00;23rd hour = 0x17)
6	Minute (On the hour = 0x00; 59th minute = 0x3B)
7	Second (On the minute = 0x00; 59th second = 0x3B)
8	One-hundredth of a second (on the second = 0x00; maximum = 0x63)

Note: On a given day, the maximum time is 23 hours, 59 minutes, and 59.99 seconds. Midnight is 0 hours, 0 minutes, and 0.0 seconds on the following day.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_API_HANDLE
Invalid system handle.

CWB_INVALID_POINTER
The pointer to the cwb_DateTime structure is NULL.

CWB_INV_BEFORE_VALIDATE
The user ID and password set in the specified system object have not been validated yet, so this information is not available.

Usage

You successfully must have called cwbCO_VerifyUserIDPassword, cwbCO_Signon, or cwbCO_Connect before using this API. If you want to ensure that the value returned is recent, you must either call cwbCO_VerifyUserIDPassword explicitly, or set the Validate Mode to CWBCO_VALIDATE_ALWAYS before you call cwbCO_Signon or cwbCO_Connect.

cwbCO_GetUserIDEx:

Purpose

This function gets the current user ID that is associated with a specified system object. This is the user ID that is being used for connections to the iSeries server.

Syntax

```
UINT CWB_ENTRY cwbCO_GetUserIDEx(
                              cwbCO_SysHandle    system,
                              LPSTR              userID,
                              PULONG             length );
```

Parameters

cwbCO_SysHandle system - input
Handle returned previously from cwbCO_CreateSystem or cwbCO_CreateSystemLike. It identifies the iSeries system.

LPSTR userID - output
Pointer to a buffer that will contain the NULL-terminated user ID. The user ID will be at most CWBCO_MAX_USER_ID characters long.

PULONG length - input/output
Pointer to the length of the userID buffer. If the buffer is too small to hold the user ID, including space for the terminating NULL, the size of the buffer needed will be filled into this parameter.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_API_HANDLE
Invalid system handle.

CWB_INVALID_POINTER
One of the pointer parameters passed in is NULL.

CWB_BUFFER_OVERFLOW
The userID buffer is not large enough to hold the entire user ID name.

Usage

The user ID may or may not have been validated on the iSeries system yet. To make sure it has been, call cwbCO_Signon or cwbCO_Connect before calling this API.

If no user ID has been set and a signon has not occurred for the system object, the returned user ID will be the empty string, even if a default user ID has been configured for the iSeries system.

cwbCO_GetValidateMode:

Purpose

This function gets, for the specified system object, the validate mode currently set.

Syntax

```
UINT CWB_ENTRY cwbCO_GetValidateMode(
                             cwbCO_SysHandle      system,
                             cwbCO_ValidateMode  *mode );
```

Parameters

cwbCO_SysHandle system - input
Handle returned previously from cwbCO_CreateSystem or cwbCO_CreateSystemLike. It identifies the iSeries system.

cwbCO_ValidateMode * mode - output
Returns the validate mode. See comments for cwbCO_SetValidateMode for possible values and their meanings.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_API_HANDLE
Invalid system handle.

CWB_INVALID_POINTER
The mode pointer is NULL.

Usage

None.

cwbCO_GetWindowHandle:

Purpose

This function gets, for the specified system object, the window handle, if any, that currently is associated with it.

Syntax

```
UINT CWB_ENTRY cwbCO_GetWindowHandle(
                              cwbCO_SysHandle       system,
                              HWND                 *windowHandle );
```

Parameters

cwbCO_SysHandle system - input
Handle that previously was returned from cwbCO_CreateSystem or cwbCO_CreateSystemLike. It identifies the iSeries system.

HWND * pWindowHandle - output
Returns the window handle associated with the system object, or NULL if no window handle is associated with it.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_API_HANDLE
Invalid system handle.

CWB_INVALID_POINTER
The windowHandle pointer is NULL.

Usage

None.

cwbCO_HasSignedOn:

Purpose

Returns an indication of whether the specified system object has ″signed on″ (whether the user ID and password have been validated at some point in the life of the specified system object).

Syntax

```
UINT CWB_ENTRY cwbCO_HasSignedOn(
                             cwbCO_SysHandle       system,
                             cwb_Boolean          *signedOn );
```

Parameters

cwbCO_SysHandle system - input
Handle that previously was returned from cwbCO_CreateSystem or cwbCO_CreateSystemLike. It identifies the iSeries system.

cwb_Boolean * signedOn - output
A pointer to a cwb_Boolean into which is stored the indication of ″signed-on-ness.″ If the specified system object has signed on, it will be set to CWB_TRUE, otherwise it will be set to CWB_FALSE. (On error it will be set to CWB_FALSE as well.)

Return Codes

The following list shows common return values:

CWB_OK
Successful completion.

CWB_INVALID_API_HANDLE
Invalid system handle.

CWB_INVALID_POINTER
The signedOn pointer is NULL.

Usage

A returned indication of CWB_TRUE does not mean that the user ID and password have been validated within a certain time period, but only that since the system object's creation, a signon has occurred. That signon may not have caused or included a connection and security validation flow to the iSeries system. This means that, even if CWB_TRUE is returned, the next call to the system object that requires a successful signon might connect and attempt to re-validate the user ID and password, and that validation, and hence the signon, may fail. The signedOn indicator reflects the results of the most-recent user ID and password validation. If user ID and password validation (signon) has occurred successfully at one time, but since then this validation has failed, signedOn will be set to CWB_FALSE.

cwbCO_SetDefaultUserMode:

Purpose

This function sets, for the specified system object, the behavior with respect to any configured default user ID.

Syntax

```
UINT CWB_ENTRY cwbCO_SetDefaultUserMode(
                             cwbCO_SysHandle         system,
                             cwbCO_DefaultUserMode   mode );
```

Parameters

cwbCO_SysHandle system - input
Handle that previously was returned from cwbCO_CreateSystem or cwbCO_CreateSystemLike. It identifies the iSeries system.

cwbCO_DefaultUserMode mode - input
Specifies what will be done with the default user ID. Possible values are:

CWBCO_DEFAULT_USER_MODE_NOT_SET
No default user mode is currently in use. When this mode is active, and the Prompt Mode setting does not prohibit prompting, the user will be prompted at signon or connect time to select which of the remaining default user modes should be used from then on. The signon or connect cannot succeed until one of these other mode values is selected. Setting the Default User Mode back to this value will cause the prompt to appear the next time a default user ID is needed by iSeries Access.

CWBCO_DEFAULT_USER_USE
When no user ID has explicitly been set (by using cwbCO_SetUserIDEx) and a signon is to occur, use the default user ID that is configured for the iSeries system as named in the system object.

CWBCO_DEFAULT_USER_IGNORE
Specifies never to use a default user ID. When a signon takes place and no user ID has explicitly been set for this system object instance, the user will be prompted to enter a user ID if the Prompt Mode allows it (see cwbCO_SetPromptMode comments), and no initial value for the user ID will be filled in the prompt.

CWBCO_DEFAULT_USER_USEWINLOGON
The user ID that is used when logging on to Windows will be used as the default if no user ID explicitly has been set for this system object (by using cwbCO_SetUserIDEx).

CWBCO_DEFAULT_USER_USE_KERBEROS
The kerberos principal created when logging into a Windows domain will be used as the default if no user ID has explicitly been set for this system object (using cwbCO_SetUserIDEx).

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_API_HANDLE
Invalid system handle.

CWB_INVALID_PARAMETER
The mode parameter is an invalid value.

CWB_RESTRICTED_BY_POLICY
A policy exists that prohibits the user from changing this value.

CWB_INV_AFTER_SIGNON
Signon successfully has occurred by using the specified system object, so this setting no longer may be changed.

CWB_KERB_NOT_AVAILABLE
Kerberos security package is not available on this version of Windows.

Usage

This API cannot be used after a successful signon has occurred for the specified system object. A signon has occurred if either cwbCO_Signon or cwbCO_Connect has been called successfully for this system object. The default user mode set with this API will be ignored if a user ID has been set explicitly with the cwbCO_SetUserIDEx API.

Error code CWB_KERB_NOT_AVAILABLE will be returned if you attempt to set CWBCO_DEFAULT_USER_USE_KERBEROS on a Windows platform that does not support Kerberos.

cwbCO_SetPassword:

Purpose

This function sets the password to associate with the specified system object. This password will be used when connecting to the iSeries server with either the cwbCO_Signon or cwbCO_Connect call, and when a user ID has been set with the cwbCO_SetUserIDEx call.

Syntax

```
UINT CWB_ENTRY cwbCO_SetPassword(
                              cwbCO_SysHandle    system,
                              LPCSTR             password );
```

Parameters

cwbCO_SysHandle system - input
Handle that previously was returned from cwbCO_CreateSystem or cwbCO_CreateSystemLike. It identifies the iSeries system.

LPCSTR password - input
A pointer to a buffer that contains the NULL-terminated password. The maximum length is CWBCO_MAX_PASSWORD + 1 bytes in length, including the NULL terminator.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_API_HANDLE
Invalid system handle.

CWB_INVALID_POINTER
The password pointer is NULL.

CWB_NON_REPRESENTABLE_UNICODE_CHAR
One or more input Unicode characters have no representation in the codepage that is being used.

CWB_INV_AFTER_SIGNON
Signon successfully has occurred by using the specified system object, so this setting no longer may be changed.

Usage

This API cannot be used after a successful signon has occurred for the specified system object. A signon has occurred if either cwbCO_Signon or cwbCO_Connect has been called successfully for this system object. A password set with this API will not be used unless a corresponding user ID has been set with cwbCO_SetUserIDEx.

Valid password lengths depend on the current setting of the iSeries system password level. Password levels 0 and 1 allow passwords up to 10 characters in length. Password levels 2 and 3 allow passwords up to 128 characters in length.

cwbCO_SetPromptMode:

Purpose

This function sets, for the specified system object, the prompt mode, which specifies when and if the user should be prompted for user ID and password, or other information, when a signon is performed.

Syntax

```
UINT CWB_ENTRY cwbCO_SetPromptMode(
                             cwbCO_SysHandle     system,
                             cwbCO_PromptMode    mode );
```

Parameters

cwbCO_SysHandle system - input
Handle that previously was returned from cwbCO_CreateSystem or cwbCO_CreateSystemLike. It identifies the iSeries system.

cwbCO_PromptMode - input
Specifies the prompt mode. Possible values are:

CWBCO_PROMPT_IF_NECESSARY
iSeries Access for Windows will prompt if either the user ID or password have not been explicitly set or cannot be retrieved from the persistent configuration for this system, the password cache (if enabled), or by some other means.

If the Default User Mode has not been set, and if for this iSeries system the user has not been prompted yet for default user ID, iSeries access for Windows will prompt for it at cwbCO_Connect or cwbCO_Signon time

CWBCO_PROMPT_ALWAYS
iSeries Access for Windows will always prompt when a signon is to occur for the specified system object, even if a successful signon using the same user ID to the same iSeries system has occurred using a different system object. Since a signon can occur only once for a system object, this means that exactly one prompt per system object will occur. Additional explicit signon calls will do nothing (including prompt). See two exceptions to using this mode in the usage notes below.

CWBCO_PROMPT_NEVER
iSeries Access for Windows never will prompt for user ID and password, or for default user ID. When this mode is used, a call to any API that requires a signon for completion (for example, cwbCO_Signon or cwbCO_Connect) will fail if either the user ID or password have not been set and cannot be programmatically retrieved (from the iSeries password cache). This mode should be used when either

- iSeries Access for Windows is running on a PC that is unattended or for some other reason cannot support end-user interaction.
- The application itself is prompting for or otherwise fetching the user ID and password, and explicitly setting them by using cwbCO_SetUserIDEx and cwbCO_SetPassword.

Return Codes

The following list shows common return values:

CWB_OK
Successful completion.

CWB_INVALID_API_HANDLE
Invalid system handle.

CWB_INVALID_PARAMETER
The mode parameter is an invalid value.

CWB_RESTRICTED_BY_POLICY
A policy exists that prohibits the user from changing this value.

CWB_INV_AFTER_SIGNON
Signon successfully has occurred by using the specified system object, so this setting no longer may be changed.

Usage

This API cannot be used after a successful signon has occurred for the specified system object. A signon has occurred if either cwbCO_Signon or cwbCO_Connect has been called successfully for this system object. Setting the prompt mode to CWBCO_PROMPT_ALWAYS will not prompt the user in the following two cases:

- A user ID and password explicitly have been set with the cwbCO_setUserIDEx and cwbCO_SetPassword APIs.
- Use Windows logon info (CWBCO_DEFAULT_USER_USEWINLOGON) has been set with the cwbCO_SetDefaultUserMode API.

cwbCO_SetUserIDEx:

Purpose

This function sets the user ID to associate with the specified system object. This user ID will be used when connecting to the iSeries server with either the cwbCO_Signon or cwbCO_Connect call.

Syntax

```
UINT CWB_ENTRY cwbCO_SetUserIDEx(
                             cwbCO_SysHandle    system,
                             LPCSTR             userID );
```

Parameters

cwbCO_SysHandle system - input
Handle that previously was returned from cwbCO_CreateSystem or cwbCO_CreateSystemLike. It identifies the iSeries server system.

LPCSTR userID - input
Pointer to a buffer that contains the NULL-terminated user ID. The user ID must not be longer than CWBCO_MAX_USER_ID characters, not including the terminating NULL character.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_API_HANDLE
Invalid system handle.

CWB_INVALID_POINTER
The userID pointer is NULL.

CWB_NON_REPRESENTABLE_UNICODE_CHAR
One or more input Unicode characters have no representation in the codepage that is being used.

CWB_INV_AFTER_SIGNON
Signon successfully has occurred by using the specified system object, so this setting no longer may be changed.

Usage

This API cannot be used after a successful signon has occurred for the specified system object. A signon has occurred if either cwbCO_Signon or cwbCO_Connect has been called successfully for this system object. Setting a user ID explicitly with this API will cause any default user mode set with the cwbCO_SetDefaultUserMode API to be ignored.

cwbCO_SetWindowHandle:

Purpose

This function sets, for the specified system object, the window handle to use if any prompting is to be done that is associated with the system object (for example, prompting for user ID and password). When so set (to a non-NULL window handle), such a prompt would appear 'modal' to the main application window and therefore never would get hidden behind that window.

Syntax

```
UINT CWB_ENTRY cwbCO_SetWindowHandle(
                             cwbCO_SysHandle     system,
                             HWND                windowHandle );
```

Parameters

cwbCO_SysHandle system - input
Handle that previously was returned from cwbCO_CreateSystem or cwbCO_CreateSystemLike. It identifies the iSeries system.

HWND windowHandle - input
Specifies the window handle to associate with the system object. If NULL, no window handle is associated with the system object.

Return Codes

The following list shows common return values:

CWB_OK
Successful completion.

CWB_INVALID_API_HANDLE
Invalid system handle.

Usage

This API may be used any time to change the window handle for the specified system object, even after a successful signon.

cwbCO_SetValidateMode:

Purpose

This function sets, for the specified system object, the validate mode, which affects behavior when validating the user ID and password.

Syntax

```
UINT CWB_ENTRY cwbCO_SetValidateMode(
                             cwbCO_SysHandle     system,
                             cwbCO_ValidateMode  mode );
```

Parameters

cwbCO_SysHandle system - input
Handle that previously was returned from cwbCO_CreateSystem or cwbCO_CreateSystemLike. It identifies the iSeries system.

cwbCO_ValidateMode mode - input
Specifies the validate mode. Possible values are:

CWBCO_VALIDATE_IF_NECESSARY
If validation of this user ID on this iSeries system has occurred from this PC within the last 24 hours, and the validation was successful, then use the results of the last validation and do not connect to validate at this time. There may be other scenarios where re-validation will occur; iSeries Access for Windows will re-validate as needed.

CWBCO_VALIDATE_ALWAYS
Communication with the iSeries system to validate user ID and password will occur every time this validation is requested or required. Setting this mode forces the validation to occur (when the system object is not signed on yet). Once a system object is signed on, this setting is ignored.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_API_HANDLE
Invalid system handle.

CWB_INVALID_PARAMETER
The mode parameter is an invalid value.

CWB_RESTRICTED_BY_POLICY
A policy exists that prohibits the user from changing this value.

CWB_INV_AFTER_SIGNON
Signon has successfully occurred using the specified system object, so this setting no longer may be changed.

Usage

This API cannot be used after a successful signon has occurred for the specified system object. A signon has occurred if either cwbCO_Signon or cwbCO_Connect has been called successfully for this system object.

cwbCO_Signon:

Purpose

Sign the user on to the iSeries system that is represented by the specified system object by using user ID and password.

Note: Passing an incorrect password on the cwbCO_Signon API increments the invalid signon attempts counter for the specified user. The user profile is disabled if sufficient invalid passwords are sent to the host.

Syntax

```
UINT CWB_ENTRY cwbCO_Signon(
                             cwbCO_SysHandle      system,
                             cwbSV_ErrHandle      errorHandle );
```

Parameters

cwbCO_SysHandle system - input
Handle that previously was returned from cwbCO_CreateSystem or cwbCO_CreateSystemLike. It identifies the iSeries system.

cwbSV_ErrHandle errorHandle - input/output
Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle API. The messages may be retrieved through the cwbSV_GetErrText API. If the parameter is set to zero, or if the errorHandle is invalid, no messages will be retrieved.

Return Codes

The following list shows common return values:

CWB_OK
Successful completion.

CWB_INVALID_API_HANDLE
Invalid system handle.

CWB_UNKNOWN_USERID
The supplied user ID is not known to this system.

CWB_WRONG_PASSWORD
Password is not correct.

CWB_PASSWORD_EXPIRED
Password has expired.

CWB_USER_PROFILE_DISABLED
The user ID has been disabled.

CWB_INVALID_PASSWORD
One or more characters in the password is invalid or the password is too long.

CWB_INVALID_USERID
One or more characters in the user ID is invalid or the user ID is too long.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory; may have failed to allocate temporary buffer.

CWB_API_ERROR
General API failure.

CWB_USER_CANCELLED
The user cancelled the signon process.

Other return codes commonly may be returned as a result of a failed attempt to connect to the signon server. For a list of such return codes, see comments for cwbCO_Connect.

Usage

Both whether the user is prompted for user ID and password, and whether the iSeries system actually is contacted during user validation, are influenced by current system object settings, such as user ID, password, Prompt Mode, Default User Mode, and Validate Mode. See declarations for the get/set APIs of these attributes for more information. If the iSeries system as named in the specified system object does not exist in the System List, and the system object Persistence Mode is set appropriately, then when cwbCO_Connect or cwbCO_Signon first is called successfully, the iSeries system, as named in the system object, will be added to the System List.

For more information about the Persistence Mode, see the comments for cwbCO_SetPersistenceMode. If successful, and iSeries server password caching is enabled, the password will be stored for the resulting user ID in the PC's iSeries server password cache.

See also:
- "Differences between cwbCO_Signon and cwbCO_VerifyUserIDPassword" on page 91
- "Similarities between cwbCO_Signon and cwbCO_VerifyUserIDPassword" on page 91

cwbCO_VerifyUserIDPassword:

Purpose

This function verifies the correctness of the user ID and password passed in, on the iSeries system that the specified system object represents. If the user ID and password are correct, it also retrieves data related to signon attempts and password expiration.

Note: Passing an incorrect password on the cwbCO_VerifyUserIDPassword API increments the invalid signon attempts counter for the specified user. The user profile is disabled if sufficient invalid passwords are sent to the host.

Syntax

```
UINT CWB_ENTRY cwbCO_VerifyUserIDPassword(
                             cwbCO_SysHandle       system,
                             LPCSTR                userID,
                             LPCSTR                password,
                             cwbSV_ErrHandle       errorHandle );
```

Parameters

cwbCO_SysHandle system - input
Handle that previously was returned from cwbCO_CreateSystem or cwbCO_CreateSystemLike. It identifies the iSeries system.

LPCSTR userID - input
Pointer to a buffer that contains the NULL-terminated user ID, which must not exceed CWBCO_MAX_USER_ID characters in length, not including the terminating NULL.

LPCSTR password - input
A pointer to a buffer that contains the NULL-terminated password. The maximum length is CWBCO_MAX_PASSWORD + 1 bytes in length, including the NULL terminator.

cwbSV_ErrHandle errorHandle - input/output
Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle API. The messages may be retrieved through the cwbSV_GetErrText API. If the parameter is set to zero, or if the errorHandle is invalid, no messages will be retrieved.

Return Codes

The following list shows common return values:

CWB_OK
Successful completion.

CWB_INVALID_API_HANDLE
Invalid system handle.

CWB_INVALID_POINTER
A pointer supplied to the API is not valid.

CWB_UNKNOWN_USERID
The supplied user ID is not known to this system.

CWB_WRONG_PASSWORD
Password is not correct.

CWB_PASSWORD_EXPIRED
Password has expired.

CWB_USER_PROFILE_DISABLED
The user ID has been disabled.

CWB_INVALID_PASSWORD
One or more characters in the password is invalid or the password is too long.

CWB_INVALID_USERID
One or more characters in the user ID is invalid or the user ID is too long.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory; may have failed to allocate a temporary buffer.

CWB_API_ERROR
General API failure.

Usage

Valid password lengths depend on the current setting of the iSeries system password level. Password levels 0 and 1 allow passwords up to 10 characters in length. Password levels 2 and 3 allow passwords up to 128 characters in length.

See “Differences between cwbCO_Signon and cwbCO_VerifyUserIDPassword” on page 91 and “Similarities between cwbCO_Signon and cwbCO_VerifyUserIDPassword” on page 91.

Communications and security: Get and set attribute APIs

Use the APIs to get and set other system object attributes, or determine if the attributes are restricted by policies.

cwbCO_CanModifyDefaultUserMode:

Purpose

Indicates whether the default user mode for the specified system object may be modified.

Syntax

```
UINT CWB_ENTRY cwbCO_CanModifyDefaultUserMode(
                            cwbCO_SysHandle        system,
                            cwb_Boolean           *canModify );
```

Parameters

cwbCO_SysHandle system - input
Handle that previously was returned from cwbCO_CreateSystem or cwbCO_CreateSystemLike. It identifies the iSeries system.

cwb_Boolean *canModify - output
Set to CWB_TRUE if this mode may be modified, otherwise set to CWB_FALSE.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_API_HANDLE
Invalid system handle.

CWB_INVALID_POINTER
The canModify pointer is NULL.

Usage

This value may not be modified if policy settings prohibit its modification, or if a successful signon or connection that is using the specified system object already has occurred. In these cases, canModify will be set to CWB_FALSE. The results returned from this API are correct only at the time of the call.

If policy settings are changed or a signon or connection is performed using this system object, the results of this API could become incorrect. This must be considered and managed, especially in a multi-threaded application.

cwbCO_CanModifyIPAddress:

Purpose

Indicates whether IP Address that is used to connect may be modified for this system object.

Syntax

```
UINT CWB_ENTRY cwbCO_CanModifyIPAddress(
                             cwbCO_SysHandle        system,
                             cwb_Boolean           *canModify );
```

Parameters

cwbCO_SysHandle system - input
Handle that previously was returned from cwbCO_CreateSystem or cwbCO_CreateSystemLike. It identifies the iSeries system.

cwb_Boolean *canModify - output
Set to CWB_TRUE if the IP Address may be modified, otherwise set to CWB_FALSE.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_API_HANDLE
Invalid system handle.

CWB_INVALID_POINTER
The canModify pointer is NULL.

Usage

This value may not be modified if policy settings prohibit its modification, or if a successful signon or connection by using the specified system object already has occurred. In these cases, canModify will be set to CWB_FALSE. This value may not be modified if the IP Address Lookup Mode is not CWBCO_IPADDR_LOOKUP_NEVER, and policy settings prohibit modification of the IP Address Lookup Mode. In that case, canModify will be set to CWB_FALSE. The results returned from this API are correct only at the time of the call. If policy settings are changed or a signon or connection is performed using this system object, the results of this API could become incorrect. This must be considered and managed, especially in a multi-threaded application.

cwbCO_CanModifyIPAddressLookupMode:

Purpose

Indicates whether the IP Address Lookup Mode may be modified for this system object.

Syntax

```
UINT CWB_ENTRY cwbCO_CanModifyIPAddressLookupMode(
                           cwbCO_SysHandle        system,
                           cwb_Boolean           *canModify );
```

Parameters

cwbCO_SysHandle system - input
Handle that previously was returned from cwbCO_CreateSystem or cwbCO_CreateSystemLike. It identifies the iSeries system.

cwb_Boolean *canModify - output
Set to CWB_TRUE if this mode may be modified, otherwise set to CWB_FALSE.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_API_HANDLE
Invalid system handle.

CWB_INVALID_POINTER
The canModify pointer is NULL.

Usage

This value may not be modified if policy settings prohibit its modification, or if a successful signon or connection using the specified system object already has occurred. In these cases, canModify will be set to CWB_FALSE. The results returned from this API are correct only at the time of the call.

If policy settings are changed or a signon or connection is performed using this system object, the results of this API could become incorrect. This must be considered and managed, especially in a multi-threaded application.

cwbCO_CanModifyPersistenceMode:

Purpose

Indicates whether persistence mode for the specified system object may be modified.

Syntax

```
UINT CWB_ENTRY cwbCO_CanModifyPersistenceMode(
                             cwbCO_SysHandle        system,
                             cwb_Boolean           *canModify );
```

Parameters

cwbCO_SysHandle system - input
Handle that previously was returned from cwbCO_CreateSystem or cwbCO_CreateSystemLike. It identifies the iSeries system.

cwb_Boolean *canModify - output
Set to CWB_TRUE if this mode may be modified, otherwise set to CWB_FALSE.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_API_HANDLE
Invalid system handle.

CWB_INVALID_POINTER
The canModify pointer is NULL.

Usage

This value may not be modified if policy settings prohibit its modification, or if a successful signon or connection by using the specified system object has already occurred. In these cases, canModify will be set to CWB_FALSE. The results returned from this API are correct only at the time of the call. If policy settings are changed or a signon or connection is performed using this system object, the results of this API could become incorrect. This must be considered and managed, especially in a multi-threaded application.

cwbCO_CanModifyPortLookupMode:

Purpose

Indicates whether the port lookup mode for the specified system object may be modified.

Syntax

```
UINT CWB_ENTRY cwbCO_CanModifyPortLookupMode(
                             cwbCO_SysHandle        system,
                             cwb_Boolean           *canModify );
```

Parameters

cwbCO_SysHandle system - input
Handle that previously was returned from cwbCO_CreateSystem or cwbCO_CreateSystemLike. It identifies the iSeries system.

cwb_Boolean *canModify - output
Set to CWB_TRUE if this mode may be modified, otherwise set to CWB_FALSE.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_API_HANDLE
Invalid system handle.

CWB_INVALID_POINTER
The canModify pointer is NULL.

Usage

This value may not be modified if policy settings prohibit its modification, or if a successful signon or connection by using the specified system object already has occurred. In these cases, canModify will be set to CWB_FALSE. The results returned from this API are correct only at the time of the call. If policy settings are changed or a signon or connection is performed using this system object, the results of this API could become incorrect. This must be considered and managed, especially in a multi-threaded application.

cwbCO_CanModifyUseSecureSockets:

Purpose

Indicates whether the secure sockets use setting may be modified for this system object.

Syntax

```
UINT CWB_ENTRY cwbCO_CanModifyUseSecureSockets(
                             cwbCO_SysHandle        system,
                             cwb_Boolean           *canModify );
```

Parameters

cwbCO_SysHandle system - input
Handle that previously was returned from cwbCO_CreateSystem or cwbCO_CreateSystemLike. It identifies the iSeries system.

cwb_Boolean *canModify - output
Set to CWB_TRUE if the secure sockets use setting may be modified, otherwise set to CWB_FALSE.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_API_HANDLE
Invalid system handle.

CWB_INVALID_POINTER
The canModify pointer is NULL.

Usage

This value may not be modified if policy settings prohibit its modification, or if a successful signon or connection using the specified system object has already occurred. In these cases, canModify will be set to CWB_FALSE. The results returned from this API are correct only at the time of the call. If policy settings are changed or a signon or connection is performed using this system object, the results of this API could become incorrect. This must be considered and managed, especially in a multi-threaded application.

cwbCO_GetDescription:

Purpose

This function gets the text description associated with a specified system object.

Syntax

```
UINT CWB_ENTRY cwbCO_GetDescription(
                              cwbCO_SysHandle    system,
                              LPSTR              description,
                              PULONG             length );
```

Parameters

cwbCO_SysHandle system - input
Handle returned previously from cwbCO_CreateSystem or cwbCO_CreateSystemLike. It identifies the iSeries system.

LPSTR description - output
Pointer to a buffer that will contain the NULL-terminated description. The description will be at most CWBCO_MAX_SYS_DESCRIPTION characters long, not including the terminating NULL.

PULONG length - input/output
Pointer to the length of the description buffer. If the buffer is too small to hold the description, including space for the terminating NULL, the size of the buffer needed will be filled into this parameter.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_API_HANDLE
Invalid system handle.

CWB_INVALID_POINTER
One of the pointer parameters passed in is NULL.

CWB_BUFFER_OVERFLOW
The description buffer is not large enough to hold the entire description.

cwbCO_GetHostCCSID:

Purpose

Returns the associated CCSID of the iSeries system that is represented by the given system object that was in use when the signon to the iSeries system occurred, and that is associated with the user ID that is set in the system object.

Syntax

```
UINT CWB_ENTRY cwbCO_GetHostCCSID(
                             cwbCO_SysHandle        system,
                             PULONG                 pCCSID );
```

Parameters

cwbCO_SysHandle system - input
Handle that previously was returned from cwbCO_CreateSystem or cwbCO_CreateSystemLike. It identifies the iSeries system.

PULONG pCCSID - output
The host CCSID is copied into here if successful.

Return Codes

The following list shows common return values:

CWB_OK
Successful completion.

CWB_INVALID_API_HANDLE
Invalid system handle.

CWB_INVALID_POINTER
the CCSID pointer is NULL.

CWB_DEFAULT_HOST_CCSID_USED
Host CCSID 500 is returned because this API is unable to determine the host CCSID appropriate for the user ID as set in the system object.

CWB_USER_TIMEOUT

CWB_SSL_JAVA_ERROR

CWB_USER_TIMEOUT_SENDRCV

Usage

This API does not make or require an active connection to the host system to retrieve the associated CCSID value. However, it does depend on a prior successful connection to the host system by using the same user ID as is set in the specified system object. This is because the CCSID that is returned is the one from the specific user profile, NOT the iSeries system's default CCSID. To retrieve a host CCSID without requiring a user ID, call cwbNL_GetHostCCSID.

cwbCO_GetHostVersionEx:

Purpose

Get the version and release level of the host.

Syntax

```
UINT CWB_ENTRY cwbCO_GetHostVersionEx(
                             cwbCO_SysHandle        system,
                             PULONG                 version,
                             PULONG                 release);
```

Parameters

cwbCO_SysHandle system - input
Handle that previously was returned from cwbCO_CreateSystem or cwbCO_CreateSystemLike. It identifies the iSeries system.

PULONG version - output
Pointer to a buffer where the version level of the system is returned.

PULONG release - output
Pointer to a buffer where the release level of the system is returned.

Return Codes

The following list shows common return values:

CWB_OK
Successful Completion.

CWB_NOT_CONNECTED
The system has never been connected to when using the currently active environment.

CWB_INVALID_POINTER
One of the pointers passed in is NULL.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory; may have failed to allocate a temporary buffer.

Usage

The host version is retrieved and saved whenever a connection is made to the iSeries system. If no connection has been made yet to this iSeries system in the currently-active environment, this information will not be available, and the error code CWB_NOT_CONNECTED will be returned. If you know that a connection to the iSeries system recently was made successfully, it is likely that the version and release levels returned are current. If you want to make sure that the values are available and recently have been retrieved, call cwbCO_Signon or cwbCO_Connect for this system object first, then call cwbCO_GetHostVersionEx.

cwbCO_GetIPAddress:

Purpose

This function gets, for the specified system object, the IP address of the iSeries system it represents. This is the IP address that was used to connect to the iSeries system (or was set some other way, such as by using cwbCO_SetIPAddress), and will be used for later connections, when using the specified system object.

Syntax

```
UINT CWB_ENTRY cwbCO_GetIPAddress(
                            cwbCO_SysHandle    system,
                            LPSTR              IPAddress,
                            PULONG             length );
```

Parameters

cwbCO_SysHandle system - input
Handle that previously was returned by cwbCO_CreateSystem or cwbCO_CreateSystemLike. It identifies the iSeries system.

LPSTR IPAddress - output
Pointer to a buffer that will contain the NULL-terminated IP address in dotted-decimal notation (in the form ″nnn.nnn.nnn.nnn″ where each ″nnn″ is in the range of from 0 to 255).

PULONG length - input/output
Pointer to the length of the IPAddress buffer. If the buffer is too small to hold the output, including room for the terminating NULL, the size of the buffer needed will be filled into this parameter and CWB_BUFFER_OVERFLOW will be returned.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_API_HANDLE
Invalid system handle.

CWB_INVALID_POINTER
One of the input pointers is NULL.

CWB_BUFFER_OVERFLOW
The IPAddress buffer is not large enough to hold the entire IPAddress string.

Usage

None.

cwbCO_GetIPAddressLookupMode:

Purpose

This function gets, for the specified system object, the indication of when, if ever, the iSeries system's IP address will be looked up dynamically.

Syntax

```
UINT CWB_ENTRY cwbCO_GetIPAddressLookupMode(
                            cwbCO_SysHandle              system,
                            cwbCO_IPAddressLookupMode   *mode );
```

Parameters

cwbCO_SysHandle system - input
Handle that previously was returned by cwbCO_CreateSystem or cwbCO_CreateSystemLike. It identifies the iSeries system.

cwbCO_IPAddressLookupMode * mode - output
Returns the IP address lookup mode that currently is in use. See comments for "cwbCO_SetIPAddressLookupMode" on page 87 for possible values and their meanings.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_API_HANDLE
Invalid system handle.

CWB_INVALID_POINTER
The mode pointer is NULL.

Usage

None.

cwbCO_GetPortLookupMode:

Purpose

This function gets, for the specified system object, the mode or method by which host service ports are looked up when they are needed by iSeries Access for Windows to establish a service connection.

Syntax

```
UINT CWB_ENTRY cwbCO_GetPortLookupMode(
                             cwbCO_SysHandle         system,
                             cwbCO_PortLookupMode   *mode );
```

Parameters

cwbCO_SysHandle system - input
Handle that previously was returned by cwbCO_CreateSystem or cwbCO_CreateSystemLike. It identifies the iSeries system.

cwbCO_PortLookupMode * mode - output
Returns the host service port lookup mode. See comments for cwbCO_SetPortLookupMode for possible values and their meanings.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_API_HANDLE
Invalid system handle.

CWB_INVALID_POINTER
The mode pointer is NULL.

Usage

None.

cwbCO_GetSystemName:

Purpose

This function gets the iSeries system name that is associated with the specified system object.

Syntax

```
UINT CWB_ENTRY cwbCO_GetSystemName(
                              cwbCO_SysHandle    system,
                              LPSTR              sysName,
                              PULONG             length );
```

Parameters

cwbCO_SysHandle system - input
Handle that previously was returned from cwbCO_CreateSystem or cwbCO_CreateSystemLike. It identifies the iSeries system.

LPSTR sysName - output
Pointer to a buffer that will contain the NULL-terminated system name. The name will be CWBCO_MAX_SYS_NAME characters long at most, not including the terminating NULL.

PULONG length - input/output
Pointer to the length of the sysName buffer. If the buffer is too small to hold the system name, including room for the terminating NULL, the size of the buffer needed will be filled into this parameter and CWB_BUFFER_OVERFLOW will be returned.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_API_HANDLE
Invalid system handle.

CWB_INVALID_POINTER
One of the pointer parameters passed in is NULL.

CWB_BUFFER_OVERFLOW
The sysName buffer is not large enough to hold the entire system name.

Usage

None.

cwbCO_IsSecureSockets:

Purpose

This function gets (for the specified system object) whether Secure Sockets is being used (if connected), or would be attempted (if not currently connected) for a connection.

Syntax

```
UINT CWB_ENTRY cwbCO_IsSecureSockets(
                             cwbCO_SysHandle    system,
                             cwb_Boolean       *inUse );
```

Parameters

cwbCO_SysHandle system - input
Handle that previously was returned from cwbCO_CreateSystem or cwbCO_CreateSystemLike. It identifies the iSeries system.

cwb_Boolean * inUse - output
Returns whether iSeries Access is using, or will try to use, secure sockets for communication:

CWB_TRUE
IS in use or would be if connections active.

CWB_FALSE
NOT in use, would not try to use it.

Return Codes

The following list shows common return values:

CWB_OK
Successful completion.

CWB_INVALID_API_HANDLE
Invalid system handle.

CWB_INVALID_POINTER
The inUse pointer is NULL.

Usage

This flag is an indication of what iSeries Access for Windows attempts will TRY to do for any future communications. If CWB_TRUE is returned, then any attempt to communicate to the iSeries system that cannot be performed using secure sockets will fail.

| Although with limitations, iSeries Access for Windows enforces Federal Information Processing Standards (FIPS) compliance when SSL is used, this API does not return an indication of whether FIPS compliance is on or off. The only way to verify that FIPS-compliance is on or off is to visually inspect the FIPS compliance checkbox in iSeries Access for Windows Properties. For more information about FIPS and its use, see the User's Guide installed with iSeries Access for Windows.

cwbCO_SetIPAddress:

Purpose

This function sets, for the specified system object, the IP address that will be used to connect to the iSeries system. It also changes the IP Address Lookup Mode for the system object to CWBCO_IPADDR_LOOKUP_NEVER. These changes will NOT affect any other system object that exists or is created later.

Syntax

```
UINT CWB_ENTRY cwbCO_SetIPAddress(
                           cwbCO_SysHandle    system,
                           LPCSTR             IPAddress );
```

Parameters

cwbCO_SysHandle system - input
Handle that previously was returned from cwbCO_CreateSystem or cwbCO_CreateSystemLike. It identifies the iSeries system.

LPCSTR IPAddress - input
Specifies the IP address as a character string, in dotted-decimal notation (″nnn.nnn.nnn.nnn″), where each ″nnn″ is a decimal value ranging from 0 to 255. The IPAddress must not be longer than CWBCO_MAX_IP_ADDRESS characters, not including the terminating NULL character.

Return Codes

The following list shows common return values:

CWB_OK
Successful completion.

CWB_INVALID_API_HANDLE
Invalid system handle.

CWB_INVALID_PARAMETER
The IPAddress parameter does not contain a valid IP address.

CWB_RESTRICTED_BY_POLICY
A policy exists that prohibits the user from changing this value.

CWB_INV_AFTER_SIGNON
Signon has successfully occurred by using the specified system object, so this setting no longer may be changed.

Usage

This API cannot be used after a successful signon has occurred for the specified system object. A signon has occurred if either cwbCO_Signon or cwbCO_Connect has been called successfully for this system object.

Use this API to force use of a specific IP address whenever any connection is made using the specified system object. Since the IP Address Lookup Mode is set to NEVER lookup the IP address, the address specified always will be used, unless before a connect or signon occurs, the IP Address Lookup Mode is changed by calling cwbCO_SetIPAddressLookupMode.

cwbCO_SetIPAddressLookupMode:

Purpose

This function sets, for the specified system object, when iSeries Access for Windows dynamically will lookup the iSeries system's IP address when a connection is to be made. If the system name that is specified when cwbCO_CreateSystem or cwbCO_CreateSystemLike was called is an actual IP address, this setting is ignored, because iSeries Access for Windows never needs to lookup the address.

Syntax

```
UINT CWB_ENTRY cwbCO_SetIPAddressLookupMode(
                           cwbCO_SysHandle            system,
                           cwbCO_IPAddressLookupMode  mode );
```

Parameters

cwbCO_SysHandle system - input
Handle that previously was returned from cwbCO_CreateSystem or cwbCO_CreateSystemLike. It identifies the iSeries system.

cwbCO_IPAddressLookupMode mode - input
Specifies when the dynamic address lookup can occur. Possible values are:

CWBCO_IPADDR_LOOKUP_ALWAYS
Every time a connection is to occur, dynamically lookup the iSeries system's IP address.

CWBCO_IPADDR_LOOKUP_1HOUR
Lookup the IP address dynamically if it has been at least one hour since the last lookup for this iSeries system.

CWBCO_IPADDR_LOOKUP_1DAY
Lookup the IP address dynamically if it has been at least one day since the last lookup for this iSeries system.

CWBCO_IPADDR_LOOKUP_1WEEK
Lookup the IP address dynamically if it has been at least one week since the last lookup for this iSeries system.

CWBCO_IPADDR_LOOKUP_NEVER
Never dynamically lookup the IP address of this iSeries system, always use the IP address that was last used for this iSeries system on this PC.

CWBCO_IPADDR_LOOKUP_AFTER_STARTUP
Lookup the IP address dynamically if Windows has been re-started since the last lookup for this iSeries system.

Return Codes

The following list shows common return values:

CWB_OK
Successful completion.

CWB_INVALID_API_HANDLE
Invalid system handle.

CWB_INVALID_PARAMETER
The mode parameter is an invalid value.

CWB_RESTRICTED_BY_POLICY
A policy exists that prohibits the user from changing this value.

CWB_INV_AFTER_SIGNON
Signon has successfully occurred by using the specified system object, so this setting no longer may be changed.

Usage

This API cannot be used after a successful signon has occurred for the specified system object. A signon has occurred if either cwbCO_Signon or cwbCO_Connect has been called successfully for this system object.

Setting this to a value other than CWB_IPADDR_LOOKUP_ALWAYS could shorten the time to connect to the iSeries system, since the dynamic lookup may cause network traffic and take many seconds to complete. If the dynamic lookup is not performed, there is a risk that the IP address of the iSeries system will have changed and a connection will either fail or will be made to the wrong iSeries system.

cwbCO_SetPortLookupMode:

Purpose

This function sets, for the specified system object, how a host server port lookup will be done.

Syntax

```
UINT CWB_ENTRY cwbCO_SetPortLookupMode(
                         cwbCO_SysHandle      system,
                         cwbCO_PortLookupMode  mode );
```

Parameters

cwbCO_SysHandle system - input
Handle that previously was returned by cwbCO_CreateSystem or cwbCO_CreateSystemLike. It identifies the iSeries system.

cwbCO_PortLookupMode mode - input
Specifies port lookup method. Possible values are:

CWBCO_PORT_LOOKUP_SERVER
Lookup of a host server port will be done by contacting the host (iSeries) server mapper each time the connection of a service is to be made when one does not yet exist. The server mapper returns the port number that is then used to connect to the desired service on the iSeries system.

CWBCO_PORT_LOOKUP_LOCAL
Lookup of a host server port will be done by lookup in the SERVICES file on the PC itself.

CWBCO_PORT_LOOKUP_STANDARD
The ″standard″ port—that set by default for a given host server and in use if no one has changed the services table on the iSeries system for that service—will be used to connect to the desired service.

The latter two modes eliminate the iSeries server mapper connection and its associated delay, network traffic, and load on the iSeries system.

Return Codes

The following list shows common return values:

CWB_OK
Successful completion.

CWB_INVALID_API_HANDLE
Invalid system handle.

CWB_INVALID_PARAMETER
The mode parameter is an invalid value.

CWB_RESTRICTED_BY_POLICY
A policy exists that prohibits the user from changing this value.

CWB_INV_AFTER_SIGNON
Signon has successfully occurred by using the specified system object, so this setting no longer may be changed.

Usage

This API cannot be used after a successful signon has occurred for the specified system object. A signon has occurred if either cwbCO_Signon or cwbCO_Connect has been called successfully for this system object.

Use CWBCO_PORT_LOOKUP_SERVER to be most certain of the accuracy of the port number for a service; however, this requires an extra connection to the server mapper on the iSeries system every time a new connection to a service is to be made.

Use CWBCO_PORT_LOOKUP_STANDARD to achieve the best performance, although if the system administrator has changed the ports of any iSeries Access host service in the service table on that iSeries system, this mode will not work.

Use CWBCO_PORT_LOOKUP_LOCAL for best performance when the port for a iSeries Access host service has been changed on the iSeries system represented by the system object. For this to work, entries for each host service port must be added to a file on the PC named SERVICES. Each such entry must contain first the standard name of the host service (for example, ″as-rmtcmd″ without the quotes) followed by spaces and the port number for that service. The SERVICES file is located in a subdirectory under the Windows install directory called **system32\drivers\etc**.

cwbCO_UseSecureSockets:

Purpose

Specify that all communication to the iSeries system that uses the specified system object either must use secure sockets or must not use secure sockets.

Syntax

```
UINT CWB_ENTRY cwbCO_UseSecureSockets(
                             cwbCO_SysHandle    system,
                             cwb_Boolean        useSecureSockets );
```

Parameters

cwbCO_SysHandle system - input
Handle that previously was returned from cwbCO_CreateSystem or cwbCO_CreateSystemLike. It identifies the iServer system.

cwb_Boolean useSecureSockets - input
Specifies whether to require secure sockets use when communicating with the iSeries system that the specified system object handle represents. Use the appropriate value:

CWB_TRUE
Require secure sockets use for communication

CWB_FALSE
Do not use secure sockets for communication

CWB_USER_TIMEOUT
The connect timeout value associated with the system object expired before the connection verification attempt completed, so we stopped waiting.

Return Codes

The following list shows common return values:

CWB_OK
Successful completion.

CWB_INVALID_API_HANDLE
Invalid system handle.

CWB_SECURE_SOCKETS_NOTAVAIL
Secure sockets is not available. It may not be installed on the PC, prohibited for this user, or not available on the iServer system.

CWB_RESTRICTED_BY_POLICY
A policy exists that prohibits the user from changing this value.

CWB_INV_AFTER_SIGNON
Signon has successfully occurred by using the specified system object, so this setting no longer may be changed.

Usage

Even if a connection to the specified service already exists for the given system object, a new connection is attempted. The attributes of the given system object, such as whether to use secure sockets, are used for this connection attempt. It is therefore possible that connection verification may fail given the passed system object, but might succeed to the same system given a system object whose attributes are set differently. The most obvious example of this is where secure sockets use is concerned, since the non-secure-sockets version of the service may be running on the iSeries system, while the secure-sockets version of the service might not be running, or vice-versa.

iSeries Access for Windows may or may not be able to detect at the time this API is called if Secure Sockets will be available for use at connect time for this iSeries system. Even if CWB_SECURE_SOCKETS_NOTAVAIL is NOT returned, it may be determined at a later time that secure sockets is not available.

Although with limitations, iSeries Access for Windows enforces Federal Information Processing Standards (FIPS) compliance when SSL is used, this API does not return an indication of whether FIPS compliance is on or off. The only way to verify that FIPS-compliance is on or off is to visually inspect the FIPS compliance checkbox in iSeries Access for Windows Properties. For more information about FIPS and its use, see the User’s Guide installed with iSeries Access for Windows.

Defines for cwbCO_Service

The following values define cwbCO_Service.

- CWBCO_SERVICE_CENTRAL
- CWBCO_SERVICE_NETFILE
- CWBCO_SERVICE_NETPRINT
- CWBCO_SERVICE_DATABASE
- CWBCO_SERVICE_ODBC
- CWBCO_SERVICE_DATAQUEUES
- CWBCO_SERVICE_REMOTECMD
- CWBCO_SERVICE_SECURITY
- CWBCO_SERVICE_DDM
- CWBCO_SERVICE_WEB_ADMIN
- CWBCO_SERVICE_TELNET
- CWBCO_SERVICE_MGMT_CENTRAL
- CWBCO_SERVICE_ANY
- CWBCO_SERVICE_ALL

Differences between cwbCO_Signon and cwbCO_VerifyUserIDPassword

Following are listed some of the significant differences between cwbCO_Signon and cwbCO_VerifyUserIDPassword.

- cwbCO_VerifyUserIDPassword requires that a user ID and password be passed-in (system object values for these will NOT be used), and will not prompt for this information. cwbCO_Signon may use prompting, depending on other system object settings, and in that case will use whatever values are supplied by the user for user ID and password in its validation attempt.
- Since cwbCO_VerifyUserIDPassword never will prompt for user ID and password, these settings in the specified system object will not be changed as a result of that call. A call to cwbCO_Signon, however, may change the user ID or password of the system object as the result of possible prompting for this information.
- cwbCO_VerifyUserIDPassword ALWAYS will result in a connection to the iSeries system being established to perform user ID and password validation, and to retrieve current values (such as date and time of last successful signon) related to signon attempts. cwbCO_Signon, however, might not connect to validate the user ID and password, but instead may use recent results of a previous validation. This is affected by recency of previous validation results as well as by the Validation Mode attribute of the given system object.
- The password will be cached in the iSeries password cache only in the case of the successful completion of cwbCO_Signon, never as the result of a call to cwbCO_VerifyUserIDPassword.
- cwbCO_VerifyUserIDPassword NEVER will set the system object state to ’signed on’, whereas a successful cwbCO_Signon WILL change the state to ’signed on’. This is important because when a system object is in a ’signed on’ state, most of its attributes may no longer be changed.

Similarities between cwbCO_Signon and cwbCO_VerifyUserIDPassword

The following information illustrates the similarities between cwbCO_Signon and cwbCO_VerifyUserIDPassword

Both APIs, when using a connection to validate the user ID and password, also retrieve current data related to signon attempts. This data then can be retrieved by using the following APIs:

- cwbCO_GetSignonDate
- cwbCO_GetPrevSignonDate
- cwbCO_GetPasswordExpireDate
- cwbCO_GetFailedSignons

Communications: Create and delete APIs

Use these APIs to create a list of configured systems, either in the currently active environment or in a different environment. Retrieve the number of entries in the list, and each entry in succession.

cwbCO_CreateSysListHandle:

Purpose

Creates a handle to a list of configured system names in the active environment.

Syntax

```
unsigned int CWB_ENTRY cwbCO_CreateSysListHandle(
                             cwbCO_SysListHandle *listHandle,
                             cwbSV_ErrHandle      errorHandle);
```

Parameters

cwbCO_SysListHandle *listHandle - output
Pointer to a list handle that will be passed back on output. This handle is needed for other calls using the list.

cwbSV_ErrorHandle errorHandle - input
If the API call fails, the message object that is associated with this handle will be filled in with message text that describes the error. If this parameter is zero, no messages will be available.

Return Codes

The following list shows common return values:

CWB_OK
Successful Completion.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory.

CWB_INVALID_POINTER
Pointer to the list handle is NULL.

Usage

cwbCO_DeleteSysListHandle must be called to free resources that are allocated with this API.

cwbCO_CreateSysListHandleEnv:

Purpose

Creates a handle to list of configured system names of the specified environment.

Syntax

```
unsigned int CWB_ENTRY cwbCO_CreateSysListHandleEnv(
                             cwbCO_SysListHandle *listHandle,
                             cwbSV_ErrHandle      errorHandle,
                             LPCSTR               pEnvironment );
```

Parameters

cwbCO_SysListHandle *listHandle - output
Pointer to a list handle that will be passed back on output. This handle is needed for other calls that are using the list.

cwbSV_ErrorHandle errorHandle - input
If the API call fails, the message object that is associated with this handle will be filled in with message text that describes the error. If this parameter is zero, no messages will be available.

LPCSTR pEnvironment
Pointer to a string containing the desired environment name. If pEnvironment is the NULL pointer, or points to the NULL string ("\0"), the system list of the current active environment is returned.

Return Codes

The following list shows common return values.

CWB_OK
Successful Completion.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory; may have failed to allocate temporary buffer.

CWB_INVALID_POINTER
Pointer to the list handle is NULL.

CWBCO_NO_SUCH_ENVIRONMENT
The specified environment does not exist.

CWB_NON_REPRESENTABLE_UNICODE_CHAR
One or more input Unicode characters have no representation in the codepage being used.

CWB_API_ERROR
General API failure.

Usage

cwbCO_DeleteSysListHandle must be called to free resources allocated with this API.

cwbCO_DeleteSysListHandle:

Purpose

Deletes a handle to a list of configured system names. This must be called when you are finished using the system name list.

Syntax

```
unsigned int CWB_ENTRY cwbCO_DeleteSysListHandle(
                            cwbCO_SysListHandle listHandle);
```

Parameters

cwbCO_SysListHandle - listHandle
A handle to the system name list to delete.

Return Codes

The following list shows common return values.

CWB_OK
Successful Completion.

CWB_INVALID_API_HANDLE
Invalid system handle.

Usage

Use this API to delete the list created with the cwbCO_CreateSysListHandle or cwbCO_CreateSysListHandleEnv API.

cwbCO_GetNextSysName:

Purpose

Get the name of the next system from a list of systems.

Syntax

```
unsigned int CWB_ENTRY cwbCO_GetNextSysName(
                             cwbCO_SysListHandle listHandle,
                             char               *systemName,
                             unsigned long       bufferSize,
                             unsigned long      *needed);
```

Parameters

cwbCO_SysListHandle handleList - input
Handle to a list of systems.

char *systemName - output
Pointer to a buffer that will contain the system name. This buffer should be large enough to hold at least CWBCO_MAX_SYS_NAME + 1 characters, including the terminating NULL character.

unsigned long bufferSize - input
Size of the buffer pointed to by systemName.

unsigned long *needed - output
Number of bytes needed to hold entire system name.

Return Codes

The following list shows common return values.

CWB_OK
Successful Completion.

CWB_INVALID_API_HANDLE
Invalid system handle.

CWB_INVALID_POINTER
Pointer to system name or pointer to buffer size needed is NULL. Check messages in the History Log to determine which are NULL.

CWB_BUFFER_OVERFLOW
Not enough room in output buffer to hold entire system name. Use *needed to determine the correct size. No error message is logged to the History Log since the caller is expected to recover from this error and continue.

CWBCO_END_OF_LIST
The end of the system list has been reached. No system name was returned.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory; may have failed to allocate temporary buffer.

CWB_API_ERROR
General API failure.

Usage

If the system list passed in was created using the API cwbCO_CreateSystemListHandle, then the system returned is configured in the currently active environment, unless between these API calls the user has removed it or switched to a different environment. If cwbCO_CreateSysListHandleEnv was called to create the system list, then the system returned is configured in the environment passed to that API, unless the user has since removed it.

cwbCO_GetSysListSize:

Purpose

Gets the number of system names in the list.

Syntax

```
unsigned int CWB_ENTRY cwbCO_GetSysListSize(
                             cwbCO_SysListHandle  listHandle,
                             unsigned long       *listSize);
```

Parameters

cwbCO_SysListHandle listHandle - input
Handle of the list of systems.

unsigned long *listSize - output
On output this will be set to the number of systems in the list.

Return Codes

The following list shows common return values.

CWB_OK
Successful Completion.

CWB_INVALID_API_HANDLE
Invalid system handle.

CWB_INVALID_POINTER
Pointer to the list size is NULL.

Usage

None.

Communications: System information APIs

Use these APIs to obtain information about individual systems that are configured or connected in the current process. Unless the environment name is passed as a parameter, these APIs work only with the currently active environment.

cwbCO_GetActiveConversations:

Purpose

Get the number of active conversations of the system.

Syntax

```
int CWB_ENTRY cwbCO_GetActiveConversations(
                                         LPCSTR systemName);
```

Parameters

LPCSTR systemName - input
Pointer to a buffer that contains the system name.

Return Codes

The number of active conversations, if any, is returned. If the systemName pointer is NULL, points to an empty string, the system is not currently connected, or system name contains one or more Unicode characters which cannot be converted, 0 will be returned.

Usage

This API returns the number of conversations active for the specified iSeries system within the CURRENT PROCESS ONLY. There may be other conversations active within other processes running on the PC.

cwbCO_GetConnectedSysName:

Purpose

Get the name of the connected system corresponding to the index.

Syntax

```
unsigned int CWB_ENTRY cwbCO_GetConnectedSysName(
                                char              *systemName,
                                unsigned long     *bufferSize,
                                unsigned long      index);
```

Parameters

char *systemName - output
Pointer to a buffer that will contain the system name. This buffer should be large enough to hold at least CWBCO_MAX_SYS_NAME + 1 characters, including the terminating NULL character.

unsigned long * bufferSize - input/output

input Size of the buffer pointed to by *systemName.

output
Size of buffer needed.

unsigned long index
Indicates which connected system to retrieve the name for. The first connected system's index is 0, the second index is 1, and so on.

Return Codes

The following list shows common return values.

CWB_OK
Successful Completion.

CWB_INVALID_POINTER
Pointer to system name or pointer to buffer size needed is NULL. Check messages in the History Log to determine which are NULL.

CWB_BUFFER_OVERFLOW
Not enough room in output buffer to hold entire system name. Use *bufferSize to determine the correct size. No error message is logged to the History Log since the caller is expected to recover from this error and continue.

CWBCO_END_OF_LIST
The end of connected system list has been reached. No system name was returned.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory; may have failed to allocate temporary buffer.

CWB_API_ERROR
General API failure.

Usage

Connections for which system names can be retrieved are those within the current process only.

cwbCO_GetDefaultSysName:

Purpose

Get the name of the default system in the active environment.

Syntax

```
unsigned int CWB_ENTRY cwbCO_GetDefaultSysName(
                             char              *defaultSystemName,
                             unsigned long      bufferSize,
                             unsigned long     *needed,
                             cwbSV_ErrHandle    errorHandle);
```

Parameters

char *defaultSystemName - output
Pointer to a buffer that will contain the NULL-terminated system name. This buffer should be large enough to hold at least CWBCO_MAX_SYS_NAME + 1 characters, including the terminating NULL character.

unsigned long bufferSize - input
Size of input buffer.

unsigned long *needed - output
Number of bytes needed to hold entire system name including the terminating NULL.

cwbSV_ErrorHandle errorhandle - input
If the API call fails, the message object associated with this handle will be filled in with message text that describes the error. If this parameter is zero, no messages will be available.

Return Codes

The following list shows common return values:

CWB_OK
Successful Completion.

CWB_INVALID_POINTER
Pointer to the system name or pointer to buffer size needed is NULL. Check messages in the History Log to determine which are NULL.

CWB_BUFFER_OVERFLOW
Not enough room in output buffer to hold the entire system name. Use *needed to determine the correct size. No error message is logged to the History Log since the caller is expected to recover from this error and continue.

CWBCO_DEFAULT_SYSTEM_NOT_DEFINED
The setting for the default system has not been defined in the active environment.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory; may have failed to allocate temporary buffer.

CWB_API_ERROR
General API failure.

Usage

None.

cwbCO_GetHostVersion:

Purpose

Get the version and release level of the host.

Syntax

```
unsigned int CWB_ENTRY cwbCO_GetHostVersion(
                             LPCSTR         system,
                             unsigned int * version,
                             unsigned int * release );
```

Parameters

LPCSTR systemName - input
Pointer to a buffer that contains the system name.

unsigned int * version - output
Pointer to a buffer where the version level of the system is returned.

unsigned int * release - output
Pointer to a buffer where the release level of the system is returned.

Return Codes

The following list shows common return values:

CWB_OK
Successful Completion.

CWBCO_SYSTEM_NOT_CONFIGURED
The system is not configured in the currently active environment.

CWBCO_SYSTEM_NOT_CONNECTED
The system has never been connected to when using the currently active environment.

CWB_INVALID_POINTER
One of the pointers passed is NULL.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory; may have failed to allocate temporary buffer.

CWB_NON_REPRESENTABLE_UNICODE_CHAR
One or more input Unicode characters have no representation in the codepage being used.

CWB_API_ERROR
General API failure.

Usage

The host version is retrieved and saved whenever a connection is made to the system; this API does not go to the host to get it on each call. The system must have been connected previously, though not necessarily at the time the API is called. Host information can only be retrieved for systems configured in the currently active environment.

cwbCO_GetUserID:

Purpose

Get signon or default user ID of the input system as it is configured and possibly connected in the currently active environment. This API is obsolete, and has been replaced.

Syntax

```
unsigned int CWB_ENTRY cwbCO_GetUserID(
                             LPCSTR             systemName,
                             char              *userID,
                             unsigned int       userID_Type,
                             unsigned long     *bufferSize);
```

Parameters

LPCSTR systemName - input
Pointer to a buffer that contains the system name.

char *userID - output
Pointer to a buffer where the desired userID of the system is returned. This buffer should be large enough to hold at least CWBCO_MAX_USER_ID + 1 characters, including the terminating NULL character.

unsigned int userID_Type - input
Specify whether current user ID of connected system (CWBCO_CURRENT_USER_ID) or default user ID of configured system (CWBCO_DEFAULT_USER_ID) is to be returned.

unsigned long * bufferSize - input/output
Pointer to a value that indicates the size of the userID buffer. If the buffer is not big enough, the value needed is returned.

Return Codes

The following list shows common return values.

CWB_OK
Successful Completion.

CWB_INVALID_POINTER
One or more input pointers are invalid.

CWB_INVALID_PARAMETER
The value for userID_Type is invalid.

CWB_BUFFER_OVERFLOW
Not enough room in userID buffer to store the user ID. Use *bufferSize to determine the correct size. No error message is logged to the History Log since the caller is expected to recover from this error and continue.

CWBCO_SYSTEM_NOT_CONNECTED
The system of the ″current user ID″ is not connected.

CWBCO_SYSTEM_NOT_CONFIGURED
The system of the ″default user ID″ is not configured in the currently active environment.

CWBCO_INTERNAL_ERROR
Internal error.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory; may have failed to allocate temporary buffer.

CWB_NON_REPRESENTABLE_UNICODE_CHAR
One or more input Unicode characters have no representation in the codepage being used.

CWB_API_ERROR
General API failure.

Usage

If the default user ID is specified, and none was entered when the connection was configured, CWB_OK will be returned and the user ID sent back to the caller will be the empty string, ″\0″. The user ID retrieved will be that of the specified system from the currently active environment.

cwbCO_IsSystemConfigured:

Purpose

Check if the input system is configured in the environment currently in use.

Syntax

```
cwb_Boolean CWB_ENTRY cwbCO_IsSystemConfigured(
                                       LPCSTR    systemName);
```

Parameters

LPCSTR systemName - input
Pointer to a buffer that contains the system name.

Return Codes

The following list shows common return values:

CWB_TRUE:
System is configured.

CWB_FALSE:
System is not configured, systemName is NULL, or system name contains one or more Unicode characters that cannot be converted.

Usage

None

cwbCO_IsSystemConfiguredEnv:

Purpose

Check if the input system is configured in the environment specified.

Syntax

```
cwb_Boolean CWB_ENTRY cwbCO_IsSystemConfiguredEnv(
                          LPCSTR    systemName,
                          LPCSTR    pEnvironment);
```

Parameters

LPCSTR systemName - input
Pointer to a buffer that contains the system name.

LPCSTR pEnvironment - input
Pointer to a buffer that contains the environment name. If pEnvironment is NULL, or if it points to an empty string, the environment currently in use is checked.

Return Codes

The following list shows common return values:

CWB_TRUE:
System is configured.

CWB_FALSE:
System is not configured, systemName is NULL, or system name contains one or more Unicode characters that cannot be converted.

Usage

None

cwbCO_IsSystemConnected:
Purpose

Check if the input system is currently connected.

Syntax

```
cwb_Boolean CWB_ENTRY cwbCO_IsSystemConnected(
                                          LPCSTR systemName);
```

Parameters

LPCSTR systemName - input
Pointer to a buffer that contains the system name.

Return Codes

The following list shows common return values.

CWB_TRUE:
System is connnected.

CWB_FALSE:
System is not connected, systemName is NULL, or system name contains one or more Unicode characters that cannot be converted.

Usage

This API indicates connection status within the current process only. The system may be connected within a different process, but this has no effect on the output of this API.

Communications: Configured environments information

Use these APIs to obtain the names of environments that have been configured.

cwbCO_GetActiveEnvironment:
Purpose

Get the name of the environment currently active.

Syntax

```
unsigned int CWB_ENTRY cwbCO_GetActiveEnvironment(
                              char              *environmentName,
                              unsigned long     *bufferSize);
```

Parameters

char *environmentName - output
Pointer to a buffer into which will be copied the name of the active environment, if the buffer that is passed is large enough to hold it. The buffer should be large enough to hold at least CWBCO_MAX_ENV_NAME + 1 characters, including the terminating NULL character.

unsigned long * bufferSize - input/output

input Size of the buffer pointed to by *environmentName.

output
Size of buffer needed.

Return Codes

The following list shows common return values:

CWB_OK
Successful Completion.

CWB_INVALID_POINTER
One or more pointer parameters are NULL.

CWB_BUFFER_OVERFLOW
Not enough room in output buffer to hold entire environment name. Use *bufferSize to determine the correct size. No error message is logged to the History Log since the caller is expected to recover from this error and continue.

CWBCO_NO_SUCH_ENVIRONMENT
No environments have been configured, so there is no active environment.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory; may have failed to allocate temporary buffer.

CWB_API_ERROR
General API failure.

Usage

None.

cwbCO_GetEnvironmentName:

Purpose

Get the name of the environment corresponding to the index.

Syntax

```
unsigned int CWB_ENTRY cwbCO_GetEnvironmentName(
                              char              *environmentName,
                              unsigned long     *bufferSize,
                              unsigned long      index);
```

Parameters

char *environmentName - output
Pointer to a buffer that will contain the environment name. This buffer should be large enough to hold at least CWBCO_MAX_ENV_NAME + 1 characters, including the terminating NULL character.

unsigned long * bufferSize - input/output

input Size of the buffer pointed to by *environmentName.

output
Size of buffer needed, if the buffer provided was too small.

unsigned long index - input
0 corresponds to the first environment.

Return Codes

The following list shows common return values:

CWB_OK
Successful Completion.

CWB_INVALID_POINTER
One or more pointer parameters are NULL.

CWB_BUFFER_OVERFLOW
Not enough room in output buffer to hold entire environment name. Use *bufferSize to determine the correct size. No error message is logged to the History Log since the caller is expected to recover from this error and continue.

CWBCO_END_OF_LIST
The end of the environments list has been reached. No environment name was returned.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory; may have failed to allocate temporary buffer.

CWB_API_ERROR
General API failure.

Usage

None.

cwbCO_GetNumberOfEnvironments:

Purpose

Get the number of iSeries Access environments that exist. This includes both the active and all non-active environments.

Syntax

```
unsigned int CWB_ENTRY cwbCO_GetNumberOfEnvironments(
                             unsigned long      *numberOfEnv);
```

Parameters

unsigned long *numberOfEnv - output
On output this will be set to the number of environments.

Return Codes

The following list shows common return values.

CWB_OK
Successful Completion.

CWB_INVALID_POINTER
The numberOfEnv pointer parameter is NULL.

Usage

None.

Communications: Environment and connection information

Use these APIs to determine if the calling application can modify environments and connection information.

cwbCO_CanConnectNewSystem:

Purpose

Indicates whether the user may connect to a system not currently configured in the System List within the active environment.

Syntax

```
cwb_Boolean CWB_ENTRY cwbCO_CanConnectNewSystem();
```

Parameters

None

Return Codes

The following list shows common return values:

CWB_TRUE
Can connect to systems not already configured.

CWB_FALSE
Cannot connect to systems not already configured.

Usage

If this API returns CWB_FALSE, a call to cwbCO_CreateSystem with a system name not currently configured will fail, as will various other iSeries Access for Windows APIs that take system name as a parameter.

cwbCO_CanModifyEnvironmentList:

Purpose

Indicates whether the user can create/remove/rename environments.

Syntax

```
cwb_Boolean CWB_ENTRY cwbCO_CanModifyEnvironmentList();
```

Parameters

None

Return Codes

The following list shows common return values.

CWB_TRUE
: Can create/remove/rename/delete environments.

CWB_FALSE
: Cannot create/remove/rename/delete environments.

Usage

This API indicates whether environments can be manipulated. To see if systems within an environment may be manipulated, use the cwbCO_CanModifySystemList and cwbCO_CanModifySystemListEnv APIs.

cwbCO_CanModifySystemList:

Purpose

Indicates whether the user can add/remove/delete systems within the active environment. Note that systems ″suggested″ by the administrator via policies cannot be removed.

Syntax

```
cwb_Boolean CWB_ENTRY cwbCO_CanModifySystemList();
```

Parameters

None

Return Codes

The following list shows common return values:

CWB_TRUE
: Can modify system list.

CWB_FALSE
: Cannot modify system list.

Usage

This API indicates whether systems within the active environment can be manipulated. To see if environments can be manipulated see the cwbCO_CanModifyEnvironmentList API.

cwbCO_CanModifySystemListEnv:

Purpose

Indicates whether the user can add/remove/delete systems within an input environment. Note that systems ″suggested″ by the administrator via policies cannot be removed.

Syntax

```
cwb_Boolean CWB_ENTRY cwbCO_CanModifySystemListEnv(
                             char              *environmentName);
```

Parameters

char *environmentName - input
Pointer to a string that contains the desired environment name. If this pointer is NULL, or if it points to an empty string, the currently active environment is used.

Return Codes

The following list shows common return values:

CWB_TRUE
Can modify system list.

CWB_FALSE
Cannot modify system list, or an error occurred, such as having been passed a non-existent environment name.

Usage

This API indicates whether systems within an environment can be manipulated. To see if environments can be manipulated see the cwbCO_CanModifyEnvironmentList API.

cwbCO_CanSetActiveEnvironment:

Purpose

Indicates whether the user can set an environment to be the active environment.

Syntax

```
cwb_Boolean CWB_ENTRY cwbCO_CanSetActiveEnvironment();
```

Parameters

None

Return Codes

The following list shows common return values:

CWB_TRUE
Can set the active environment.

CWB_FALSE
Cannot set the active environment.

Usage

None

Example: Using iSeries Access for Windows communications APIs

The example program below shows the use of communications APIs to retrieve and display the names of the default (managing) system, along with all the systems that are configured in the active environment.

```
/******************************************************************
*
* Module:
*   GETSYS.C
*
* Purpose:
*   This module is used to demonstrate how an application might use the
*   Communication API's.  In this example, these APIs are used to get
*   and display the list of all configured systems.  The user can then
*   select one, and that system's connection properties (the attributes
*   of the created system object) are displayed.  All Client Access
*   services are then checked for connectabliity, and the results displayed.
*
* Usage Notes:
*
*   Include CWBCO.H, CWBCOSYS.H, and CWBSV.H
*   Link with CWBAPI.LIB
*
* IBM grants you a nonexclusive license to use this as an example
* from which you can generate similar function tailored to your own
* specific needs. This sample is  provided in the form of source
* material which you may change and use.
* If you change the source, it is recommended that you first copy the
* source to a different directory.  This will ensure that your changes
* are preserved when the tool kit contents are changed by IBM.
*
*                             DISCLAIMER
*                             ----------
*
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*
******************************************************************/

#include windows.h
#include stdio.h

#include "cwbsv.h"       /* Service APIs for retrieving any FAILURE messages  */
#include "cwbco.h"       /* Comm APIs for enumerating systems configured    */
#include "cwbcosys.h"    /* Comm APIs for creating and using system objects */

#define SUCCESS   (0)
#define FAILURE   (1)


/*
 *  Arrays of attribute description strings, for human-readable
 *  display of these values.
 */
char* valModeStr[2] = { "CWBCO_VALIDATE_IF_NECESSARY" ,
                        "CWBCO_VALIDATE_ALWAYS" } ;

char* promptModeStr[3] = { "CWBCO_PROMPT_IF_NECESSARY" ,
                           "CWBCO_PROMPT_ALWAYS" ,
                           "CWBCO_PROMPT_NEVER" } ;

char* dfltUserModeStr[4] = { "CWBCO_DEFAULT_USER_MODE_NOT_SET" ,
                             "CWBCO_DEFAULT_USER_USE" ,
                             "CWBCO_DEFAULT_USER_IGNORE" ,
                             "CWBCO_DEFAULT_USER_USEWINLOGON",
                             "CWBCO_DEFAULT_USER_USE_KERBEROS" } ;

char* IPALModeStr[6] = { "CWBCO_IPADDR_LOOKUP_ALWAYS" ,
                         "CWBCO_IPADDR_LOOKUP_1HOUR" ,
                         "CWBCO_IPADDR_LOOKUP_1DAY" ,
                         "CWBCO_IPADDR_LOOKUP_1WEEK" ,
                         "CWBCO_IPADDR_LOOKUP_NEVER" ,
                         "CWBCO_IPADDR_LOOKUP_AFTER_STARTUP" } ;

char* portLookupModeStr[3] = { "CWBCO_PORT_LOOKUP_SERVER" ,
                               "CWBCO_PORT_LOOKUP_LOCAL" ,
                               "CWBCO_PORT_LOOKUP_STANDARD" } ;

char* cwbBoolStr[2] = { "False", "True" } ;

/* NOTE! The corresponding service CONSTANT integers start
 *       at 1, NOT at 0; that is why the dummy "FAILURE" value
 *       was added at position 0.
 */
char* serviceStr[15] = { "CWBCO_SERVICE_THISISABADSERVICE!",
                         "CWBCO_SERVICE_CENTRAL" ,
                         "CWBCO_SERVICE_NETFILE" ,
                         "CWBCO_SERVICE_NETPRINT" ,
                         "CWBCO_SERVICE_DATABASE" ,
                         "CWBCO_SERVICE_ODBC" ,
                         "CWBCO_SERVICE_DATAQUEUES" ,
                         "CWBCO_SERVICE_REMOTECMD" ,
                         "CWBCO_SERVICE_SECURITY" ,
                         "CWBCO_SERVICE_DDM" ,
                         "", /* not used */
                         "", /* not used */
                         "CWBCO_SERVICE_WEB_ADMIN" ,
                         "CWBCO_SERVICE_TELNET" ,
                         "CWBCO_SERVICE_MGMT_CENTRAL" } ;




/*
 *  Node in a singly-linked list to hold a pointer
 *  to a system name.  Note that the creator of an
 *  instance of this node must allocate the space to
 *  hold the system name himself, only a pointer is
 *  supplied here.
 */
typedef struct sysListNodeStruct SYSLISTNODE, *PSYSLISTNODE;
struct sysListNodeStruct
{
   char*              sysName;
   cwbCO_SysHandle    hSys;
   PSYSLISTNODE       next;
} ;


/****************************************************************************
 *  Add a system name to the list of configured systems we will keep around.
 ****************************************************************************/
UINT addSystemToList(
   char* sysName,
   SYSLISTNODE** ppSysList )
{
   SYSLISTNODE* pNewSys;
   char*        pNewSysName;

   pNewSys = (SYSLISTNODE*) malloc (sizeof( SYSLISTNODE ));
   if ( pNewSys == NULL )
   {
      return FAILURE;
   }

   pNewSysName = (char*) malloc (strlen( sysName ) + 1 );
   if ( pNewSysName == NULL )
   {
      free (pNewSys);
      return FAILURE;
   }

   strcpy( pNewSysName, sysName );
   pNewSys->sysName = pNewSysName;
   pNewSys->hSys = 0;           /* delay creating sys object until needed */
   pNewSys->next = *ppSysList;
   *ppSysList = pNewSys;

   return SUCCESS;
}



/****************************************************************************
 *  Clear the list of system names and clean up used storage.
 ****************************************************************************/
void clearList( SYSLISTNODE* pSysList )
{
   PSYSLISTNODE pCur, pNext;

   pCur = pSysList;

   while ( pCur != NULL )
   {
      pNext = pCur->next;
      free (pCur->sysName);
      free (pCur);
      pCur = pNext;
   }
}


/****************************************************************************
 *  Retrieve and display Client Access FAILURE messages.
 ****************************************************************************/
void reportCAErrors( cwbSV_ErrHandle hErrs )
{
   ULONG msgCount;
   UINT apiRC;
   UINT i;
   char msgText[ 200 ];               /* 200 is big enuf to hold most msgs */
   ULONG bufLen = sizeof( msgText );  /* holds size of msgText buffer      */
   ULONG lenNeeded;                   /* to hold length of buf needed      */

   apiRC = cwbSV_GetErrCount( hErrs, &msgCount );
   if ( CWB_OK != apiRC )
   {
      printf( "Failed to get message count, cwbSV_GetErrCount rc=%u\n", apiRC );
      if ( ( CWB_INVALID_POINTER == apiRC )   ||
           ( CWB_INVALID_HANDLE  == apiRC ) )
      {
         printf( "  --> likely a programming FAILURE!\n");
      }
      return;
   }

   bufLen = sizeof( msgText );
   for ( i=1; i<=msgCount; i++ )
   {
      apiRC = cwbSV_GetErrTextIndexed(hErrs, i, msgText, bufLen, &lenNeeded);
      if ( ( CWB_OK == apiRC ) ||
           ( CWB_BUFFER_OVERFLOW == apiRC ) )  /* if truncated, that's ok */
      {
         printf( "CA FAILURE #%u: %s\n", i, msgText );
      }
      else
      {
         printf( "CA FAILURE #%u unuvailable, cwbSV_GetErrTextIndexed rc=%u\n",
            i, apiRC );
      }
   }
}


/*****************************************************************************
 *  Build the list of systems as it is currently configured in Client
 *  Access.
 *****************************************************************************/
UINT buildSysList(
   SYSLISTNODE** ppSysList )
{
   cwbSV_ErrHandle      hErrs;
   cwbCO_SysListHandle  hList;
   char                 sysName[ CWBCO_MAX_SYS_NAME + 1 ];
   ULONG                bufSize = sizeof( sysName );
   ULONG                needed;
   UINT                 apiRC;
   UINT                 myRC = SUCCESS;
   UINT                 rc = SUCCESS;

   /*  Create a FAILURE handle so that, in case of FAILURE, we can
    *  retrieve and display the messages (if any) associated with
    *  the failure.
    */
   apiRC = cwbSV_CreateErrHandle( &hErrs );
   if ( CWB_OK != apiRC )
   {
      /*  Failed to create a FAILURE handle, use NULL instead.
       *  This means we'll not be able to get at FAILURE messages.
       */
      hErrs = 0;
   }

   apiRC = cwbCO_CreateSysListHandle( *hList, hErrs );
   if ( CWB_OK != apiRC )
   {
      printf( "Failure to get a handle to the system list.\n" );
      reportCAErrors( hErrs );
      myRC = FAILURE;
   }

   /*  Get each successive system name and add the system to our
    *  internal list for later use.
    */
   while ( ( CWB_OK == apiRC ) && ( myRC == SUCCESS ) )
   {
      apiRC = cwbCO_GetNextSysName( hList, sysName, bufSize, &needed );

      /*  Note that since the sysName buffer is as large as it will
       *    ever need to be, we don't check specifically for the return
       *    code CWB_BUFFER_OVERFLOW.  We could instead choose to use a
       *    smaller buffer, and if CWB_BUFFER_OVERFLOW were returned,
       *    allocate one large enough and call cwbCO_GetNextSysName
       *    again.
       */
      if ( CWB_OK == apiRC )
      {
         myRC = addSystemToList( sysName, ppSysList );
         if ( myRC != SUCCESS )
         {
            printf( "Failure to add the next system name to the list.\n");
         }
      }
      else if ( CWBCO_END_OF_LIST != apiRC )
      {
         printf( "Failed to get the next system name.\n" );
         myRC = FAILURE;
      }
   } /* end while (to build a list of system names) */

   /*
    *  Free the FAILURE handle if one was created
    */
   if ( hErrs != 0 )   /* (non-NULL if it was successfully created) */
   {
      apiRC = cwbSV_DeleteErrHandle( hErrs );
      if ( CWB_INVALID_HANDLE == apiRC )
      {
         printf("Failure: FAILURE handle invalid, could not delete!\n");
         myRC = FAILURE;
      }
   }

   return myRC;
}


/****************************************************************************
 *  Get a system object given an index into our list of systems.
 ****************************************************************************/
UINT getSystemObject(
   UINT sysNum,
   SYSLISTNODE* pSysList,
   cwbCO_SysHandle* phSys )
{
   SYSLISTNODE* pCur;
   UINT myRC, apiRC;

   pCur = pSysList;
   for ( ; sysNum > 1; sysNum-- )
   {
      /*  We have come to the end of the list without finding
       *  the system requested, break out of loop and set FAILURE rc.
       */
      if ( NULL == pCur )
      {
         myRC = FAILURE;
         break;
      }

      pCur = pCur->next;
   }
   /*  If we're at a real system node, continue
    */
   if ( NULL != pCur )
   {
      /*  We're at the node/sysname of the user's choice.  If no
       *  Client Access "system object" has yet been created for this
       *  system, create one.  Pass back the one for the selected system.
       */
      if ( 0 == pCur->hSys )
      {
         apiRC = cwbCO_CreateSystem( pCur->sysName, &(pCur->hSys) );
         if ( CWB_OK != apiRC )
         {
            printf(
               "Failed to create system object, cwbCO_CreateSystem rc = %u\n",
               apiRC );
            myRC = FAILURE;
         }
      }
      *phSys = pCur->hSys;
   }

   return myRC;
}



/******************************************************************************
 *  Allow the user to select a system from the list we have.
 ******************************************************************************/
UINT selectSystem(
   UINT* pNumSelected,
   SYSLISTNODE* pSysList,
   BOOL refreshList )
{
   UINT                 myRC = SUCCESS;
   SYSLISTNODE*         pCur;
   UINT                 sysNum, numSystems;
   char                 choiceStr[ 20 ];

   /*  If the user wants the list refreshed, clear any existing list
    *  so we can rebuilt it from scratch.
    */
   if ( refreshList )
   {
      clearList( pSysList );
      pSysList = NULL;
   }

   /*  If the list of system names is NULL (no list exists), build
    *  the list of systems using Client Access APIs.
    */
   if ( NULL == pSysList )
   {
      myRC = buildSysList( &pSysList );
      if ( SUCCESS != myRC )
      {
         *pNumSelected = 0;
         printf( "Failed to build sys list, cannot select a system.\n");
      }
   }

   if ( SUCCESS == myRC )
   {
      printf( "-------------------------------------------- \n" );
      printf( "The list of systems configured is as follows:\n" );
      printf( "-------------------------------------------- \n" );
      for ( sysNum = 1, pCur = pSysList;
            pCur != NULL;
            sysNum++, pCur = pCur->next )
      {
         printf( "   %u) %s\n", sysNum, pCur->sysName );
      }
      numSystems = sysNum - 1;

      printf( "Enter the number of the system of your choice:\n");
      gets( choiceStr );
      *pNumSelected = atoi( choiceStr );

      if ( *pNumSelected > numSystems )
      {
         printf( "Invalid selection, there are only %u systems configured.\n");
         *pNumSelected = 0;
         myRC = FAILURE;
      }
   }

   return myRC;
}



/****************************************************************************
 *  Display a single attribute and its value, or a failing return code
 *  if one occurred when trying to look it up.
 ****************************************************************************/
void dspAttr(
   char* label,
   char* attrVal,
   UINT  lookupRC,
   BOOL* pCanBeModified,
   UINT  canBeModifiedRC )
{
   if ( CWB_OK == lookupRC )
   {
      printf( "%25s : %-30s   ", label, attrVal );
      if ( CWB_OK == canBeModifiedRC )
      {
         if ( pCanBeModified != NULL )
         {
            printf( "%s\n", cwbBoolStr[ *pCanBeModified ] );
         }
         else
         {
            printf( "(N/A)\n" );
         }
      }
      else
      {
         printf( "(Error, rc=%u)\n", canBeModifiedRC );
      }
   }
   else
   {
      printf( "%30s : (Error, rc=%u)\n", label, lookupRC );
   }
}



/****************************************************************************
 *
 *  Load the host/version string into the buffer specified.  The
 *  buffer passed in must be at least 7 bytes long!  A pointer to
 *  the buffer itself is passed back so that the output from this
 *  function can be used directly as a parameter.
 *
 ****************************************************************************/
char* hostVerModeDescr(
   ULONG ver,
   ULONG rel,
   char* verRelBuf )
{
   char* nextChar = verRelBuf;

   if ( verRelBuf != NULL )
   {
      *nextChar++ = 'v';
      if ( ver < 10 )
      {
         *nextChar++ = '0' + (char)ver;
      }
      else
      {
         *nextChar++ = '?';
         *nextChar++ = '?';
      }

      *nextChar++ = 'r';
      if ( rel < 10 )
      {
         *nextChar++ = '0' + (char)rel;
      }
      else
      {
         *nextChar++ = '?';
         *nextChar++ = '?';
      }

      *nextChar = '\0';
   }

   return verRelBuf;
}



/****************************************************************************
 *  Display all attributes of the system whose index in the passed list
 *  is passed in.
 ****************************************************************************/
void dspSysAttrs(
   SYSLISTNODE* pSysList,
   UINT sysNum )
{
   cwbCO_SysHandle hSys;
   UINT rc;
   char sysName[ CWBCO_MAX_SYS_NAME + 1 ];
   char IPAddr[ CWBCO_MAX_IP_ADDRESS + 1 ];
   ULONG bufLen, IPAddrLen;
   ULONG IPAddrBufLen;
   UINT apiRC, apiRC2;
   cwbCO_ValidateMode         valMode;
   cwbCO_DefaultUserMode      dfltUserMode;
   cwbCO_PromptMode           promptMode;
   cwbCO_PortLookupMode       portLookupMode;
   cwbCO_IPAddressLookupMode  IPALMode;
   ULONG ver, rel;
   char verRelBuf[ 10 ];
   ULONG verRelBufLen;
   cwb_Boolean isSecSoc;
   cwb_Boolean canModify;

   IPAddrBufLen = sizeof( IPAddr );
   verRelBufLen = sizeof( verRelBuf );

   rc = getSystemObject( sysNum, pSysList, &hSys );
   if ( rc == FAILURE )
   {
      printf( "Failed to get system object for selected system.\n");
      return;
   }

   printf("\n\n");
   printf("-----------------------------------------------------------\n");
   printf("            S y s t e m   A t t r i b u t e s              \n");
   printf("-----------------------------------------------------------\n");
   printf("\n");
   printf( "%25s : %-30s   %s\n", "Attribute", "Value", "Modifiable" );
   printf( "%25s : %-30s   %s\n", "---------", "-----", "----------" );
   printf("\n");

   apiRC = cwbCO_GetSystemName( hSys, sysName, &bufLen );
   dspAttr( "System Name", sysName, apiRC, NULL, 0 );

   apiRC = cwbCO_GetIPAddress( hSys, IPAddr, &IPAddrLen );
   dspAttr( "IP Address", IPAddr, apiRC, NULL, 0 );

   apiRC = cwbCO_GetHostVersionEx( hSys, &ver, &rel );
   dspAttr( "Host Version/Release",
      hostVerModeDescr( ver, rel, verRelBuf ), apiRC, NULL, 0 );

   apiRC = cwbCO_IsSecureSockets( hSys, &isSecSoc );
   apiRC2 = cwbCO_CanModifyUseSecureSockets( hSys, &canModify );
   dspAttr( "Secure Sockets In Use", cwbBoolStr[ isSecSoc ],
      apiRC, &canModify, apiRC2 );

   apiRC = cwbCO_GetValidateMode( hSys, &valMode );
   canModify = CWB_TRUE;
   dspAttr( "Validate Mode", valModeStr[ valMode ], apiRC,
      &canModify, 0 );

   apiRC = cwbCO_GetDefaultUserMode( hSys, &dfltUserMode );
   apiRC2 = cwbCO_CanModifyDefaultUserMode( hSys, &canModify );
   dspAttr( "Default User Mode", dfltUserModeStr[ dfltUserMode ], apiRC,
      &canModify, apiRC2 );

   apiRC = cwbCO_GetPromptMode( hSys, &promptMode );
   canModify = CWB_TRUE;
   dspAttr( "Prompt Mode", promptModeStr[ promptMode ], apiRC,
      &canModify, 0 );

   apiRC = cwbCO_GetPortLookupMode( hSys, &prtLookupMode );
   apiRC2 = cwbCO_CanModifyPortLookupMode( hSys, &canModify );
   dspAttr( "Port Lookup Mode", portLookupModeStr[ portLookupMode ], apiRC,
      &canModify, apiRC2 );

   apiRC = cwbCO_GetIPAddressLookupMode( hSys, &IPALMode );
   apiRC2 = cwbCO_CanModifyIPAddressLookupMode( hSys, &canModify );
   dspAttr( "IP Address Lookup Mode", IPALModeStr[ IPALMode ], apiRC,
      &canModify, apiRC2 );

   printf("\n\n");
}
```

```
/***************************************************************************
 *  Display connectability to all Client Access services that are
 *  possible to connect to.
 ***************************************************************************/
void dspConnectability(
   PSYSLISTNODE pSysList,
   UINT sysNum )
{
   UINT rc;
   UINT apiRC;
   cwbCO_Service service;
   cwbCO_SysHandle hSys;

   rc = getSystemObject( sysNum, pSysList, &hSys );
   if ( rc == FAILURE )
   {
      printf( "Failed to get system object for selected system.\n");
   }
   else
   {
      printf("\n\n");
      printf("----------------------------------------------------------\n");
      printf("       S y s t e m   S e r v i c e s   S t a t u s       \n");
      printf("----------------------------------------------------------\n");
      for ( service=(cwbCO_Service)1;
            service <= CWBCO_SERVICE_MGMT_CENTRAL;
            service++ )
      {
         apiRC = cwbCO_Verify( hSys, service, 0 );   // 0=no err handle
         printf("  Service '%s': ", serviceStr[ service ] );
         if ( apiRC == CWB_OK )
         {
            printf("CONNECTABLE\n");
         }
         else
         {
            printf("CONNECT TEST FAILED, rc = %u\n", apiRC );
         }
      }
   }

   printf("\n");
}



/***************************************************************************
 *  MAIN PROGRAM BODY
 ***************************************************************************/
void main(void)
{
   PSYSLISTNODE pSysList = NULL;
   UINT numSelected;
   UINT rc;
   char choiceStr[10];
   UINT choice;

   rc = buildSysList( &pSysList );
   if ( SUCCESS != rc )
   {
      printf( "Failure to build the system list, exiting.\n\n");
      exit( FAILURE );
   }

   do
   {
      printf( "Select one of the following options:\n" );
      printf( "   (1) Display current system attributes\n");
      printf( "   (2) Display service connectability for a system\n");
      printf( "   (3) Refresh the list of systems\n" );
      printf( "   (9) Quit\n" );
      gets( choiceStr );
      choice = atoi( choiceStr );
      switch ( choice )
      {
         // ---- Display current system attributes ---------------
         case 1 :
         {
            rc = selectSystem( &numSelected, pSysList, FALSE );
            if ( SUCCESS == rc )
            {
               dspSysAttrs( pSysList, numSelected );
            }

            break;
         }

         // ---- Display service connectability for a system -----
         case 2 :
         {
            rc = selectSystem( &numSelected, pSysList, FALSE );
            if ( SUCCESS == rc )
            {
               dspConnectability( pSysList, numSelected );
            }

            break;
         }

         // ---- Refresh the list of systems ---------------------
         case 3 :
         {
            clearList( pSysList );
            pSysList = NULL;
            rc = buildSysList( &pSysList );
            break;
         }

         // ---- Quit --------------------------------------------
         case 9 :
         {
            printf("Ending the program!\n");
            break;
         }

         default :
         {
            printf("Invalid choice.  Please make a different selection.\n");
         }
      }
   } while ( choice != 9 );

   /* Cleanup the list, we're done */
   clearList( pSysList );
   pSysList = NULL;

   printf( "\nEnd of program.\n\n" );
}
```

iSeries Access for Windows Data Queues APIs

Use iSeries Access for Windows Data Queues application programming interfaces (APIs) to provide easy access to iSeries data queues. Data queues allow you to create client/server applications that do not require the use of communications APIs.

iSeries Access for Windows Data Queues APIs required files:

Header file	Import library	Dynamic Link Library
cwbdq.h	cwbapi.lib	cwbdq.dll

Programmer’s Toolkit:

The Programmer’s Toolkit provides Data Queues documentation, access to the cwbdq.h header file, and links to sample programs. To access this information, open the Programmer’s Toolkit and select **Data Queues** → **C/C++ APIs**.

Note: By using the code examples, you agree to the terms of the “Code license and disclaimer information” on page 552.

Related reference

“Data Queues APIs return codes” on page 23

“iSeries system name formats for connection APIs” on page 5
APIs that take an iSeries system name as a parameter accept names in the following formats.

“OEM, ANSI, and Unicode considerations” on page 6
Most of the iSeries Access for Windows C/C++ APIs that accept string parameters exist in three forms: OEM, ANSI, or Unicode.

Data queues

A data queue is a system object that exists on the iSeries system.

Benefits of using data queues:

Data queues provide many benefits to PC developers and iSeries applications developers, including:

- They are a fast and efficient means of communication on the iSeries server.
- They have low system overhead and require very little setup.
- They are efficient because a single data queue can be used by a batch job to service several interactive jobs.
- The contents of a data queue message are free-format (fields are not required), providing flexibility that is not provided by other system objects.
- Access data queues through an iSeries API and through CL commands, which provides a straight-forward means of developing client/server applications.

Ordering data queue messages

There are three ways to designate the order of messages on a data queue:

LIFO Last in, first out. The last message (newest) placed on the data queue will be the first message taken off of the queue.

FIFO First in, first out. The first message (oldest) placed on the data queue will be the first message taken off of the queue.

KEYED
Each message on the data queue has a key associated with it. A message can be taken off of the queue only by requesting the key with which it is associated.

Work with data queues

You can work with data queues by using iSeries CL commands or callable programming interfaces. Access to data queues is available to all iSeries applications regardless of the programming language in which the application is written.

Use the following iSeries system interfaces to work with data queues:

i5/OS™ commands:

CRTDTAQ
Creates a data queue and stores it in a specified library

DLTDTAQ
Deletes the specified data queue from the system

i5/OS application programming interfaces:

QSNDDTAQ
Send a message (record) to the specified data queue

QRCVDTAQ
Read a message (record) to the specified data queue

QCLRDTAQ
Clear all messages from the specified data queue

QMHQRDQD
Retrieve a data queue description

QMHRDQM
Retrieve an entry from a data queue without removing the entry

Typical use of data queues

A data queue is a powerful program-to-program interface. Programmers who are familiar with programming on the iSeries servers are accustomed to using queues. Data queues simply represent a method that is used to pass information to another program.

Because this interface does not require communications programming, use it either for synchronous or for asynchronous (disconnected) processing.

Develop host applications and PC applications by using any supported language. For example, a host application could use RPG while a PC application might use C++. The queue is there to obtain input from one side and to pass input to the other.

The following example shows how data queues might be used:

- A PC user might take telephone orders all day, and key each order into a program, while the program places each request on iSeries data queue.
- A partner program (either a PC program or an iSeries program) monitors the data queue and pulls information from queue. This partner program could be simultaneously running, or started after peak user hours.
- It may or may not return input to the initiating PC program, or it may place something on the queue for another PC or iSeries program.
- Eventually the order is filled, the customer is billed, the inventory records are updated, and information is placed on the queue for the PC application to direct a PC user to call the customer with an expected ship date.

Objects

An application that uses the data queue function uses four **objects**. Each of these objects is identified to the application through a handle. The objects are:

Queue object:
This object represents the iSeries data queue.

Attribute:
This object describes the iSeries data queue.

Data: Use these objects to write records to, and to read records from, the iSeries data queue.

Read object:
Use this object only with the asynchronous read APIs. It uniquely identifies a request to read a record from the iSeries data queue. This handle is used on subsequent calls to check if the data has been returned. See the cwbDQ_AsyncRead API for more information.

Data Queues: Create, delete, and open APIs

Use these APIs in conjunction with the cwbCO_SysHandle System Object handle.

cwbDQ_CreateEx:

Purpose

Create an iSeries data queue object. After the object is created it can be opened using the cwbDQ_OpenEx API. It will have the attributes that you specify in the attributes handle.

Syntax

```
unsigned int CWB_ENTRY cwbDQ_CreateEx(
                             cwbCO_SysHandle     sysHandle,
                             const char         *queue,
                             const char         *library,
                             cwbDQ_Attr          queueAttributes,
                             cwbSV_ErrHandle     errorHandle);
```

Parameters

cwbCO_SysHandle sysHandle - input
Handle to a system object

const char * queue - input
Pointer to the data queue name contained in an ASCIIZ string.

const char * library - input
Pointer to the library name contained in an ASCIIZ string. If this pointer is NULL then the current library will be used (set library to ″*CURLIB″).

cwbDQ_Attr queueAttributes - input
Handle to the attributes for the data queue.

cwbSV_ErrHandle errorHandle - output
Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle API. The messages may be retrieved through the cwbSV_GetErrTextAPI. If the parameter is set to zero, no messages will be retrieved.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_COMMUNICATIONS_ERROR
A communications error occurred.

CWB_SERVER_PROGRAM_NOT_FOUND
iSeries application not found.

CWB_HOST_NOT_FOUND
iSeries system inactive or does not exist.

CWB_INVALID_POINTER
Bad or null pointer.

CWB_SECURITY_ERROR
A security error has occurred.

CWB_LICENSE_ERROR
A license error has occurred.

CWB_CONFIG_ERROR
A configuration error has occurred.

CWBDQ_INVALID_ATTRIBUTE_HANDLE
Invalid attributes handle.

CWBDQ_BAD_QUEUE_NAME
Queue name is incorrect.

CWBDQ_BAD_LIBRARY_NAME
Library name is incorrect.

CWBDQ_REJECTED_USER_EXIT
Command rejected by user exit program.

CWBDQ_USER_EXIT_ERROR
Error in user exit program.

CWBDQ_USER_EXIT_ERROR
Error in user exit program.

CWBDQ_LIBRARY_NOT_FOUND
Library not found on system.

CWBDQ_NO_AUTHORITY
No authority to library.

CWBDQ_QUEUE_EXISTS
Queue already exists.

CWBDQ_QUEUE_SYNTAX
Queue syntax is incorrect.

CWBDQ_LIBRARY_SYNTAX
Library syntax is incorrect.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory; may have failed to allocate temporary buffer.

CWB_NON_REPRESENTABLE_UNICODE_CHAR
One or more input Unicode characters have no representation in the code page being used.

CWB_API_ERROR
General API failure.

CWB_INVALID_HANDLE
Invalid system handle.

Usage

This function requires that you have previously issued the following APIs:

- cwbDQ_CreateSystem
- cwbDQ_CreateAttr

- cwbDQ_SetMaxRecLen

cwbDQ_DeleteEx:

Purpose

Remove all data from an iSeries data queue and delete the data queue object.

Syntax

```
unsigned int CWB_ENTRY cwbDQ_DeleteEx(
                             cwbCO_SysHandle     sysHandle
                             const char         *queue,
                             const char         *library,
                             cwbSV_ErrHandle     errorHandle);
```

Parameters

cwbCO_SysHandle - input
Handle to a system object.

const char * queue - input
Pointer to the data queue name contained in an ASCIIZ string.

const char * library - input
Pointer to the library name contained in an ASCIIZ string. If this pointer is NULL then the current library will be used (set library to ″*CURLIB″).

cwbSV_ErrHandle errorHandle - output
Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle API. The messages may be retrieved through the cwbSV_GetErrText API. If the parameter is set to zero, no messages will be retrieved.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_COMMUNICATIONS_ERROR
A communications error occurred.

CWB_SERVER_PROGRAM_NOT_FOUND
iSeries application not found.

CWB_HOST_NOT_FOUND
iSeries system inactive or does not exist.

CWB_INVALID_POINTER
Bad or null pointer.

CWB_SECURITY_ERROR
A security error has occurred.

CWB_LICENSE_ERROR
A license error has occurred.

CWB_CONFIG_ERROR
A configuration error has occurred.

CWBDQ_BAD_QUEUE_NAME
Queue name is too long.

CWBDQ_BAD_LIBRARY_NAME
Library name is too long.

CWBDQ_REJECTED_USER_EXIT
Command rejected by user exit program.

CWBDQ_USER_EXIT_ERROR
Error in user exit program.

CWBDQ_LIBRARY_NOT_FOUND
Library not found on system.

CWBDQ_QUEUE_NOT_FOUND
Queue not found on system.

CWBDQ_NO_AUTHORITY
No authority to queue.

CWBDQ_QUEUE_SYNTAX
Queue syntax is incorrect.

CWBDQ_LIBRARY_SYNTAX
Library syntax is incorrect.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory; may have failed to allocate temporary buffer.

CWB_NON_REPRESENTABLE_UNICODE_CHAR
One or more input Unicode characters have no representation in the code page being used.

CWB_API_ERROR
General API failure.

CWB_INVALID_HANDLE
Invalid system handle.

Usage

This function requires that you previously have issued cwbCO_CreateSystem.

cwbDQ_OpenEx:

Purpose

Start a connection to the specified data queue. This will start a conversation with the iSeries system. If the connection is not successful, a non-zero handle will be returned.

Syntax

```
unsigned int CWB_ENTRY cwbDQ_OpenEx(
                             cwbCO_SysHandle     sysHandle
                             const char         *queue,
                             const char         *library,
                             cwbDQ_QueueHandle  *queueHandle,
                             cwbSV_ErrHandle     errorHandle);
```

Parameters

cwbCO_SysHandle sysHandle - input
Handle to a system object.

const char * queue - input
Pointer to the data queue name contained in an ASCIIZ string.

const char * library - input
Pointer to the library name that is contained in an ASCIIZ string. If this pointer is NULL, the library list will be used (set library to "*LIBL").

cwbDQ_QueueHandle * queueHandle - output
Pointer to a cwbDQ_QueueHandle where the handle will be returned. This handle should be used in all subsequent calls.

cwbSV_ErrHandle errorHandle - output
Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle API. The messages may be retrieved through the cwbSV_GetErrText API. If the parameter is set to zero, no messages will be retrieved.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_COMMUNICATIONS_ERROR
A communications error occurred.

CWB_SERVER_PROGRAM_NOT_FOUND
iSeries application not found.

CWB_HOST_NOT_FOUND
iSeries system inactive or does not exist.

CWB_COMM_VERSION_ERROR
Data Queues will not run with this version of communications.

CWB_INVALID_POINTER
Bad or null pointer.

CWB_SECURITY_ERROR
A security error has occurred.

CWB_LICENSE_ERROR
A license error has occurred.

CWB_CONFIG_ERROR
A configuration error has occurred.

CWBDQ_BAD_QUEUE_NAME
Queue name is too long.

CWBDQ_BAD_LIBRARY_NAME
Library name is too long.

CWBDQ_BAD_SYSTEM_NAME
System name is too long.

CWBDQ_REJECTED_USER_EXIT
Command rejected by user exit program.

CWBDQ_USER_EXIT_ERROR
Error in user exit program.

CWBDQ_LIBRARY_NOT_FOUND
Library not found on system.

CWBDQ_QUEUE_NOT_FOUND
Queue not found on system.

CWBDQ_NO_AUTHORITY
No authority to queue or library.

CWBDQ_DAMAGED_QUE
Queue is in unusable state.

CWBDQ_CANNOT_CONVERT
Data cannot be converted for this queue.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory; may have failed to allocate temporary buffer.

CWB_NON_REPRESENTABLE_UNICODE_CHAR
One or more input Unicode characters have no representation in the code page being used.

CWB_API_ERROR
General API failure.

CWB_INVALID_HANDLE
Invalid system handle.

Usage

This function requires that you previously have issued cwbCO_CreateSystem.

Data Queues: Accessing data queues APIs

After the cwbDQ_Open API is used to create a connection to a specific data queue, these other APIs can be used to utilize it. Use the cwbDQ_Close API when the connection no longer is needed.

cwbDQ_AsyncRead:

Purpose

Read a record from the iSeries data queue object that is identified by the specified handle. The AsyncRead will return control to the caller immediately. This call is used in conjunction with the CheckData API. When a record is read from a data queue, it is removed from the data queue. If the data queue is empty for more than the specified wait time, the read is aborted, and the CheckData API returns a value of CWBDQ_TIMED_OUT. You may specifying a wait time from 0 to 99,999 (in seconds) or forever (-1). A wait time of zero causes the CheckData API to return a value of CWBDQ_TIMED_OUT on its initial call if there is no data in the data queue.

Syntax

```
unsigned int CWB_ENTRY cwbDQ_AsyncRead(
                             cwbDQ_QueueHandle   queueHandle,
                             cwbDQ_Data          data,
                             signed long         waitTime,
                             cwbDQ_ReadHandle   *readHandle,
                             cwbSV_ErrHandle     errorHandle);
```

Parameters

cwbDQ_QueueHandle queueHandle - input
Handle that was returned by a previous call to the cwbDQ_Open function. This identifies the iSeries data queue object.

cwbDQ_Data data - input
The data object to be read from the iSeries data queue.

signed long waitTime - input
Length of time in seconds to wait for data, if the data queue is empty. A wait time of -1 indicates to wait forever.

cwbDQ_ReadHandle * readHandle - output
Pointer to where the cwbDQ_ReadHandle will be written. This handle will be used in subsequent calls to the cwbDQ_CheckData API.

cwbSV_ErrHandle errorHandle - output
Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle API. The messages may be retrieved through the cwbSV_GetErrText API. If the parameter is set to zero, no messages will be retrieved.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWBDQ_INVALID_TIME
Invalid wait time.

CWBDQ_INVALID_QUEUE_HANDLE
Invalid queue handle.

CWBDQ_INVALID_SEARCH
Invalid search order.

Usage

This function requires that you have previously issued the following APIs:

- cwbDQ_Open or cwbDQ_OpenEx
- cwbDQ_CreateData

cwbDQ_Cancel:

Purpose

Cancel a previously issued AsyncRead. This will end the read on the iSeries data queue.

Syntax

```
unsigned int CWB_ENTRY cwbDQ_Cancel(
                            cwbDQ_ReadHandle    readHandle,
                            cwbSV_ErrHandle     errorHandle);
```

Parameters

cwbDQ_ReadHandle readHandle - input
The handle that was returned by the AsyncRead API.

cwbSV_ErrHandle errorHandle - output
Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle API. The messages may be retrieved through the cwbSV_GetErrText API. If the parameter is set to zero, no messages will be retrieved.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWBDQ_INVALID_READ_HANDLE
Invalid read handle.

Usage

This function requires that you have previously issued the following APIs:

- cwbDQ_Open or cwbDQ_OpenEx
- cwbDQ_CreateData
- cwbDQ_AsyncRead

cwbDQ_CheckData:

Purpose

Check if data was returned from a previously issued AsyncRead API. This API can be issued multiple times for a single AsyncRead call. It will return 0 when the data actually has been returned.

Syntax

```
unsigned int CWB_ENTRY cwbDQ_CheckData(
                             cwbDQ_ReadHandle    readHandle,
                             cwbSV_ErrHandle     errorHandle);
```

Parameters

cwbDQ_ReadHandle readHandle - input
The handle that was returned by the AsyncRead API.

cwbSV_ErrHandle errorHandle - output
Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle API. The messages may be retrieved through the cwbSV_GetErrText API. If the parameter is set to zero, no messages will be retrieved.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWBDQ_INVALID_READ_HANDLE
Invalid read handle.

CWBDQ_DATA_TRUNCATED
Data truncated.

CWBDQ_TIMED_OUT
Wait time expired and no data returned.

CWBDQ_REJECTED_USER_EXIT
Command rejected by user exit program.

CWBDQ_QUEUE_DESTROYED
Queue was destroyed.

CWBDQ_NO_DATA
No data.

CWBDQ_CANNOT_CONVERT
Unable to convert data.

Usage

This function requires that you have previously issued the following APIs:

- cwbDQ_Open or cwbDQ_OpenEx
- cwbDQ_CreateData
- cwbDQ_AsyncRead

If a time limit was specified on the AsyncRead, this API will return CWBDQ_NO_DATA until data is returned (return code will be CWB_OK), or the time limit expires (return code will be CWBDQ_TIMED_OUT).

cwbDQ_Clear:

Purpose

Remove all messages from the iSeries data queue object that is identified by the specified handle. If the queue is keyed, messages for a particular key may be removed by specifying the key and key length. These values should be set to NULL and zero, respectively, if you want to clear all messages from the queue.

Syntax

```
unsigned int CWB_ENTRY cwbDQ_Clear(
                              cwbDQ_QueueHandle   queueHandle,
                              unsigned char      *key,
                              unsigned short      keyLength,
                              cwbSV_ErrHandle     errorHandle);
```

Parameters

cwbDQ_QueueHandle queueHandle - input
Handle that was returned by a previous call to the cwbDQ_Open function. This identifies the iSeries data queue object.

unsigned char * key - input
Pointer to the key. The key may contain embedded NULLs, so it is not an ASCIIZ string.

unsigned short keyLength - input
Length of the key in bytes.

cwbSV_ErrHandle errorHandle - output
Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle API. The messages may be retrieved through the cwbSV_GetErrText API. If the parameter is set to zero, no messages will be retrieved.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWBDQ_INVALID_QUEUE_HANDLE
Invalid queue handle.

CWBDQ_BAD_KEY_LENGTH
Length of key is not correct.

CWBDQ_REJECTED_USER_EXIT
Command rejected by user exit program.

Usage

This function requires that you have previously issued:

- cwbDQ_Open or cwbDQ_OpenEx

cwbDQ_Close:

Purpose

End the connection with the iSeries data queue object that is identified by the specified handle. This will end the conversation with the iSeries system.

Syntax

```
unsigned int CWB_ENTRY cwbDQ_Close(
                             cwbDQ_QueueHandle   queueHandle);
```

Parameters

cwbDQ_QueueHandle queueHandle - input
Handle that was returned by a previous call to the cwbDQ_Open or cwbDQ_OpenEx function. This identifies the iSeries data queue object.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWBDQ_INVALID_QUEUE_HANDLE
Invalid queue handle.

Usage

This function requires that you previously issued the following APIs:

- cwbDQ_Open or cwbDQ_OpenEx

cwbDQ_Create:

Purpose

Create an iSeries data queue object. After the object is created it can be opened using the cwbDQ_Open API. It will have the attributes that you specify in the attributes handle.

Note: This API is obsolete. Use "cwbDQ_CreateEx" on page 120.

Syntax

```
unsigned int CWB_ENTRY cwbDQ_Create(
                             char              *queue,
                             char              *library,
                             char              *systemName,
                             cwbDQ_Attr         queueAttributes,
                             cwbSV_ErrHandle    errorHandle);
```

Parameters

char * queue - input
Pointer to the data queue name contained in an ASCIIZ string.

char * library - input
Pointer to the library name contained in an ASCIIZ string. If this pointer is NULL then the current library will be used (set library to ″*CURLIB″).

char * systemName - input
Pointer to the system name contained in an ASCIIZ string.

cwbDQ_Attr queueAttributes - input
Handle to the attributes for the data queue.

cwbSV_ErrHandle errorHandle - output
Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle API. The messages may be retrieved through the cwbSV_GetErrText API. If the parameter is set to zero, no messages are retrieved.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_COMMUNICATIONS_ERROR
A communications error occurred.

CWB_SERVER_PROGRAM_NOT_FOUND
iSeries application not found.

CWB_HOST_NOT_FOUND
iSeries system inactive or does not exist.

CWB_INVALID_POINTER
Bad or null pointer.

CWB_SECURITY_ERROR
A security error has occurred.

CWB_LICENSE_ERROR
A license error has occurred.

CWB_CONFIG_ERROR
A configuration error has occurred.

CWBDQ_INVALID_ATTRIBUTE_HANDLE
Invalid attributes handle.

CWBDQ_BAD_QUEUE_NAME
Queue name is incorrect.

CWBDQ_BAD_LIBRARY_NAME
Library name is incorrect.

CWBDQ_BAD_SYSTEM_NAME
System name is incorrect.

CWBDQ_REJECTED_USER_EXIT
Command rejected by user exit program.

CWBDQ_USER_EXIT_ERROR
Error in user exit program.

CWBDQ_LIBRARY_NOT_FOUND
Library not found on system.

CWBDQ_NO_AUTHORITY
No authority to library.

CWBDQ_QUEUE_EXISTS
Queue already exists.

CWBDQ_QUEUE_SYNTAX
Queue syntax is incorrect.

CWBDQ_LIBRARY_SYNTAX
Library syntax is incorrect.

Usage

This function requires that you have previously issued the following APIs:

- cwbDQ_CreateAttr
- cwbDQ_SetMaxRecLen

cwbDQ_Delete:

Purpose

Remove all data from an iSeries data queue and delete the data queue object.

Note: This API is obsolete. Use "cwbDQ_DeleteEx" on page 122.

Syntax

```
unsigned int CWB_ENTRY cwbDQ_Delete(
                              char              *queue,
                              char              *library,
                              char              *systemName,
                              cwbSV_ErrHandle    errorHandle);
```

Parameters

char * queue - input
Pointer to the data queue name contained in an ASCIIZ string.

char * library - input
Pointer to the library name contained in an ASCIIZ string. If this pointer is NULL then the current library will be used (set library to "*CURLIB").

char * systemName - input
Pointer to the system name contained in an ASCIIZ string.

cwbSV_ErrHandle errorHandle - output
Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle API. The messages may be retrieved through the cwbSV_GetErrText API. If the parameter is set to zero, no messages will be retrieved.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_COMMUNICATIONS_ERROR
A communications error occurred.

CWB_SERVER_PROGRAM_NOT_FOUND
iSeries application not found.

CWB_HOST_NOT_FOUND
iSeries system inactive or does not exist.

CWB_INVALID_POINTER
Bad or null pointer.

CWB_SECURITY_ERROR
A security error has occurred.

CWB_LICENSE_ERROR
A license error has occurred.

CWB_CONFIG_ERROR
A configuration error has occurred.

CWBDQ_QUEUE_NAME
Queue name is too long.

CWBDQ_LIBRARY_NAME
Library name is too long.

CWBDQ_SYSTEM_NAME
System name is too long.

CWBDQ_REJECTED_USER_EXIT
Command rejected by user exit program.

CWBDQ_USER_EXIT_ERROR
Error in user exit program.

CWBDQ_LIBRARY_NOT_FOUND
Library not found on system.

CWBDQ_QUEUE_NOT_FOUND
Queue not found on system.

CWBDQ_NO_AUTHORITY
No authority to queue.

CWBDQ_QUEUE_SYNTAX
Queue syntax is incorrect.

CWBDQ_LIBRARY_SYNTAX
Library syntax is incorrect.

Usage

None

cwbDQ_GetLibName:

Purpose

Retrieve the library name used with the cwbDQ_Open API.

Syntax

```
unsigned int CWB_ENTRY cwbDQ_GetLibName(
                             cwbDQ_QueueHandle   queueHandle,
                             char               *libName);
```

Parameters

cwbDQ_QueueHandle queueHandle - input
Handle that was returned by a previous call to the cwbDQ_Open function. This identifies the iSeries data queue object.

char * libName - output
Pointer to a buffer where the library name will be written.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWBDQ_INVALID_QUEUE_HANDLE
Invalid queue handle.

Usage

This function requires that you have previously issued cwbDQ_Open.

cwbDQ_GetQueueAttr:

Purpose

Retrieve the attributes of the iSeries data queue object that is identified by the specified handle. A handle to the data queue attributes will be returned. The attributes then can be retrieved individually.

Syntax

```
unsigned int CWB_ENTRY cwbDQ_GetQueueAttr(
                             cwbDQ_QueueHandle   queueHandle,
                             cwbDQ_Attr          queueAttributes,
                             cwbSV_ErrHandle     errorHandle);
```

Parameters

cwbDQ_QueueHandle queueHandle - input
Handle that was returned by a previous call to the cwbDQ_Open function. This identifies the iSeries data queue object.

cwbDQ_Attr queueAttributes - input/output
The attribute object. This was the output from the cwbDQ_CreateAttr call. The attributes will be filled in by this function, and you should call the cwbDQ_DeleteAttr function to delete this object when you have retrieved the attributes from it.

cwbSV_ErrHandle errorHandle - output
Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle API. The messages may be retrieved through the cwbSV_GetErrText API. If the parameter is set to zero, no messages will be retrieved.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWBDQ_INVALID_QUEUE_HANDLE
Invalid queue handle.

CWBDQ_REJECTED_USER_EXIT
Command rejected by user exit program.

Usage

This function requires that you have previously issued the following APIs:

- cwbDQ_Open or cwbDQ_OpenEx
- cwbDQ_CreateAttr

cwbDQ_GetQueueName:

Purpose

Retrieve the queue name used with the cwbDQ_Open API.

Syntax

```
unsigned int CWB_ENTRY cwbDQ_GetQueueName(
                             cwbDQ_QueueHandle   queueHandle,
                             char               *queueName);
```

Parameters

cwbDQ_QueueHandle queueHandle - input
Handle that was returned by a previous call to the cwbDQ_Open function. This identifies the iSeries data queue object.

char * queueName - output
Pointer to a buffer where the queue name will be written.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWBDQ_INVALID_QUEUE_HANDLE
Invalid queue handle.

Usage

This function requires that you have previously issued cwbDQ_Open.

cwbDQ_GetSysName:

Purpose

Retrieve the system name that is used with the cwbDQ_Open API.

Syntax

```
unsigned int CWB_ENTRY cwbDQ_GetSysName(
                             cwbDQ_QueueHandle   queueHandle,
                             char               *systemName);
```

Parameters

cwbDQ_QueueHandle queueHandle - input
Handle that was returned by a previous call to the cwbDQ_Open function. This identifies the iSeries data queue object.

char *systemName - output
Pointer to a buffer where the system name will be written.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_POINTER
Bad or null pointer.

CWBDQ_INVALID_QUEUE_HANDLE
Invalid queue handle.

Usage

This function requires that you previously have issued cwbDQ_Open or cwbDQ_OpenEx.

cwbDQ_Open:

Purpose

Start a connection to the specified data queue. This will start a conversation with the iSeries system. If the connection is not successful, a non-zero handle will be returned.

Note: This API is obsolete. Use "cwbDQ_OpenEx" on page 123.

Syntax

```
unsigned int CWB_ENTRY cwbDQ_Open(
                             char               *queue,
                             char               *library,
                             char               *systemName,
                             cwbDQ_QueueHandle  *queueHandle,
                             cwbSV_ErrHandle     errorHandle);
```

Parameters

char * queue - input
Pointer to the data queue name contained in an ASCIIZ string.

char * library - input
Pointer to the library name that is contained in an ASCIIZ string. If this pointer is NULL, the library list will be used (set library to ″*LIBL″).

char * systemName - input
Pointer to the system name that is contained in an ASCIIZ string.

cwbDQ_QueueHandle * queueHandle - output
Pointer to a cwbDQ_QueueHandle where the handle will be returned. This handle should be used in all subsequent calls.

cwbSV_ErrHandle errorHandle - output
Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle API. The messages may be retrieved through the cwbSV_GetErrText API. If the parameter is set to zero, no messages will be retrieved.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_COMMUNICATIONS_ERROR
A communications error occurred.

CWB_SERVER_PROGRAM_NOT_FOUND
iSeries application not found.

CWB_HOST_NOT_FOUND
iSeries system inactive or does not exist.

CWB_COMM_VERSION_ERROR
Data Queues will not run with this version of communications.

CWB_INVALID_POINTER
Bad or null pointer.

CWB_SECURITY_ERROR
A security error has occurred.

CWB_LICENSE_ERROR
A license error has occurred.

CWB_CONFIG_ERROR
A configuration error has occurred.

CWBDQ_BAD_QUEUE_NAME
Queue name is too long.

CWBDQ_BAD_LIBRARY_NAME
Library name is too long.

CWBDQ_BAD_SYSTEM_NAME
System name is too long.

CWBDQ_REJECTED_USER_EXIT
Command rejected by user exit program.

CWBDQ_USER_EXIT_ERROR
Error in user exit program.

CWBDQ_LIBRARY_NOT_FOUND
Library not found on system.

CWBDQ_QUEUE_NOT_FOUND
Queue not found on system.

CWBDQ_NO_AUTHORITY
No authority to queue or library.

CWBDQ_DAMAGED_QUE
Queue is in unusable state.

CWBDQ_CANNOT_CONVERT
Data cannot be converted for this queue.

Usage

None

cwbDQ_Peek:

Purpose

Read a record from the iSeries data queue object that is identified by the specified handle. When a record is peeked from a data queue, it remains in the data queue. You may wait for a record if the data queue is empty by specifying a wait time from 0 to 99,999 or forever (-1). A wait time of zero will return immediately if there is no data in the data queue.

Syntax

```
unsigned int CWB_ENTRY cwbDQ_Peek(
                             cwbDQ_QueueHandle   queueHandle,
                             cwbDQ_Data          data,
                             signed long         waitTime,
                             cwbSV_ErrHandle     errorHandle);
```

Parameters

cwbDQ_QueueHandle queueHandle - input
Handle that was returned by a previous call to the cwbDQ_Open API. This identifies the iSeries data queue object.

cwbDQ_Data data - input
The data object to be read from the iSeries data queue.

signed long waitTime - input
Length of time in seconds to wait for data, if the data queue is empty. A wait time of -1 indicates to wait forever.

cwbSV_ErrHandle errorHandle - output
Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle API. The messages may be retrieved through the cwbSV_GetErrText API. If the parameter is set to zero, no messages will be retrieved.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWBDQ_INVALID_TIME
Invalid wait time.

CWBDQ_INVALID_QUEUE_HANDLE
Invalid queue handle.

CWBDQ_INVALID_SEARCH
Invalid search order.

CWBDQ_DATA_TRUNCATED
Data truncated.

CWBDQ_TIMED_OUT
Wait time expired and no data returned.

CWBDQ_REJECTED_USER_EXIT
Command rejected by user exit program.

CWBDQ_QUEUE_DESTROYED
Queue was destroyed.

CWBDQ_CANNOT_CONVERT
Unable to convert data.

Usage

This function requires that you have previously issued cwbDQ_Open or cwbDQ_OpenEx and cwbDQ_CreateData.

cwbDQ_Read:

Purpose

Read a record from the iSeries data queue object that is identified by the specified handle. When a record is read from a data queue, it is removed from the data queue. You may wait for a record if the data queue is empty by specifying a wait time from 0 to 99,999 or forever (-1). A wait time of zero will return immediately if there is no data in the data queue.

Syntax

```
unsigned int CWB_ENTRY cwbDQ_Read(
                             cwbDQ_QueueHandle   queueHandle,
                             cwbDQ_Data          data,
                             long                waitTime,
                             cwbSV_ErrHandle     errorHandle);
```

Parameters

cwbDQ_QueueHandle queueHandle - input
Handle that was returned by a previous call to the cwbDQ_Open function. This identifies the iSeries data queue object.

cwbDQ_Data data - input
The data object to be read from the iSeries data queue.

long waitTime - input
Length of time in seconds to wait for data, if the data queue is empty. A wait time of -1 indicates to wait forever.

cwbSV_ErrHandle errorHandle - output
Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle API. The messages may be retrieved through the cwbSV_GetErrText API. If the parameter is set to zero, no messages will be retrieved.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWBDQ_INVALID_TIME
Invalid wait time.

CWBDQ_INVALID_QUEUE_HANDLE
Invalid queue handle.

CWBDQ_INVALID_SEARCH
Invalid search order.

CWBDQ_DATA_TRUNCATED
Data truncated.

CWBDQ_TIMED_OUT
Wait time expired and no data returned.

CWBDQ_REJECTED_USER_EXIT
Command rejected by user exit program.

CWBDQ_QUEUE_DESTROYED
Queue was destroyed.

CWBDQ_CANNOT_CONVERT
Unable to convert data.

Usage

This function requires that you have previously issued cwbDQ_Open and cwbDQ_CreateData.

cwbDQ_Write:

Purpose

Write a record to the iSeries data queue object that is identified by the specified handle.

Syntax

```
unsigned int CWB_ENTRY cwbDQ_Write(
                             cwbDQ_QueueHandle   queueHandle,
                             cwbDQ_Data          data,
                             cwb_Boolean         commit,
                             cwbSV_ErrHandle     errorHandle);
```

Parameters

cwbDQ_QueueHandle queueHandle - input
Handle that was returned by a previous call to the cwbDQ_Open or cwbDQ_OpenEx functions. This identifies the iSeries data queue object.

cwbDQ_Data data - input
The data object to be written to the iSeries data queue.

cwb_Boolean commit - input
This flag is no longer used and is ignored.

cwbSV_ErrHandle errorHandle - output
Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle API. The messages may be retrieved through the cwbSV_GetErrText API. If the parameter is set to zero, no messages will be retrieved.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWBDQ_BAD_DATA_LENGTH
Length of data is not correct.

CWBDQ_INVALID_MESSAGE_LENGTH
Invalid message length.

CWBDQ_INVALID_QUEUE_HANDLE
Invalid queue handle.

CWBDQ_REJECTED_USER_EXIT
Command rejected by user exit program.

CWBDQ_CANNOT_CONVERT
Unable to convert data.

Usage

This function requires that you previously have issued cwbDQ_Open or cwbDQ_OpenEx, and cwbDQ_CreateData.

Data Queues: Attributes APIs

Use these APIs to declare attributes of a data queue. The attribute object is used when creating a data queue or when obtaining the data queue attributes.

cwbDQ_CreateAttr:

Purpose

Create a data queue attribute object. The handle returned by this API can be used to set the specific attributes you want for a data queue prior to using it as input for the cwbDQ_Create or cwbDQ_CreateEx APIs. It also may be used to examine specific attributes of a data queue after using it as input for the cwbDQ_GetQueueAttr API.

Syntax

```
cwbDQ_Attr CWB_ENTRY cwbDQ_CreateAttr(void);
```

Parameters

None

Return Codes

The following list shows common return values.

cwbDQ_Attr — A handle to a cwbDQ_Attr object.
Use this handle to obtain and set attributes. After creation, an attribute object will have the default values of:

- Maximum Record Length - 1000
- Order - FIFO
- Authority - LIBCRTAUT
- Force to Storage - FALSE
- Sender ID - FALSE
- Key Length - 0

Usage

None

cwbDQ_DeleteAttr:

Purpose

Delete the data queue attributes.

Syntax

```
unsigned int CWB_ENTRY cwbDQ_DeleteAttr(
                             cwbDQ_Attr          queueAttributes);
```

Parameters

cwbDQ_Attr queueAttributes - input
Handle of the data queue attributes returned by a previous call to cwbDQ_CreateAttr.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWBDQ_INVALID_ATTRIBUTE_HANDLE
Invalid attributes handle.

Usage

None

cwbDQ_GetAuthority:

Purpose

Get the attribute for the authority that other users will have to the data queue.

Syntax

```
unsigned int CWB_ENTRY cwbDQ_GetAuthority(
                             cwbDQ_Attr          queueAttributes,
                             unsigned short     *authority);
```

Parameters

cwbDQ_Attr queueAttributes - input
Handle of the data queue attributes returned by a previous call to cwbDQ_CreateAttr.

unsigned short * authority - output
Pointer to an unsigned short to where the authority will be written. This value will be one of the following defined types:

- CWBDQ_ALL
- CWBDQ_EXCLUDE
- CWBDQ_CHANGE
- CWBDQ_USE
- CWBDQ_LIBCRTAUT

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_POINTER
Bad or null pointer.

CWBDQ_INVALID_ATTRIBUTE_HANDLE
Invalid attributes handle.

Usage

None

cwbDQ_GetDesc:

Purpose

Get the attribute for the description of the data queue.

Syntax

```
unsigned int CWB_ENTRY cwbDQ_GetDesc(
                             cwbDQ_Attr          queueAttributes,
                             char               *description);
```

Parameters

cwbDQ_Attr queueAttributes - input
Handle of the data queue attributes returned by a previous call to cwbDQ_CreateAttr.

char * description - output
Pointer to a 51 character buffer where the description will be written. The description is an ASCIIZ string.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_POINTER
Bad or null pointer.

CWBDQ_INVALID_ATTRIBUTE_HANDLE
Invalid attributes handle.

Usage

None

cwbDQ_GetForceToStorage:

Purpose

Get the attribute for whether records will be forced to auxiliary storage when they are enqueued.

Syntax

```
unsigned int CWB_ENTRY cwbDQ_GetForceToStorage(
                             cwbDQ_Attr          queueAttributes,
                             cwb_Boolean        *forceToStorage);
```

Parameters

cwbDQ_Attr queueAttributes - input
Handle of the data queue attributes returned by a previous call to cwbDQ_CreateAttr.

cwb_Boolean * forceToStorage - output
Pointer to a Boolean where the force-to-storage indicator will be written.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_POINTER
Bad or null pointer.

CWBDQ_INVALID_ATTRIBUTE_HANDLE
Invalid attributes handle.

Usage

None

cwbDQ_GetKeySize:

Purpose

Get the attribute for the key size in bytes.

Syntax

```
unsigned int CWB_ENTRY cwbDQ_GetKeySize(
                             cwbDQ_Attr         queueAttributes,
                             unsigned short     *keySize);
```

Parameters

cwbDQ_Attr queueAttributes - input
Handle of the data queue attributes returned by a previous call to cwbDQ_CreateAttr.

unsigned short * keySize - output
Pointer to an unsigned short where the key size will written.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_POINTER
Bad or null pointer.

CWBDQ_INVALID_ATTRIBUTE_HANDLE
Invalid attributes handle.

Usage

None

cwbDQ_GetMaxRecLen:

Purpose

Get the maximum record length for the data queue.

Syntax

```
unsigned int CWB_ENTRY cwbDQ_GetMaxRecLen(
                             cwbDQ_Attr          queueAttributes,
                             unsigned long      *maxRecordLength);
```

Parameters

cwbDQ_Attr queueAttributes - input
Handle of the data queue attributes returned by a call to cwbDQ_CreateAttr.

unsigned long * maxRecordLength - output
Pointer to an unsigned long where the maximum record length will be written.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_POINTER
Bad or null pointer.

CWBDQ_INVALID_ATTRIBUTE_HANDLE
Invalid attributes handle.

Usage

None

cwbDQ_GetOrder:

Purpose

Get the attribute for the queue order. If the order is CWBDQ_SEQ_LIFO, the last record written is the first record read (Last In First Out). If the order is CWBDQ_SEQ_FIFO, the first record written is the first record read (First In First Out). If the order is CWBDQ_SEQ_KEYED, the order in which records are read from the data queue depends on the value of the search order attribute of the data object and the key value specified for the cwbDQ_SetKey API. If multiple records contain the key that satisfies the search order, a FIFO scheme is used among those records.

Syntax

```
unsigned int CWB_ENTRY cwbDQ_GetOrder(
                             cwbDQ_Attr          queueAttributes,
                             unsigned short     *order);
```

Parameters

cwbDQ_Attr queueAttributes - input
Handle of the data queue attributes returned by a previous call to cwbDQ_CreateAttr.

unsigned short * order - output
Pointer to an unsigned short where the order will be written. Possible values are:

- CWBDQ_SEQ_LIFO
- CWBDQ_SEQ_FIFO
- CWBDQ_SEQ_KEYED

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_POINTER
Bad or null pointer.

CWBDQ_INVALID_ATTRIBUTE_HANDLE
Invalid attributes handle.

Usage

None

cwbDQ_GetSenderID:

Purpose

Get the attribute for whether information about the sender is kept with each record on the queue.

Syntax

```
unsigned int CWB_ENTRY cwbDQ_GetSenderID(
                             cwbDQ_Attr        queueAttributes,
                             cwb_Boolean      *senderID);
```

Parameters

cwbDQ_Attr queueAttributes - input
Handle of the data queue attributes that are returned by a previous call to cwbDQ_CreateAttr.

cwb_Boolean * senderID - output
Pointer to a Boolean where the sender ID indicator will be written.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_POINTER
Bad or null pointer.

CWBDQ_INVALID_ATTRIBUTE_HANDLE
Invalid attributes handle.

Usage

None

cwbDQ_SetAuthority:

Purpose

Set the attribute for the authority that other users will have to the data queue.

Syntax

```
unsigned int CWB_ENTRY cwbDQ_SetAuthority(
                             cwbDQ_Attr         queueAttributes,
                             unsigned short     authority);
```

Parameters

cwbDQ_Attr queueAttributes - input
Handle of the data queue attributes returned by a previous call to cwbDQ_CreateAttr.

unsigned short authority - input
Authority that other users on the iSeries system have to access the data queue. Use one of the following defined types for authority:

- CWBDQ_ALL
- CWBDQ_EXCLUDE
- CWBDQ_CHANGE
- CWBDQ_USE
- CWBDQ_LIBCRTAUT

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWBDQ_INVALID_ATTRIBUTE_HANDLE
Invalid attributes handle.

CWBDQ_INVALID_AUTHORITY
Invalid queue authority.

Usage

None

cwbDQ_SetDesc:

Purpose

Set the attribute for the description of the data queue.

Syntax

```
unsigned int CWB_ENTRY cwbDQ_SetDesc(
                             cwbDQ_Attr         queueAttributes,
                             char              *description);
```

Parameters

cwbDQ_Attr queueAttributes - input
Handle of the data queue attributes returned by a previous call to cwbDQ_CreateAttr.

char * description - input
Pointer to an ASCIIZ string that contains the description for the data queue. The maximum length for the description is 50 characters.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_POINTER
Bad or null pointer.

CWBDQ_INVALID_ATTRIBUTE_HANDLE
Invalid attributes handle.

CWBDQ_INVALID_QUEUE_TITLE
Queue title is too long.

Usage

None

cwbDQ_SetForceToStorage:

Purpose

Set the attribute for whether records will be forced to auxiliary storage when they are enqueued.

Syntax

```
unsigned int CWB_ENTRY cwbDQ_SetForceToStorage(
                             cwbDQ_Attr          queueAttributes,
                             cwb_Boolean         forceToStorage);
```

Parameters

cwbDQ_Attr queueAttributes - input
Handle of the data queue attributes returned by a previous call to cwbDQ_CreateAttr.

cwb_Boolean forceToStorage - input
Boolean indicator of whether each record is forced to auxiliary storage when it is enqueued.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWBDQ_INVALID_ATTRIBUTE_HANDLE
Invalid attributes handle.

Usage

None

cwbDQ_SetKeySize:

Purpose

Set the attribute for the key size in bytes.

Syntax

```
unsigned int CWB_ENTRY cwbDQ_SetKeySize(
                             cwbDQ_Attr          queueAttributes,
                             unsigned short      keySize);
```

Parameters

cwbDQ_Attr queueAttributes - input

Handle of the data queue attributes returned by a previous call to cwbDQ_CreateAttr.

unsigned short keySize - input

Size in bytes of the key. This value should be zero if the order is LIFO or FIFO, and between 1 and 256 for KEYED.

Return Codes

The following list shows common return values.

CWB_OK

Successful completion.

CWBDQ_INVALID_KEY_LENGTH

Invalid key length.

CWBDQ_INVALID_ATTRIBUTE_HANDLE

Invalid attributes handle.

Usage

None

cwbDQ_SetMaxRecLen:

Purpose

Set the maximum record length for the data queue.

Syntax

```
unsigned int CWB_ENTRY cwbDQ_SetMaxRecLen(
                             cwbDQ_Attr          queueAttributes,
                             unsigned long       maxRecordLength);
```

Parameters

cwbDQ_Attr queueAttributes - input

Handle of the data queue attributes returned by a previous call to cwbDQ_CreateAttr.

unsigned long maxLength - input

Maximum length for a data queue record. This value must be between 1 and 31744.

Return Codes

The following list shows common return values.

CWB_OK

Successful completion.

CWBDQ_INVALID_ATTRIBUTE_HANDLE

Invalid attributes handle.

CWBDQ_INVALID_QUEUE_LENGTH
Invalid queue record length.

Usage

None

cwbDQ_SetOrder:
Purpose

Set the attribute for the queue order. If the order is CWBDQ_SEQ_LIFO, the last record written is the first record read (Last In First Out). If the order is CWBDQ_SEQ_FIFO, the first record written is the first record read (First In First Out). If the order is CWBDQ_SEQ_KEYED, the order in which records are read from the data queue depends on the value of the search order attribute of the data object and the key value specified for the cwbDQ_SetKey API. If multiple records contain the key that satisfies the search order, a FIFO scheme is used among those records.

Syntax

```
unsigned int CWB_ENTRY cwbDQ_SetOrder(
                             cwbDQ_Attr         queueAttributes,
                             unsigned short     order);
```

Parameters

cwbDQ_Attr queueAttributes - input
Handle of the data queue attributes returned by a previous call to cwbDQ_CreateAttr.

unsigned short order - input
Order in which new entries will be enqueued. Use one of the following defined types for order:

- CWBDQ_SEQ_LIFO
- CWBDQ_SEQ_FIFO
- CWBDQ_SEQ_KEYED

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWBDQ_INVALID_ATTRIBUTE_HANDLE
Invalid attributes handle.

CWBDQ_INVALID_ORDER
Invalid queue order.

Usage

None

cwbDQ_SetSenderID:
Purpose

Set the attribute for whether information about the sender is kept with each record on the queue.

Syntax

```
unsigned int CWB_ENTRY cwbDQ_SetSenderID(
                             cwbDQ_Attr          queueAttributes,
                             cwb_Boolean         senderID);
```

Parameters

cwbDQ_Attr queueAttributes - input
Handle of the data queue attributes returned by a previous call to cwbDQ_CreateAttr.

cwb_Boolean senderID - input
Boolean indicator of whether information about the sender is kept with record on the queue.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWBDQ_INVALID_ATTRIBUTE_HANDLE
Invalid attributes handle.

Usage

None

Data Queues: Read and write APIs

Use these APIs for writing to and reading from a data queue

cwbDQ_CreateData:

Purpose

Create the data object. This data object can be used for both reading and writing data to a data queue.

Syntax

```
cwbDQ_Data CWB_ENTRY cwbDQ_CreateData(void);
```

Parameters

None

Return Codes

The following list shows common return values.

cwbDQ_Data — A handle to the data object
After creation, a data object will have the default values of:

- data - NULL and length 0
- key - NULL and length 0
- sender ID info - NULL
- search order - NONE
- convert - FALSE

Usage

None

cwbDQ_DeleteData:

Purpose

Delete the data object.

Syntax

```
unsigned int CWB_ENTRY cwbDQ_DeleteData(
                             cwbDQ_Data          data);
```

Parameters

cwbDQ_Data data - input
Handle of the data object that was returned by a previous call to cwbDQ_CreateData.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWBDQ_INVALID_DATA_HANDLE
Invalid data handle.

Usage

None

cwbDQ_GetConvert:

Purpose

Get the value of the convert flag for a data handle. The convert flag determines if data sent to and recieved from the host is CCSID converted (for example, between ASCII and EBCDIC).

Syntax

```
unsigned int CWB_ENTRY cwbDQ_GetConvert(
                             cwbDQ_Data          data,
                             cwb_Boolean        *convert);
```

Parameters

cwbDQ_Data data - input
Handle of the data object that was returned by a previous call to cwbDQ_CreateData.

cwb_Boolean * convert - output
Pointer to a Boolean where the convert flag will be written.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_POINTER
Bad or null pointer.

CWBDQ_INVALID_DATA_HANDLE
Invalid data handle.

Usage

None

cwbDQ_GetData:

Purpose

Get the data attribute of the data object.

Syntax

```
unsigned int CWB_ENTRY cwbDQ_GetData(
                             cwbDQ_Data          data,
                             unsigned char      *dataBuffer);
```

Parameters

cwbDQ_Data data - input
Handle of the data object that was returned by a previous call to cwbDQ_CreateData.

unsigned char * data - output
Pointer to the data. The data may contain embedded NULLs, so it is not an ASCIIZ string.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_POINTER
Bad or null pointer.

CWBDQ_INVALID_DATA_HANDLE
Invalid data handle.

Usage

None

cwbDQ_GetDataAddr:

Purpose

Get the address of the location of the data buffer.

Syntax

```
unsigned int CWB_ENTRY cwbDQ_GetDataAddr(
                             cwbDQ_Data          data,
                             unsigned char     **dataBuffer);
```

Parameters

cwbDQ_Data data - input
Handle of the data object that was returned by a previous call to cwbDQ_CreateData.

unsigned char * * data - output
Pointer to where the buffer address will be written.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_POINTER
Bad or null pointer.

CWBDQ_INVALID_DATA_HANDLE
Invalid data handle.

CWBDQ_ADDRESS_NOT_SET
Address not set with cwbDQ_SetDataAddr.

Usage

Use this function to retrieve the address of the location where the data is stored. The data address must be set with the cwbDQ_SetDataAddr API, otherwise, the return code CWBDQ_ADDRESS_NOT_SET will be returned.

cwbDQ_GetDataLen:

Purpose

Get the data length attribute of the data object. This is the total length of the data object. To obtain the length of data that was read, use the cwbDQ_GetRetDataLen API.

Syntax

```
unsigned int CWB_ENTRY cwbDQ_GetDataLen(
                             cwbDQ_Data          data,
                             unsigned long      *dataLength);
```

Parameters

cwbDQ_Data data - input
Handle of the data object that was returned by a previous call to cwbDQ_CreateData.

unsigned long * dataLength - output
Pointer to an unsigned long where the length of the data will be written.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_POINTER
Bad or null pointer.

CWBDQ_INVALID_DATA_HANDLE
Invalid data handle.

Usage

None

cwbDQ_GetKey:

Purpose

Get the key attribute of the data object, previously set by the cwbDQ_SetKey API. This is the key that is used for writing data to a keyed data queue. Along with the search order, this key is also used to read data from a keyed data queue. The key that is associated with the record retrieved can be obtained by calling the cwbDQ_GetRetKey API.

Syntax

```
unsigned int CWB_ENTRY cwbDQ_GetKey(
                             cwbDQ_Data          data,
                             unsigned char      *key);
```

Parameters

cwbDQ_Data data - input
Handle of the data object that was returned by a previous call to cwbDQ_CreateData.

unsigned char * key - output
Pointer to the key. The key may contain embedded NULLS, so it is not an ASCIIZ string.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_POINTER
Bad or null pointer.

CWBDQ_INVALID_DATA_HANDLE
Invalid data handle.

Usage

None

cwbDQ_GetKeyLen:

Purpose

Get the key length attribute of the data object.

Syntax

```
unsigned int CWB_ENTRY cwbDQ_GetKeyLen(
                             cwbDQ_Data          data,
                             unsigned short     *keyLength);
```

Parameters

cwbDQ_Data data - input
Handle of the data object that was returned by a previous call to cwbDQ_CreateData.

unsigned short * keyLength - output
Pointer to an unsigned short where the length of the key will be written.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_POINTER
Bad or null pointer.

CWBDQ_INVALID_DATA_HANDLE
Invalid data handle.

Usage

None

cwbDQ_GetRetDataLen:

Purpose

Get the length of data that was returned. The returned data length will be zero until a cwbDQ_Read or cwbDQ_Peek API is called.Then it will have the length of the data that actually was returned.

Syntax

```
unsigned int CWB_ENTRY cwbDQ_GetRetDataLen(
                             cwbDQ_Data          data,
                             unsigned long      *retDataLength);
```

Parameters

cwbDQ_Data data - input
Handle of the data object that was returned by a previous call to cwbDQ_CreateData.

unsigned long * retDataLength - output
Pointer to an unsigned long where the length of the data returned will be written.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_POINTER
Bad or null pointer.

CWBDQ_INVALID_DATA_HANDLE
Invalid data handle.

Usage

None

cwbDQ_GetRetKey:

Purpose

Get the returned key of the data object. This is the key that is associated with the messages that are retrieved from a keyed data queue. If the search order is a value other than CWBDQ_EQUAL, this key may be different than the key that is used to retrieve the message.

Syntax

```
unsigned int CWB_ENTRY cwbDQ_GetRetKey(
                             cwbDQ_Data          data,
                             unsigned char      *key);
```

Parameters

cwbDQ_Data data - input
Handle of the data object that was returned by a previous call to cwbDQ_CreateData.

unsigned char * retKey - output
Pointer to the returned key. The key may contain embedded NULLs, so it is not an ASCIIZ string.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_POINTER
Bad or null pointer.

CWBDQ_INVALID_DATA_HANDLE
Invalid data handle.

Usage

None

cwbDQ_GetRetKeyLen:

Purpose

Get the returned key length attribute of the data object. This is the length of the key that is returned by the cwbDQ_GetKey API.

Syntax

```
unsigned int CWB_ENTRY cwbDQ_GetRetKeyLen(
                             cwbDQ_Data          data,
                             unsigned short     *retKeyLength);
```

Parameters

cwbDQ_Data data - input
Handle of the data object that was returned by a previous call to cwbDQ_CreateData.

unsigned short * retKeyLength - output
Pointer to an unsigned short where the length of the key will be written.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_POINTER
Bad or null pointer.

CWBDQ_INVALID_DATA_HANDLE
Invalid data handle.

Usage

None

cwbDQ_GetSearchOrder:

Purpose

Get the search order of the open attributes. The search order is used when reading or peeking a keyed data queue to identify the relationship between the key of the record to retrieve and the key value specified on the cwbDQ_SetKey API. If the data queue order attribute is not CWBDQ_SEQ_KEYED, this property is ignored.

Syntax

```
unsigned int CWB_ENTRY cwbDQ_GetSearchOrder(
                             cwbDQ_Data          data,
                             unsigned short     *searchOrder);
```

Parameters

cwbDQ_Data data - input
Handle of the data object that was returned by a previous call to cwbDQ_CreateData.

unsigned short * searchOrder - output
Pointer to an unsigned short where the order will be written. Possible values are:

- CWBDQ_NONE
- CWBDQ_EQUAL
- CWBDQ_NOT_EQUAL
- CWBDQ_GT_OR_EQUAL
- CWBDQ_GREATER
- CWBDQ_LT_OR_EQUAL
- CWBDQ_LESS

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_POINTER
Bad or null pointer.

CWBDQ_INVALID_DATA_HANDLE
Invalid data handle.

Usage

None

cwbDQ_GetSenderInfo:

Purpose

Get the Sender Information attribute of the open attributes. This information only is available if the senderID attribute of the Data Queue was set on creation.

Syntax

```
unsigned int CWB_ENTRY cwbDQ_GetSenderInfo(
                             cwbDQ_Data          data,
                             unsigned char      *senderInfo);
```

Parameters

cwbDQ_Data data - input
Handle of the data object that was returned by a previous call to cwbDQ_CreateData.

unsigned char * senderInfo - output
Pointer to a 36 character buffer where the sender information will be written. This buffer contains:

- Job Name (10 bytes)
- User Name (10 bytes)
- Job ID (6 bytes)
- User Profile (10 bytes)

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_POINTER
Bad or null pointer.

CWBDQ_INVALID_DATA_HANDLE
Invalid data handle.

Usage

None

cwbDQ_SetConvert:

Purpose

Set the convert flag. If the flag is set, all data being written will be converted from PC CCSID (for example, ASCII) to host CCSID (for example, EBCDIC), and all data being read will be converted from host CCSID (for example, EBCDIC) to PC CCSID (for example, ASCII). Default behavior is no conversion of data.

Syntax

```
unsigned int CWB_ENTRY cwbDQ_SetConvert(
                             cwbDQ_Data          data,
                             cwb_Boolean         convert);
```

Parameters

cwbDQ_Data data - input
Handle of the data object that was returned by a previous call to cwbDQ_CreateData.

cwb_Boolean convert - input
Flag indicating if data written to and read from the queue will be CCSID converted.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWBDQ_INVALID_DATA_HANDLE
Invalid data handle.

Usage

None

cwbDQ_SetData:

Purpose

Set the data and data length attributes of the data object. The default is to have no data with zero length. This function will make a copy of the data.

Syntax

```
unsigned int CWB_ENTRY cwbDQ_SetData(
                             cwbDQ_Data          data,
                             unsigned char      *dataBuffer,
                             unsigned long       dataLength);
```

Parameters

cwbDQ_Data data - input
Handle of the data object that was returned by a previous call to cwbDQ_CreateData.

unsigned char * dataBuffer - input
Pointer to the data. The data may contain embedded NULLS, so it is not an ASCIIZ string.

unsigned long dataLength - input
Length of the data in bytes.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_POINTER
Bad or null pointer.

CWBDQ_INVALID_DATA_HANDLE
Invalid data handle.

CWBDQ_BAD_DATA_LENGTH
Length of data is not correct.

Usage

Use this function if you want to write a small amount of data or you do not want to manage the memory for the data in your application. Data will be copied and this may affect your application's performance.

cwbDQ_SetDataAddr:

Purpose

Set the data and data length attributes of the data object. The default is to have no data with zero length. This function will not copy the data.

Syntax

```
unsigned int CWB_ENTRY cwbDQ_SetDataAddr(
                             cwbDQ_Data          data,
                             unsigned char      *dataBuffer,
                             unsigned long       dataLength);
```

Parameters

cwbDQ_Data data - input
Handle of the data object that was returned by a previous call to cwbDQ_CreateData.

unsigned char * dataBuffer - input
Pointer to the data. The data may contain embedded NULLS, so it is not an ASCIIZ string.

unsigned long dataLength - input
Length of the data in bytes.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_POINTER
Bad or null pointer.

CWBDQ_INVALID_DATA_HANDLE
Invalid data handle.

CWBDQ_BAD_DATA_LENGTH
Length of data is not correct.

Usage

This function is better for large amounts of data, or if you want to manage memory in your application. Data will not be copied so performance will be improved.

cwbDQ_SetKey:

Purpose

Set the key and key length attributes of the data attributes. This is the key that is used for writing data to a keyed data queue. In addition to the search order, this key is used to read data from a keyed data queue. The default is to have no key with zero length; this is the correct value for a non-keyed (LIFO or FIFO) data queue.

Syntax

```
unsigned int CWB_ENTRY cwbDQ_SetKey(
                             cwbDQ_Data          data,
                             unsigned char      *key,
                             unsigned short      keyLength);
```

Parameters

cwbDQ_Data data - input
Handle of the data object that was returned by a previous call to cwbDQ_CreateData.

unsigned char * key - input
Pointer to the key. The key may contain embedded NULLS, so it is not an ASCIIZ string.

unsigned short keyLength - input
Length of the key in bytes.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWBDQ_INVALID_DATA_HANDLE
Invalid data handle.

CWBDQ_BAD_KEY_LENGTH
Length of key is not correct.

Usage

None

cwbDQ_SetSearchOrder:

Purpose

Set the search order of the open attributes. The default is no search order. If the cwbDQ_SetKey API is called, the search order is changed to equal. Use this API to set it to something else. The search order is used when reading or peeking a keyed data queue to identify the relationship between the key of the record to retrieve and the key value specified on the cwbDQ_SetKey API. If the data queue order attribute is not CWBDQ_SEQ_KEYED, this property is ignored.

Syntax

```
unsigned int CWB_ENTRY cwbDQ_SetSearchOrder(
                             cwbDQ_Data          data,
                             unsigned short      searchOrder);
```

Parameters

cwbDQ_Data data - input
Handle of the data object that was returned by a previous call to cwbDQ_CreateData.

unsigned short searchOrder - input
Order to use when reading from a keyed queue. Possible values are:

- CWBDQ_NONE
- CWBDQ_EQUAL
- CWBDQ_NOT_EQUAL

- CWBDQ_GT_OR_EQUAL
- CWBDQ_GREATER
- CWBDQ_LT_OR_EQUAL
- CWBDQ_LESS

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWBDQ_INVALID_DATA_HANDLE
Invalid data handle.

CWBDQ_INVALID_SEARCH
Invalid search order.

Usage

None

Example: Using Data Queues APIs

The following example illustrates using Data Queues APIs.

```
// Sample Data Queues application

#ifdef UNICODE
   #define _UNICODE
#endif
#include <windows.h>

// Include the necessary DQ Classes
#include <stdlib.h>
#include <iostream.h>
#include "cwbdq.h"

/**********************************************************************/

void main()
{

   cwbDQ_Attr queueAttributes;
   cwbDQ_QueueHandle queueHandle;
   cwbDQ_Data queueData;

   // Create an attribute object
   if ( (queueAttributes = cwbDQ_CreateAttr()) == 0 )
      return;

   // Set the maximum record length to 100
   if ( cwbDQ_SetMaxRecLen(queueAttributes,
                           100) != 0 )
      return;

   // Set the order to First-In-First-Out
   if (cwbDQ_SetOrder(queueAttributes, CWBDQ_SEQ_FIFO) != 0 )
      return;

   // Create the data queue DTAQ in library QGPL on system SYS1
   if ( cwbDQ_Create(_TEXT("DTAQ"),
                    _TEXT("QGPL"),
                    _TEXT("SYSNAMEXXX"),
                    queueAttributes,
                  NULL) != 0 )
      return;

   // Delete the attributes
   if ( cwbDQ_DeleteAttr( queueAttributes ) != 0 )
      return;

   // Open the data queue
   if ( cwbDQ_Open(_TEXT("DTAQ"),
                 _TEXT("QGPL"),
                 _TEXT("SYSNAMEXXX"),
                 &queueHandle,
                 NULL) != 0 )

       return;

   // Create a data object
   if ( (queueData = cwbDQ_CreateData()) == 0 )
      return;

   // Set the data length and the data
   if ( cwbDQ_SetData(queueData, (unsigned char*)"Test Data!", 10) != 0 )
      return;

   // Write the data to the data queue
   if ( cwbDQ_Write(queueHandle, queueData, CWB_TRUE, NULL) != 0 )
      return;

   // Delete the data object
   if ( cwbDQ_DeleteData(queueData) != 0 )
      return;

   // Close the data queue
   if ( cwbDQ_Close(queueHandle) != 0 )
      return;

}
```

iSeries Access for Windows Data Transformation and National Language Support (NLS) APIs

Use Data Transformation and National Language Support (NLS) APIs to enable your applications to transform data.

iSeries Access for Windows data transformation APIs

iSeries Access for Windows**data transformation** application programming interfaces (APIs) enable your client/server applications to transform numeric data between iSeries server and PC formats. Transformation may be required when you send and receive numeric data to and from the iSeries server. Data transformation APIs support transformation of many numeric formats.

iSeries Access for Windows data transformation APIs required files:

Header file	Import library	Dynamic Link Library
cwbdt.h	cwbapi.lib	cwbdt.dll

Programmer’s Toolkit:

The Programmer’s Toolkit provides data transformation documentation, access to the cwbdt.h header file, and links to sample programs. To access this information, open the Programmer’s Toolkit and select **Data Manipulation** → **C/C++ APIs**.

Note: By using the code examples, you agree to the terms of the “Code license and disclaimer information” on page 552.

Related reference

“iSeries system name formats for connection APIs” on page 5
APIs that take an iSeries system name as a parameter accept names in the following formats.

“OEM, ANSI, and Unicode considerations” on page 6
Most of the iSeries Access for Windows C/C++ APIs that accept string parameters exist in three forms: OEM, ANSI, or Unicode.

iSeries Access for Windows data transformation API list:

The following data transformation APIs are listed alphabetically.

Note: iSeries Access for Windows data transformation APIs that accept strings are provided in Unicode versions. In these APIs, ″ASCII″ is replaced by ″Wide″ (for example, cwbDT_ASCII11ToBin4 has a Unicode version: cwbDT_Wide11ToBin4). These APIs are indicated in the table that follows. The Unicode versions have different syntax, parameters and return values than their ASCII counterparts.

cwbDT_ASCII11ToBin4:

Purpose

Translates (exactly) 11 ASCII numeric characters to a 4-byte integer stored most significant byte first. (The source string is not expected to be zero-terminated.) This function can be used for translating ASCII numeric data to the iSeries integer format.

Unicode version

cwbDT_Wide11ToBin4

Syntax

```
unsigned int CWB_ENTRY cwbDT_ASCII11ToBin4(
                             char *target,
                             char *source);
```

Parameters

char * target - output
Pointer to the target (4 byte integer).

char * source - input
Pointer to the source (11 byte ASCII).

Return Codes

The following list shows common return values.

CWB_OK
Successful Completion.

CWB_INVALID_POINTER
NULL pointer was passed by caller.

CWB_BUFFER_OVERFLOW
Overflow error.

other Offset of the first untranslated character plus one.

Usage

The target data will be stored with the Most Significant Byte first. This is the format that the iSeries server uses and is the opposite of the format that is used by the Intel® x86 processors. Valid formats for the ASCII source data are as follows:

- [blankspaces][sign][blankspaces][digits] or
- [sign][blankspaces][digits][blankspaces]

Examples:

```
 "   +     123"
 "-     123   "
 "     +123   "
 "         123"
 "        -123"
 "+123        "
```

cwbDT_ASCII6ToBin2:

Purpose

Translates (exactly) 6 ASCII numeric characters to a 2-byte integer stored most significant byte first. (The source string is not expected to be zero-terminated.) This function can be used for translating ASCII numeric data to the iSeries integer format.

Unicode version

cwbDT_Wide6ToBin2

Syntax

```
unsigned int CWB_ENTRY cwbDT_ASCII6ToBin2(
                             char *target,
                             char *source);
```

Parameters

char * target - output
Pointer to the target (2 byte integer).

char * source - input
Pointer to the source (6 byte ASCII).

Return Codes

The following list shows common return values.

CWB_OK
Successful Completion.

CWB_INVALID_POINTER
NULL pointer was passed by caller.

CWB_BUFFER_OVERFLOW
Overflow error.

other Offset of the first untranslated character plus one.

Usage

The target data will be stored with the Most Significant Byte first. This is the format that the iSeries server uses and is the opposite of the format that is used by Intel x86 processors. Valid formats for the ASCII source data are as follows:

- [blankspaces][sign][blankspaces][digits] or
- [sign][blankspaces][digits][blankspaces]

Examples:

```
" + 123"
"- 123 "
" +123 "
"   123"
"  -123"
"+123  "
```

cwbDT_ASCIIPackedToPacked:

Purpose

Translates data from ASCII packed format to packed decimal. This function can be used for translating data from ASCII files to the iSeries system format.

Unicode version

None.

Syntax

```
unsigned int CWB_ENTRY cwbDT_ASCIIPackedToPacked(
                             char          *target,
                             char          *source,
                             unsigned long length);
```

Parameters

char * target - output
Pointer to the target data.

char * source - input
Pointer to the source data.

unsigned long length - input
Number of bytes of source data to translate.

Return Codes

The following list shows common return values.

CWB_OK
Successful Completion.

CWB_INVALID_POINTER
NULL pointer was passed by caller.

other Offset of the first untranslated character plus one.

Usage

The caller must make sure that there is adequate space to hold the target information. This function checks that each half-byte of the packed decimal data is in the range of 0 to 9. The only exception is the last half-byte which contains the sign indicator (which can be 0x3 or 0xb).

cwbDT_ASCIIToHex:

Purpose

Translates data from ASCII (hex representation) to binary. One byte is stored in the target for each two bytes in the source.

Unicode version

cwbDT_WideToHex

Syntax

```
unsigned int CWB_ENTRY cwbDT_ASCIIToHex(
                          char        *target,
                          char        *source,
                          unsigned long length);
```

Parameters

char * target - output
Pointer to the target data.

char * source - input
Pointer to the source (ASCII hex) data.

unsigned long length - input
Number of bytes of source data to translate/2.

Return Codes

The following list shows common return values.

CWB_OK
Successful Completion.

CWB_INVALID_POINTER
NULL pointer was passed by caller.

other Offset of the first untranslated character plus one.

Usage

For 'length' bytes of source data 'length'/2 bytes of target data will be stored. The caller must make sure that there is adequate space to hold the target information.

cwbDT_ASCIIToPacked:

Purpose

Translates ASCII numeric data to packed decimal format. This function can be used for translating ASCII text data for use on the iSeries server.

Unicode version

cwbDT_WideToPacked

Syntax

```
unsigned int CWB_ENTRY cwbDT_ASCIIToPacked(
                             char         *target,
                             char         *source,
                             unsigned long length,
                             unsigned long decimalPosition);
```

Parameters

char * target - output
Pointer to the target data.

char * source - input
Pointer to the source data. Must be zero terminated.

unsigned long length - input
Number of bytes of target data to translate.

unsigned long decimalPosition - input
Position of the decimal point.

Return Codes

The following list shows common return values.

CWB_OK
Successful Completion.

CWB_INVALID_POINTER
NULL pointer was passed by caller.

CWB_BUFFER_OVERFLOW
Overflow error.

CWB_NOT_ENOUGH_MEMORY
Unable to allocate temporary memory.

other Offset of the first untranslated character plus one.

Usage

The caller must make sure that there is adequate space to hold the target information. The sign half-byte will be set to 0xd to indicate a negative number and hex 0xc to indicate a positive number. 0 <= decimalPosition < (length * 2). Valid formats for the ASCII numeric data are as follows:

- [blankspaces][sign][blankspaces][digits] or
- [sign][blankspaces][digits][blankspaces] or
- [sign][digits][.digits][blankspaces] or
- [blankspaces][sign][digits][.digits][blankspaces]

Examples:

```
 "   +  123\0"
 "- 123   \0"
 "     +123  \0"
 "    123\0"
 "       -12.3\0"
 "+1.23       \0"
```

cwbDT_ASCIIToZoned:

Purpose

Translates ASCII numeric data to EBCDIC zoned decimal format. This function can be used for translating ASCII text data for use on the iSeries server.

Unicode version

cwbDT_WideToZoned

Syntax

```
unsigned int CWB_ENTRY cwbDT_ASCIIToZoned(
                             char         *target,
                             char         *source,
                             unsigned long length,
                             unsigned long decimalPosition);
```

Parameters

char * target - output
Pointer to the target data.

char * source - input
Pointer to the source data. Must be zero terminated.

unsigned long length - input
Number of bytes of target data to translate.

unsigned long decimalPosition - input
Position of the decimal point.

Return Codes

The following list shows common return values.

CWB_OK
Successful Completion.

CWB_INVALID_POINTER
NULL pointer was passed by caller.

CWB_BUFFER_OVERFLOW
Overflow error.

CWB_NOT_ENOUGH_MEMORY
Unable to allocate temporary memory.

other Offset of the first untranslated character plus one.

Usage

The caller must make sure that there is adequate space to hold the information. The sign half-byte will be set to 0xd to indicate a negative number and hex 0xc to indicate a positive number. 0 <= decimalPosition <= length. Valid formats for the ASCII numeric data are as follows:

- [blankspaces][sign][blankspaces][digits] or
- [sign][blankspaces][digits][blankspaces] or
- [sign][digits][.digits][blankspaces] or
- [blankspaces][sign][digits][.digits][blankspaces]

Examples:

```
"   +  123\0"
"- 123   \0"
"     +123  \0"
"    123\0"
"       -12.3\0"
"+1.23       \0"
```

cwbDT_ASCIIZonedToZoned:

Purpose

Translates data from ASCII zoned decimal format to EBCDIC zoned decimal. This function can be used for translating data from ASCII files for use on the iSeries server.

Unicode version

None.

Syntax

```
unsigned int CWB_ENTRY cwbDT_ASCIIZonedToZoned(
                             char         *target,
                             char         *source,
                             unsigned long length);
```

Parameters

char * target - output
Pointer to the target data.

char * source - input
Pointer to the source data.

unsigned long length - input
Number of bytes of source data to translate.

Return Codes

The following list shows common return values.

CWB_OK
Successful Completion.

CWB_INVALID_POINTER
NULL pointer was passed by caller.

other Offset of the first untranslated character plus one.

Usage

The left half of each byte (0x3) in the ASCII zoned decimal format will be converted to 0xf in the left half-byte of the EBCDIC zoned data except for the last byte (sign). This function checks that the left half of each byte in the ASCII zoned decimal data must be 0x3 except for the last byte. The high half of the last byte must be 0x3 or 0xb. The right half of each byte in the ASCII zoned decimal data must be in the range 0-9.

cwbDT_Bin2ToASCII6:

Purpose

Translates a 2-byte integer stored most significant byte first to (exactly) 6 ASCII numeric characters. (The target will not be zero terminated.) This function can be used for translating numeric data from an iSeries server to ASCII.

Unicode version

cwbDT_Bin2ToWide6

Syntax

```
unsigned int CWB_ENTRY cwbDT_Bin2ToASCII6(
                             char *target,
                             char *source);
```

Parameters

char * target - output
Pointer to the target (6 byte) area.

char * source - input
Pointer to the source (2 byte integer).

Return Codes

The following list shows common return values.

CWB_OK
Successful Completion.

CWB_INVALID_POINTER
NULL pointer was passed by caller.

Usage

The source data is assumed to be stored with the Most significant Byte first. This is the format that the iSeries server uses and is the opposite of the format used by the Intel x86 processes.

cwbDT_Bin2ToBin2:

Purpose

Reverses the order of bytes in a 2-byte integer. This function can be used for translating a 2-byte integer to or from the iSeries server format.

Unicode version

None.

Syntax

```
unsigned int CWB_ENTRY cwbDT_Bin2ToBin2(
                             char *target,
                             char *source);
```

Parameters

char * target - output
Pointer to the target (2 byte integer).

char * source - input
Pointer to the source (2 byte integer).

Return Codes

The following list shows common return values.

CWB_OK
Successful Completion.

CWB_INVALID_POINTER
NULL pointer was passed by caller.

Usage

The source data and the target data must not overlap. The following example shows the result of the translation:

- Source data: 0x1234
- Target data: 0x3412

cwbDT_Bin4ToASCII11:

Purpose

Translates a 4-byte integer stored most significant byte first to (exactly) 11 ASCII numeric characters. (The target will not be zero terminated.) This function can be used for translating numeric data from an iSeries server to ASCII.

Unicode version

cwbDT_Bin4ToWide11

Syntax

```
unsigned int CWB_ENTRY cwbDT_Bin4ToASCII11(
                             char *target,
                             char *source );
```

Parameters

char * target - output
Pointer to the target (11 byte) area.

char * source - input
Pointer to the source (4 byte integer).

Return Codes

The following list shows common return values.

CWB_OK
Successful Completion.

CWB_INVALID_POINTER
NULL pointer was passed by caller.

Usage

The source data is assumed to be stored with the Most Significant Byte first. This is the format that the iSeries server uses and is the opposite of the format used by the Intel x86 processors.

cwbDT_Bin4ToBin4:

Purpose

Reverses the order of bytes in a 4-byte integer. This function can be used for translating a 4-byte integer to or from the iSeries server format.

Unicode version

None.

Syntax

```
unsigned int CWB_ENTRY cwbDT_Bin4ToBin4(
                             char *target,
                             char *source);
```

Parameters

char * target - output
Pointer to the target (4 byte integer).

char * source - input
Pointer to the source (4 byte integer).

Return Codes

The following list shows common return values.

CWB_OK
Successful Completion.

CWB_INVALID_POINTER
NULL pointer was passed by caller.

Usage

The source data and the target data must not overlap. The following example shows the result of the translation:

- Source data: 0x12345678
- Target data: 0x78563412

cwbDT_EBCDICToEBCDIC:

Purpose

'Translates' (copies unless character value less than 0x40 is encountered) EBCDIC data to EBCDIC.

Unicode version

None.

Syntax

```
unsigned int CWB_ENTRY cwbDT_EBCDICToEBCDIC(
                             char         *target,
                             char         *source,
                             unsigned long length);
```

Parameters

char * target - output
Pointer to the target data.

char * source - input
Pointer to the source data.

unsigned long length - input
Number of bytes of target data to translate.

Return Codes

The following list shows common return values.

CWB_OK
Successful Completion.

CWB_INVALID_POINTER
NULL pointer was passed by caller.

other Offset of the first untranslated character plus one.

Usage

The caller must make sure that there is adequate space to hold the target information.

cwbDT_HexToASCII:

Purpose

Translates binary data to the ASCII hex representation. Two ASCII characters are stored in the target for each byte of source data.

Unicode version

cwbDT_HexToWide

Syntax

```
unsigned int CWB_ENTRY cwbDT_HexToASCII(
                             char        *target,
                             char        *source,
                             unsigned long length);
```

Parameters

char * target - output
Pointer to the target (ASCII hex) data.

char * source - input
Pointer to the source data.

unsigned long length - input
Number of bytes of source data to translate.

Return Codes

The following list shows common return values.

CWB_OK
Successful Completion.

CWB_INVALID_POINTER
NULL pointer was passed by caller.

Usage

For ’length’ bytes of source data ’length’*2 bytes of target data will be stored. The caller must make sure that there is adequate space to hold the target information.

cwbDT_PackedToASCII:

Purpose

Translates data from packed decimal format to ASCII numeric data. This function can be used for translating data from the iSeries server for use in ASCII text format.

Unicode version

cwbDT_PackedToWide

Syntax

```
unsigned int CWB_ENTRY cwbDT_PackedToASCII(
                             char          *target,
                             char          *source,
                             unsigned long length,
                             unsigned long decimalPosition);
```

Parameters

char * target - output
Pointer to the target data.

char * source - input
Pointer to the source data.

unsigned long length - input
Number of bytes of source data to translate.

unsigned long decimalPosition - input
Position of the decimal point.

Return Codes

The following list shows common return values.

CWB_OK
Successful Completion.

CWB_INVALID_POINTER
NULL pointer was passed by caller.

other Offset of the first untranslated character plus one.

Usage

The caller must make sure that there is adequate space to hold the target information. This function checks that each half-byte of the packed decimal data is in the range of 0 to 9. The only exception is the last half-byte which contains the sign indicator. 0 <= decimalPosition < (length * 2).

cwbDT_PackedToASCIIPacked:

Purpose

Translates data from packed decimal format to ASCII packed format. This function can be used for translating data from the iSeries server for use in ASCII format.

Unicode version

None.

Syntax

```
unsigned int CWB_ENTRY cwbDT_PackedToASCIIPacked(
                             char         *target,
                             char         *source,
                             unsigned long length);
```

Parameters

char * target - output
Pointer to the target data.

char * source - input
Pointer to the source data.

unsigned long length - input
Number of bytes of source data to translate.

Return Codes

The following list shows common return values.

CWB_OK
Successful Completion.

CWB_INVALID_POINTER
NULL pointer was passed by caller.

other Offset of the first untranslated character plus one.

Usage

The caller must make sure that there is adequate space to hold the target information. This function checks that each half-byte of the packed decimal data is in the range of 0 to 9. The only exception is the last half-byte which contains the sign indicator (which can be 0-9, 0xd, or 0xb).

cwbDT_PackedToPacked:

Purpose

Translates packed decimal data to packed decimal. This function can be used for transferring data from the iSeries system to no-conversion files and back.

Unicode version

None.

Syntax

```
unsigned int CWB_ENTRY cwbDT_PackedToPacked(
                             char         *target,
                             char         *source,
                             unsigned long length);
```

Parameters

char * target - output
Pointer to the target data.

char * source - input
Pointer to the source data.

unsigned long length - input
Number of bytes of source data to translate.

Return Codes

The following list shows common return values.

CWB_OK
Successful Completion.

CWB_INVALID_POINTER
NULL pointer was passed by caller.

other Offset of the first untranslated character plus one.

Usage

The caller must make sure that there is adequate space to hold the target information. This function checks that each half-byte of the packed decimal data is in the range of 0 to 9. The only exception is the last half-byte which contains the sign indicator.

cwbDT_ZonedToASCII:

Purpose

Translates EBCDIC zoned decimal data to ASCII numeric format. This function can be used for translating data from the iSeries server for use in ASCII text format.

Unicode version

cwbDT_ZonedToWide

Syntax

```
unsigned int CWB_ENTRY cwbDT_ZonedToASCII(
                             char         *target,
                             char         *source,
                             unsigned long length,
                             unsigned long decimalPosition);
```

Parameters

char * target - output
Pointer to the target data.

char * source - input
Pointer to the source data.

unsigned long length - input
Number of bytes of source data to translate.

unsigned long decimalPosition - input
Position of the decimal point.

Return Codes

The following list shows common return values.

CWB_OK
Successful Completion.

CWB_INVALID_POINTER
NULL pointer was passed by caller.

CWB_BUFFER_OVERFLOW
Overflow error.

other Offset of the first untranslated character plus one.

Usage

The caller must make sure that there is adequate space to hold the target information. The high half of the last byte of the zoned data indicates the sign of the number. If the high half-byte is 0xb or 0xd, then a negative number is indicated. Any other value indicates a positive number. This function checks that the high half of each byte of zoned data must be 0xf except for the last byte. The low half of each byte of zoned data must be in the range 0-9. 0 <= decimalPosition < length.

cwbDT_ZonedToASCIIZoned:

Purpose

Translates data from EBCDIC zoned decimal format to ASCII zoned decimal format. This function can be used for translating data from the iSeries server for use in ASCII files.

Unicode version

None.

Syntax

```
unsigned int CWB_ENTRY cwbDT_ZonedToASCIIZoned(
                             char        *target,
                             char        *source,
                             unsigned long length);
```

Parameters

char * target - output
Pointer to the target data.

char * source - input
Pointer to the source data.

unsigned long length - input
Number of bytes of source data to translate.

Return Codes

The following list shows common return values.

CWB_OK
Successful Completion.

CWB_INVALID_POINTER
NULL pointer was passed by caller.

other Offset of the first untranslated character plus one.

Usage

The caller must make sure that there is adequate space to hold the target information. The left half-byte (0xf) in the EBCDIC zoned decimal data will be converted to 0x3 in the left half-byte of the ASCII zoned decimal data except for the last byte (sign). The high half of the last byte of the EBCDIC zoned decimal data indicates the sign of the number. If the high half-byte is 0xb or 0xb then a negative number is indicated, any other value indicates a positive number. This function checks that the high half of each byte of EBCDIC zoned decimal data must be 0xf except for the last byte. The low half of each byte of EBCDIC zoned decimal data must be in the range 0-9.

cwbDT_ZonedToZoned:

Purpose

Translates data from zoned decimal format to zoned decimal. This function can be used for translating data from the iSeries server for use in no-conversion files and vice-versa.

Unicode version

None.

Syntax

```
unsigned int CWB_ENTRY cwbDT_ZonedToZoned(
                             char          *target,
                             char          *source,
                             unsigned long length);
```

Parameters

char * target - output
Pointer to the target data.

char * source - input
Pointer to the source data.

unsigned long length - input
Number of bytes of source data to translate.

Return Codes

The following list shows common return values.

CWB_OK
Successful Completion.

CWB_INVALID_POINTER
NULL pointer was passed by caller.

other Offset of the first untranslated character plus one.

Usage

The caller must make sure that there is adequate space to hold the target information. The high half of the last byte of the zoned data indicates the sign of the number. If the high half-byte is 0xb or 0xb then a number is indicated, any other value indicates a positive number. This function checks that the high half of each byte of zoned data must be 0xf except for the last byte. The low half of each byte of zoned data must be in the range 0-9.

Example: Using data transformation APIs:

This example illustrates using data transformation APIs.

```
/*****************************************************************/
/* Sample Data Transform Program using cwbDT_Bin4ToBin4 to reverse */
/* the order of bytes in a 4-byte integer.                       */
/*****************************************************************/

#include <iostream.h>
#include "cwbdt.h"


void main()
{
   unsigned int returnCode;
   long source,
        target;

   cout << "Enter source number:\n";

   while (cin >> source) {
     cout << "Source in Dec = " << dec << source;
     cout << "\nSource in Hex = " << hex << source << '\n';
     if (((returnCode = cwbDT_Bin4ToBin4((char *)&target,(char *)&source)) == CWB_OK)) {
        cout << "Target in Dec = " << dec << target;
        cout << "\nTarget in Hex = " << hex << target << '\n';
     } else {
        cout << "Conversion failed, Return code = " << returnCode << '\n' ;
     }; /* endif */
     cout << "\nEnter source number:\n";


   }; /* endwhile */

}
```

iSeries Access for Windows national language support (NLS) APIs

iSeries Access for Windows **national language support** APIs enable your applications to get and save (query and change) the iSeries Access for Windows settings that are relevant to national language support.

iSeries servers support many national languages, through national language support (NLS). NLS allows users to work on an iSeries system in the language of their choice. The iSeries system also ensures that the data that is sent to and received from the system appears in the form and order that is expected. By supporting many different languages, the system operates as intended, from both a linguistic and a cultural point of view.

All iSeries systems use a common set of program code, regardless of which language you use on the system. For example, the program code on a U.S. English iSeries system and the program code on a Spanish iSeries system are identical. Different sets of textual data are used, however, for different languages. Textual data is a collective term for menus, displays, lists, prompts, options, Online help information, and messages. This means that you see *Help* for the description of the function key for

Online help information on a U.S. English system, while you see *Ayuda* on a Spanish system. Using the same program code with different sets of textual data allows the iSeries system to support more than one language on a single system.

You can add convenient functions into your iSeries Access for Windows applications, including the capability to:

- Select from a list of installed national languages.
- Convert character data from one code page to another. This permits computers that use different code pages, such as personal computers and the iSeries server, to share information.
- Automatically replace the translatable text (caption and control names) within dialog boxes. This expands the size of the controls according to the text that is associated with them. The size of the dialog-box frame also is adjusted automatically.

Note: It is essential to build national language support considerations into the design of the program right from the start. It is much harder to add NLS or DBCS support after a program has been designed or coded.

iSeries Access for Windows NLS APIs required files:

NLS API type	Header file	Import library	Dynamic Link Library
General	cwbnl.h	cwbapi.lib	cwbnl.dll
Conversion	cwbnlcnv.h		cwbnl1.dll
Dialog-box	cwbnldlg.h		cwbnldlg.dll

Programmer's Toolkit:

The Programmer's Toolkit provides NLS documentation, access to the NLS APIs header files, and links to sample programs. To access this information, open the Programmer's Toolkit and select **Data Manipulation** → **C/C++ APIs**.

Related reference

"iSeries system name formats for connection APIs" on page 5
APIs that take an iSeries system name as a parameter accept names in the following formats.

"OEM, ANSI, and Unicode considerations" on page 6
Most of the iSeries Access for Windows C/C++ APIs that accept string parameters exist in three forms: OEM, ANSI, or Unicode.

Coded character sets:

Graphic characters are printable or displayable symbols, such as letters, numbers, and punctuation marks. A collection of graphic characters is called a *graphic-character set,* and often simply a *character set*.

Each language requires its own graphic-character set to be printed or displayed properly. Characters are encoded according to a *code page*, which is a table that assigns graphic and control characters to specific values called *code points*.

Code pages are classified into many types according to the encoding scheme. Two important encoding schemes for iSeries Access Family are the Host and PC code pages. Unicode also is becoming an important encoding scheme. Unicode is a 16-bit worldwide character encoding scheme that is gaining popularity on both the Host and the personal computer.

- Host code pages are encoded in accordance with IBM® Standard of Extended BCD Interchange Code (EBCDIC) and usually used by S/390® and iSeries servers.
- PC Code pages are encoded based on ANSI X3.4, ASCII and usually used by IBM Personal Computers.

iSeries Access for Windows general NLS APIs list:

Find information about iSeries Access for Windows general NLS APIs.

iSeries Access for Windows is translated into many languages. One or more of these languages can be installed on the personal computer. The following iSeries Access for Windows general NLS APIs allow an application to:

- Get a list of installed languages
- Get the current language setting
- Save the language setting

cwbNL_FindFirstLang:

Purpose

Returns the first available language.

Syntax

```
unsigned int CWB_ENTRY cwbNL_FindFirstLang(
                             char            *mriBasePath,
                             char            *resultPtr,
                             unsigned short   resultLen,
                             unsigned short  *requiredLen,
                             unsigned long   *searchHandle,
                             cwbSV_ErrHandle  errorHandle);
```

Parameters

char * mriBasePath - input
Pointer to the mriBasePath, e.g. C:\Program Files\IBM\ClientAccess/400 If NULL, the mriBasePath of the ClientAccess/400 product is used.

char * resultPtr - output
Pointer to the buffer to contain the result.

unsigned short resultLen - input
Length of the result buffer. Recommended size is CWBNL_MAX_LANG_SIZE.

unsigned short * requiredLen - output
Actual length of the result. If requiredLen > resultLen, the return value will be CWB_BUFFER_OVERFLOW.

unsigned long * searchHandle - output
Search handle to be passed on subsequent calls to cwbNL_FindNextLang.

cwbSV_ErrHandle errorHandle - input
Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle() API The messages may be retrieved through the cwbSV_GetErrText() API. If the parameter is set to zero, no messages will be retrievable.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_HANDLE
Invalid handle.

CWB_INVALID_POINTER
NULL passed on output parameter.

CWB_FILE_NOT_FOUND
File not found.

CWB_PATH_NOT_FOUND
Path not found.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory.

CWB_BUFFER_OVERFLOW
Output buffer too small, data truncated.

Usage

The result buffer will contain a language.

cwbNL_FindNextLang:

Purpose

Returns the next available language.

Syntax

```
unsigned int CWB_ENTRY cwbNL_FindNextLang(
                             char            *resultPtr,
                             unsigned short   resultLen,
                             unsigned short  *requiredLen,
                             unsigned long   *searchHandle,
                             cwbSV_ErrHandle  errorHandle);
```

Parameters

char * resultPtr - output
Pointer to the buffer to contain the result.

unsigned short resultLen - input
Length of the result buffer. Recommended size is CWBNL_MAX_LANG_SIZE.

unsigned short * requiredLen - output
Actual length of the result. If requiredLen > resultLen, the return value will be CWB_BUFFER_OVERFLOW.

unsigned long * searchHandle - output
Search handle to be passed on subsequent calls to cwbNL_FindNextLang.

cwbSV_ErrHandle errorHandle - input
Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle() API. The messages may be retrieved through the cwbSV_GetErrText() API. If the parameter is set to zero, no messages will be retrievable.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_HANDLE
Invalid handle.

CWB_INVALID_POINTER
NULL passed on output parameter.

CWB_NO_MORE_FILES
No more files are found.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory.

CWB_BUFFER_OVERFLOW
Output buffer too small, data truncated.

Usage

The result buffer will contain a language.

cwbNL_GetLang:

Purpose

Get the current language setting.

Syntax

```
unsigned int CWB_ENTRY cwbNL_GetLang(
                             char           *mriBasePath,
                             char           *resultPtr,
                             unsigned short  resultLen,
                             unsigned short *requiredLen,
                             cwbSV_ErrHandle errorHandle);
```

Parameters

char * mriBasePath - input
Pointer to the mriBasePath, e.g. C:\Program Files\IBM\ClientAccess/400. If NULL, the mriBasePath of the ClientAccess/400 product is used.

char * resultPtr - output
Pointer to the buffer to contain the result.

unsigned short resultLen - input
Length of the result buffer. Recommended size is CWBNL_MAX_LANG_SIZE.

unsigned short * requiredLen - output
Actual length of the result. If requiredLen > resultLen, the return value will be CWB_BUFFER_OVERFLOW.

cwbSV_ErrHandle errorHandle - input
Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle() API. The messages may be retrieved through the cwbSV_GetErrText() API. If the parameter is set to zero, no messages will be retrievable.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_HANDLE
Invalid handle.

CWB_INVALID_POINTER
NULL passed on output parameter.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory.

CWB_BUFFER_OVERFLOW
Buffer too small to contain result.

Usage

The result buffer will contain the name of the language subdirectory. This language subdirectory contains the language-specific files. This language subdirectory name also can be passed to cwbNL_GetLangName.

cwbNL_GetLangName:

Purpose

Return the descriptive name of a language setting.

Syntax

```
unsigned int CWB_ENTRY cwbNL_GetLangName(
                             char           *lang,
                             char           *resultPtr,
                             unsigned short  resultLen,
                             unsigned short *requiredLen,
                             cwbSV_ErrHandle errorHandle);
```

Parameters

char * lang - input
Address of the ASCIIZ string representing the language.

char * resultPtr - output
Pointer to the buffer to contain the result.

unsigned short resultLen - input
Length of the result buffer. Recommended size is CWBNL_MAX_NAME_SIZE.

unsigned short * requiredLen - output
Actual length of the result. If requiredLen > resultLen, the return value will be CWB_BUFFER_OVERFLOW.

cwbSV_ErrHandle errorHandle - input
Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle() API. The messages may be retrieved through the cwbSV_GetErrText() API. If the parameter is set to zero, no messages will be retrievable.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_HANDLE
Invalid handle.

CWB_INVALID_POINTER
NULL passed on output parameter.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory.

CWB_BUFFER_OVERFLOW
Output buffer too small, data truncated.

Usage

The language must be a value returned from one of the following APIs:

- cwbNL_GetLang
- cwbNL_FindFirstLang
- cwbNL_FindNextLang

cwbNL_GetLangPath:

Purpose

Return the complete path for language files.

Syntax

```
unsigned int CWB_ENTRY cwbNL_GetLangPath(
                             char            *mriBasePath,
                             char            *resultPtr,
                             unsigned short   resultLen,
                             unsigned short  *requiredLen,
                             cwbSV_ErrHandle  errorHandle);
```

Parameters

char * mriBasePath - input
Pointer to the mriBasePath, for example C:\Program Files\IBM\ClientAccess/400. If NULL, the mriBasePath of the ClientAccess/400 product is used.

char * resultPtr - output
Pointer to the buffer to contain the result.

unsigned short resultLen - input
Length of the result buffer. Recommended size is CWBNL_MAX_PATH_SIZE.

unsigned short * requiredLen - output
Actual length of the result. If requiredLen > resultLen, the return value will be CWB_BUFFER_OVERFLOW.

cwbSV_ErrHandle errorHandle - input
Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle() API. The messages may be retrieved through the cwbSV_GetErrText() API. If the parameter is set to zero, no messages will be retrievable.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_HANDLE
Invalid handle.

CWB_INVALID_POINTER
NULL passed on output parameter.

CWB_PATH_NOT_FOUND
Path not found.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory.

CWB_BUFFER_OVERFLOW
Output buffer too small, data truncated.

Usage

The result buffer will contain the complete path of the language subdirectory. Language files should be loaded from this path.

cwbNL_SaveLang:

Purpose

Save the language setting in the product registry.

Syntax

```
unsigned int CWB_ENTRY cwbNL_SaveLang(
                             char           *lang,
                             cwbSV_ErrHandle  errorHandle);
```

Parameters

char * lang - input
Address of the ASCIIZ string representing the language.

cwbSV_ErrHandle errorHandle - input
Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle() API. The messages may be retrieved through the cwbSV_GetErrText() API. If the parameter is set to zero, no messages will be retrievable.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_HANDLE
Invalid handle.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory.

Usage

The language must be a value returned from one of the following APIs:

- cwbNL_GetLang
- cwbNL_FindFirstLang
- cwbNL_FindNextLang

The following APIs are affected by this call:

- cwbNL_GetLang
- cwbNL_GetLangPath

iSeries Access for Windows conversion NLS APIs list:

This topic describes the iSeries Access for Windows conversion NLS APIs.

The following iSeries Access for Windows conversion NLS APIs allow applications to:
- Convert character data from one code page to another
- Determine the current code page setting
- Determine the last CCSID setting
- Convert code page values to and from code character set identifiers (CCSID)

cwbNL_CCSIDToCodePage:
Purpose

Map CCSIDs to code pages.

Syntax

```
unsigned int CWB_ENTRY cwbNL_CCSIDToCodePage(
                             unsigned long   CCSID,
                             unsigned long  *codePage,
                             cwbSV_ErrHandle errorHandle);
```

Parameters

unsigned long CCSID - input
CCSID to convert to a code page.

unsigned long * codePage - output
The resulting code page.

cwbSV_ErrHandle errorHandle - output
Handle to an error object. Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle API. The messages may be retrieved with the cwbSV_GetErrText API. If the parameter is set to zero, no messages will be retrievable.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_HANDLE
Invalid handle.

CWB_INVALID_POINTER
NULL passed on output parameter.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory.

Usage

None

cwbNL_CodePageToCCSID:
Purpose

Map code pages to CCSIDs.

Syntax

```
unsigned int CWB_ENTRY cwbNL_CodePageToCCSID(
                             unsigned long   codePage,
                             unsigned long  *CCSID,
                             cwbSV_ErrHandle errorHandle);
```

Parameters

unsigned long codePage - input
Code page to convert to a CCSID.

unsigned long * CCSID - output
The resulting CCSID.

cwbSV_ErrHandle errorHandle - output
Handle to an error object. Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle API. The messages may be retrieved with the cwbSV_GetErrText API. If the parameter is set to zero, no messages will be retrievable.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_HANDLE
Invalid handle.

CWB_INVALID_POINTER
NULL passed on output parameter.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory.

Usage

None

cwbNL_Convert:

Purpose

Convert strings by using a previously opened converter.

Syntax

```
unsigned int CWB_ENTRY cwbNL_Convert(
                             cwbNL_Converter theConverter,
                             unsigned long   sourceLength,
                             unsigned long   targetLength,
                             char           *sourceBuffer,
                             char           *targetBuffer,
                             unsigned long  *numberOfErrors,
                             unsigned long  *firstErrorIndex,
                             unsigned long  *requiredLen,
                             cwbSV_ErrHandle errorHandle);
```

Parameters

cwbNL_Converter theConverter - output
Handle to the previously opened converter.

unsigned long sourceLength - input
Length of the source buffer.

unsigned long targetLength - input
Length of the target buffer. If converting from an ASCII code page that contains DBCS characters, note that the resulting data could contain shift-out and shift-in bytes. Therefore, the targetBuffer may need to be larger than the sourceBuffer.

char *sourceBuffer - input
Buffer containing the data to convert.

char *targetBuffer - output
Buffer to contain the converted data.

unsigned long *numberOfErrors - output
Contains the number of characters that could not be converted properly.

unsigned long *firstErrorIndex - output
Contains the offset of the first character in the source buffer that could not be converted properly.

unsigned long *requiredLen - output
Actual length of the result. If requiredLen > resultLen, the return value will be CWB_BUFFER_OVERFLOW.

cwbSV_ErrHandle errorHandle - output
Handle to an error object. Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle API. The messages may be retrieved with the cwbSV_GetErrText API. If the parameter is set to zero, no messages will be retrievable.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_HANDLE
Invalid handle.

CWB_INVALID_POINTER
NULL passed on output parameter.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory.

CWB_BUFFER_OVERFLOW
Output buffer too small, data truncated.

Usage

None

cwbNL_ConvertCodePages:

Comments

cwbNL_ConvertCodePages is no longer supported. See cwbNL_ConvertCodePagesEx.

cwbNL_ConvertCodePagesEx:

Purpose

Convert strings from one code page to another. This API combines the following three converter APIs for the default conversion:

- cwbNL_CreateConverterEx
- cwbNL_Convert
- cwbNL_DeleteConverter

Syntax

```
unsigned int CWB_ENTRY cwbNL_ConvertCodePagesEx(
                             unsigned long   sourceCodePage,
                             unsigned long   targetCodePage,
                             unsigned long   sourceLength,
                             unsigned long   targetLength,
                             char           *sourceBuffer,
                             char           *targetBuffer,
                             unsigned long  *numberOfErrors,
                             unsigned long  *positionOfFirstError,
                             unsigned long  *requiredLen,
                             cwbSV_ErrHandle errorHandle);
```

Parameters

unsigned long sourceCodePage - input
Code page of the data in the source buffer.

unsigned long targetCodePage - input
Code page to which the data should be converted.

unsigned long sourceLength - input.
Length of the source buffer

unsigned long targetLength - input.
Length of the target buffer

char *sourceBuffer - input
Buffer containing the data to convert.

char *targetBuffer - output
Buffer to contain the converted data.

unsigned long *numberOfErrors - output
Contains the number of characters that could not be converted properly.

unsigned long *positionOfFirstError - output
Contains the offset of the first character in the source buffer that could not be converted properly.

unsigned long *requiredLen - output
Actual length of the result. If requiredLen > resultLen, the return value will be CWB_BUFFER_OVERFLOW.

cwbSV_ErrHandle errorHandle - output
Handle to an error object. Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle API. The messages may be retrieved with the cwbSV_GetErrText API. If the parameter is set to zero, no messages will be retrievable.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_HANDLE
Invalid handle.

CWB_INVALID_POINTER
NULL passed on output parameter.

CWBNL_ERR_CNV_UNSUPPORTED
An error occurred while attempting to convert the characters. No conversion was done. The most common reason is that a conversion table is missing. Conversion tables are either installed with iSeries Access for Windows, or retrieved from the default iSeries system when needed. There may have been some problem communicating with the default iSeries system.

CWBNL_ERR_CNV_ERR_STATUS
This return code is used to indicate that while the requested conversion is supported, and the conversion completed, there were some characters that did not convert properly. Either the source buffer contained null characters, or the characters do not exist in the target code page. Applications can choose to ignore this return code or treat it as a warning.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory.

Usage

The following values may be specified on the sourceCodePage and the targetCodePage parameters:

Value	Meaning
CWBNL_CP_UNICODE_F200	UCS2 Version 1.1 UNICODE
CWBNL_CP_UNICODE	UCS2 Current® Version UNICODE
CWBNL_CP_AS400	iSeries server host code page
CWBNL_CP_CLIENT_OEM	OEM client code page
CWBNL_CP_CLIENT_ANSI	ANSI client code page
CWBNL_CP_CLIENT_UNICODE	UNICODE client code page
CWBNL_CP_UTF8	UCS transformation form, 8–bit format
CWBNL_CP_CLIENT	Generic client code page. Default is CWBNL_CP_CLIENT_OEM. CWBNL_CP_CLIENT is set to CWBNL_CP_CLIENT_ANSI when CWB_ANSI is defined, to CWBNL_CP_CLIENT_UNICODE when CWB_UNICODE is defined and to CWBNL_CP_CLIENT_OEM when CWB_OEM is defined.
CWBNL_CP_UTF16BE	UTF-16 (Big-Endian)
CWBNL_CP_UTF16LE	UTF-16 (Little-Endian)
CWBNL_CP_UTF16	CWBNL_CP_UTF16BE or CWBNL_CP_UTF16LE, depending on the platform
CWBNL_CP_UTF32BE	UTF-32 (Big-Endian)
CWBNL_CP_UTF32LE	UTF-34 (Little-Endian)
CWBNL_CP_UTF32	CWBNL_CP_UTF32BE or CWBNL_CP_UTF32LE, depending on the platform

cwbNL_CreateConverter:
Comments

cwbNL_CreateConverter is no longer supported. See cwbNL_CreateConverterEx.

Purpose

Create a cwbNL_Converter to be used on subsequent calls to cwbNL_Convert().

Syntax

```
unsigned int CWB_ENTRY cwbNL_CreateConverter(
                            unsigned long    sourceCodePage,
                            unsigned long    targetCodePage,
                            cwbNL_Converter *theConverter,
                            cwbSV_ErrHandle  errorHandle,
                            unsigned long    shiftInShiftOutStatus,
                            unsigned long    padLength,
                            char            *pad);
```

Parameters

unsigned long sourceCodePage - input
Code page of the source data.

unsigned long targetCodePage - input
Code page to which the data should be converted.

cwbNL_Converter * theConverter - output
The newly created converter.

cwbSV_ErrHandle errorHandle - output
Handle to an error object. Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle API. The messages may be retrieved with the cwbSV_GetErrText API. If the parameter is set to zero, no messages will be retrievable.

unsigned long shiftInShiftOutStatus - input
Indicates whether the shift-in and shift-out bytes are part of the input or output data. 0 - False, no shift-in and shift-out bytes are part of the data string. 1 - True, shift-in and shift-out characters are part of the data string.

unsigned long padLength - input
Length of pad characters. 0 - No pad characters for this conversion request 1 - 1 byte of pad character. This is valid only if the target code page is either SBCS or DBCS code page 2 - 2 bytes of pad characters. This is valid only if the code page is not a single-byte code page.

char * pad - input
The character or characters for padding.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_HANDLE
Invalid handle.

CWB_INVALID_POINTER
NULL passed on output parameter.

CWBNL_ERR_CNV_UNSUPPORTED
An error occurred while attempting to convert the characters. No conversion was done. The most common reason is that a conversion table is missing. Conversion tables are either installed with iSeries Access for Windows, or retrieved from the default iSeries system when needed. There may have been some problem communicating with the default iSeries system.

CWBNL_ERR_CNV_ERR_STATUS
This return code is used to indicate that while the requested conversion is supported, and the conversion completed, there were some characters that did not convert properly. Either the source buffer contained null characters, or the characters do not exist in the target code page. Applications can choose to ignore this return code or treat it as a warning.

CWBNL_ERR_CNV_INVALID_SISO_STATUS
Invalid SISO parameter.

CWBNL_ERR_CNV_INVALID_PAD_LENGTH
Invalid Pad Length parameter.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory.

Usage

The following values may be specified on the sourceCodePage and the targetCodePage parameters:

Value	Meaning
CWBNL_CP_UNICODE_F200	UCS2 Version 1.1 UNICODE
CWBNL_CP_UNICODE	UCS2 Current Version UNICODE
CWBNL_CP_AS400	AS/400 host code page
CWBNL_CP_CLIENT_OEM	OEM client code page
CWBNL_CP_CLIENT_ANSI	ANSI client code page
CWBNL_CP_CLIENT_UNICODE	UNICODE client code page
CWBNL_CP_UTF8	UCS transformation form, 8–bit format
CWBNL_CP_CLIENT	Generic client code page. Default is CWBNL_CP_CLIENT_OEM. CWBNL_CP_CLIENT is set to CWBNL_CP_CLIENT_ANSI when CWB_ANSI is defined, to CWBNL_CP_CLIENT_UNICODE when CWB_UNICODE is defined and to CWBNL_CP_CLIENT_OEM when CWB_OEM is defined.
CWBNL_CP_UTF16BE	UTF-16 (Big-Endian)
CWBNL_CP_UTF16LE	UTF-16 (Little-Endian)
CWBNL_CP_UTF16	CWBNL_CP_UTF16BE or CWBNL_CP_UTF16LE, depending on the platform
CWBNL_CP_UTF32BE	UTF-32 (Big-Endian)
CWBNL_CP_UTF32LE	UTF-34 (Little-Endian)
CWBNL_CP_UTF32	CWBNL_CP_UTF32BE or CWBNL_CP_UTF32LE, depending on the platform

Instead of calling cwbNL_ConvertCodePagesEx multiple times with the same code pages:
- cwbNL_ConvertCodePagesEx(850, 500, ...);
- cwbNL_ConvertCodePagesEx(850, 500, ...);
- cwbNL_ConvertCodePagesEx(850, 500, ...);

It is more efficient to create a converter and use it multiple times:
- cwbNL_CreateConverter(850, 500, &conv, ...);
- cwbNL_Convert(conv, ...);
- cwbNL_Convert(conv, ...);
- cwbNL_Convert(conv, ...);
- cwbNL_DeleteConverter(conv, ...);

cwbNL_CreateConverterEx:

Purpose

Create a cwbNL_Converter to be used on subsequent calls to cwbNL_Convert().

Syntax

```
unsigned int CWB_ENTRY cwbNL_CreateConverterEx(
                             unsigned long    sourceCodePage,
                             unsigned long    targetCodePage,
                             cwbNL_Converter *theConverter,
                             cwbSV_ErrHandle  errorHandle,
                             unsigned long    shiftInShiftOutStatus,
                             unsigned long    padLength,
                             char            *pad);
```

Parameters

unsigned long sourceCodePage - input
Code page of the source data.

unsigned long targetCodePage - input
Code page to which the data should be converted.

cwbNL_Converter * theConverter - output
The newly created converter.

cwbSV_ErrHandle errorHandle - output
Handle to an error object. Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle API. The messages may be retrieved with the cwbSV_GetErrText API. If the parameter is set to zero, no messages will be retrievable.

unsigned long shiftInShiftOutStatus - input
Indicates whether the shift-in and shift-out bytes are part of the input or output data. 0 - False, no shift-in and shift-out bytes are part of the data string. 1 - True, shift-in and shift-out characters are part of the data string.

unsigned long padLength - input
Length of pad characters. 0 - No pad characters for this conversion request 1 - 1 byte of pad character. This is valid only if the target code page is either SBCS or DBCS code page 2 - 2 bytes of pad characters. This is valid only if the code page is not a single-byte code page.

char * pad - input
The character or characters for padding.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_HANDLE
Invalid handle.

CWB_INVALID_POINTER
NULL passed on output parameter.

CWBNL_ERR_CNV_UNSUPPORTED
An error occurred while attempting to convert the characters. No conversion was done. The most common reason is that a conversion table is missing. Conversion tables are either installed with @@xe1s@@, or retrieved from the default iSeries system when needed. There may have been some problem communicating with the default iSeries system.

CWBNL_ERR_CNV_ERR_STATUS
This return code is used to indicate that while the requested conversion is supported, and the conversion completed, there were some characters that did not convert properly. Either the source buffer contained null characters, or the characters do not exist in the target code page. Applications can choose to ignore this return code or treat it as a warning.

CWBNL_ERR_CNV_INVALID_SISO_STATUS
Invalid SISO parameter.

CWBNL_ERR_CNV_INVALID_PAD_LENGTH
Invalid Pad Length parameter.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory.

Usage

The following values may be specified on the sourceCodePage and the targetCodePage parameters:

Value	**Meaning**
CWBNL_CP_UNICODE_F200	UCS2 Version 1.1 UNICODE
CWBNL_CP_UNICODE	UCS2 Current Version UNICODE
CWBNL_CP_AS400	AS/400 host code page
CWBNL_CP_CLIENT_OEM	OEM client code page
CWBNL_CP_CLIENT_ANSI	ANSI client code page
CWBNL_CP_CLIENT_UNICODE	UNICODE client code page
CWBNL_CP_UTF8	UCS transformation form, 8–bit format
CWBNL_CP_CLIENT	Generic client code page. Default is CWBNL_CP_CLIENT_OEM. CWBNL_CP_CLIENT is set to CWBNL_CP_CLIENT_ANSI when CWB_ANSI is defined, to CWBNL_CP_CLIENT_UNICODE when CWB_UNICODE is defined and to CWBNL_CP_CLIENT_OEM when CWB_OEM is defined.
CWBNL_CP_UTF16BE	UTF-16 (Big-Endian)
CWBNL_CP_UTF16LE	UTF-16 (Little-Endian)
CWBNL_CP_UTF16	CWBNL_CP_UTF16BE or CWBNL_CP_UTF16LE, depending on the platform
CWBNL_CP_UTF32BE	UTF-32 (Big-Endian)
CWBNL_CP_UTF32LE	UTF-34 (Little-Endian)
CWBNL_CP_UTF32	CWBNL_CP_UTF32BE or CWBNL_CP_UTF32LE, depending on the platform

Instead of calling cwbNL_ConvertCodePagesEx multiple times with the same code pages:

- cwbNL_ConvertCodePagesEx(850, 500, ...);
- cwbNL_ConvertCodePagesEx(850, 500, ...);
- cwbNL_ConvertCodePagesEx(850, 500, ...);

It is more efficient to create a converter and use it multiple times:

- cwbNL_CreateConverterEx(850, 500, &conv, ...);
- cwbNL_Convert(conv, ...);
- cwbNL_Convert(conv, ...);
- cwbNL_Convert(conv, ...);
- cwbNL_DeleteConverter(conv, ...);

cwbNL_DeleteConverter:

Purpose

Delete a cwbNL_Converter.

Syntax

```
unsigned int CWB_ENTRY cwbNL_DeleteConverter(
                             cwbNL_Converter theConverter,
                             cwbSV_ErrHandle errorHandle);
```

Parameters

cwbNL_Converter theConverter - input
A previously created converter.

cwbSV_ErrHandle errorHandle - output
Handle to an error object. Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle0 API. The messages may be retrieved with the cwbSV_GetErrText API. If the parameter is set to zero, no messages will be retrievable.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory.

CWB_INVALID_HANDLE
Invalid handle.

Usage

None

cwbNL_GetCodePage:

Purpose

Get the current code page of the client system.

Syntax

```
unsigned int CWB_ENTRY cwbNL_GetCodePage(
                             unsigned long  *codePage,
                             cwbSV_ErrHandle errorHandle);
```

Parameters

unsigned long * codePage - output
Returns the current code page of the client system or the OEM code page character conversion override value, if one is specified on the Language tab of the iSeries Access Family Properties dialog.

cwbSV_ErrHandle errorHandle - output
Handle to an error object. Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle API. The messages may be retrieved with the cwbSV_GetErrText API. If the parameter is set to zero, no messages will be retrievable.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_HANDLE
Invalid handle.

CWB_INVALID_POINTER
NULL passed on output parameter.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory.

Usage

None

cwbNL_GetANSICodePage:
Purpose

Get the current ANSI code page of the client system.

Syntax

```
unsigned int CWB_ENTRY cwbNL_GetANSICodePage(
                             unsigned long  *codePage,
                             cwbSV_ErrHandle errorHandle);
```

Parameters

unsigned long * codePage - output
Returns the current ANSI code page of the client system or the ANSI code page character conversion override value, if one is specified on the Language tab of the iSeries Access Family Properties dialog.

cwbSV_ErrHandle errorHandle - output
Handle to an error object. Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle API. The messages may be retrieved with the cwbSV_GetErrText API. If the parameter is set to zero, no messages will be retrievable.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_HANDLE
Invalid handle.

CWB_INVALID_POINTER
NULL passed on output parameter.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory.

Usage

None

cwbNL_GetHostCCSID:
Purpose

Returns the associated CCSID of a given host system or the managing system or the EBCDIC code page character conversion override value, if one is specified on the **Language** tab of the iSeries Access Family **Properties** dialog.

Syntax

```
unsigned long CWB_ENTRY cwbNL_GetHostCCSID(
                              char * system,
                              unsigned long * CCSID );
```

Parameters

char * system - input
The name of the host system. If NULL, the managing system is used.

unsigned * CCSID - output
Length of the result buffer.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_POINTER
NULL passed on output parameter.

CWBNL_DEFAULT_HOST_CCSID_USED
Host CCSID 500 is returned

Usage

This API does not make or require an active connection to the host system to retrieve the associated CCSID value. However, it does depend on a prior successful connection to the host system. If no prior successful connection was made to the host system, the API determines the most appropriate associated host CCSID by using an internal mapping table.

iSeries Access for Windows dialog-box NLS API list:

iSeries Access for Windows dialog-box NLS APIs are interfaces that are used to manipulate the translatable text within dialog boxes.

The following iSeries Access for Windows dialog-box NLS APIs allow applications to:
- Replace translatable text with a dialog box
- Expand dialog-box controls according to the text

Usage notes

This module works ONLY on the following kinds of dialog-box controls:
- Static text
- Button
- Group box
- Edit box
- Check box
- Radio button

It does NOT work on complex controls such as Combo box.

cwbNL_CalcControlGrowthXY:

Purpose

Routine to calculate the growth factor of an individual control within a dialog box.

Syntax

```
unsigned int CWB_ENTRY cwbNL_CalcControlGrowthXY(
                    HWND windowHandle,
                    HDC  hDC,
                    float* growthFactorX,
               float* growthFactorY);
```

Parameters

HWND windowHandle - input
Window handle of the control for which to calculate the growth factor.

HDC hDC - input
Device context. Used by GetTextExtentPoint32 to determine extent needed for the translated string in the control.

float* growthFactorX - output
+/- growth to the width needed to contain the string for the control.

float* growthFactorY - output
+/- growth to the height needed to contain the string for the control.

Return Codes

The following list shows common return values.

CWB_OK
Successful Completion

Usage

It is assumed that the translated text has been loaded into the control prior to calling this function. A control that does not contain text will return a 1.00 growth factor. This means that it does not need to change size.

cwbNL_CalcDialogGrowthXY:

Purpose

Routine to calculate the growth factor of a dialog box. All of the controls within the dialog box will looked at to determine how much the dialog-box size needs to be adjusted.

Syntax

```
unsigned int CWB_ENTRY cwbNL_CalcDialogGrowthXY(
                    HWND windowHandle,
                    float* growthFactorX,
               float* growthFactorY);
```

Parameters

HWND windowHandle - input
Window handle of the dialog box for which to calculate the growth factor.

float* growthFactorX - output
+/- growth to the width needed to contain the string for all of the controls in the dialog box.

float* growthFactorY - output
+/- growth to the height needed to contain the string for all of the controls in the dialog box.

Return Codes

The following list shows common return values.

CWB_OK
Successful Completion

Usage

It is assumed that the translated text has been loaded into the controls prior to calling this function.

cwbNL_GrowControlXY:

Purpose

Routine to grow an individual control within a dialog box.

Syntax

```
unsigned int CWB_ENTRY cwbNL_GrowControlXY(
                             HWND        windowHandle,
                             HWND        parentWindowHandle,
                             float       growthFactorX,
                             float       growthFactorY,
                             cwb_Boolean growAllControls);
```

Parameters

HWND windowHandle - input
Window handle of the control to be resized.

HWND parentWindowHandle - input
Window handle of the dialog box that contains the controls.

float growthFactorX - input
Multiplication factor for growing the width of the control. 1.00 = Stay same size. 1.50 = 1 1/2 times original size.

float growthFactorY - input
Multiplication factor for growing the height of the control. 1.00 = Stay same size. 1.50 = 1 1/2 times original size.

cwb_Boolean growAllControls - input
CWB_TRUE = All controls will be resized by the growthFactor. CWB_FALSE = Only controls with text will be resized.

Return Codes

The following list shows common return values.

CWB_OK
Successful Completion

Usage

Care should be used to not pass in a growth factor that will cause a control to not fit on the physical display.

cwbNL_GrowDialogXY:

Purpose

Internal routine to growth the dialog box and its controls proportionally based off of a growth factor that is input.

Syntax

```
unsigned int CWB_ENTRY cwbNL_GrowDialogXY(
                             HWND        windowHandle,
                             float       growthFactorX,
                             float       growthFactorY,
                             cwb_Boolean growAllControls);
```

Parameters

HWND windowHandle - input
Window handle of the window owning the controls.

float growthFactorX - input
Multiplication factor for growing the dialog box, ie. 1.00 = Stay same size, 1.50 = 1 1/2 times original size.

float growthFactorY - input
Multiplication factor for growing the dialog box, ie. 1.00 = Stay same size, 1.50 = 1 1/2 times original size.

cwb_Boolean growAllControls - input
CWB_TRUE = All controls will be resized by the growthFactor, CWB_FALSE = Only controls with text will be resized.

Return Codes

The following list shows common return values.

CWB_OK
Successful Completion.

Usage

It is assumed that the translated text has been loaded into the controls prior to calling this function. The dialog-box frame will not be allowed to grow larger than the desktop window size.

cwbNL_LoadDialogStrings:

Purpose

This routine will control the replacement of translatable text within a dialog box. This includes dialog control text as well as the dialog-box caption.

Syntax

```
unsigned int CWB_ENTRY cwbNL_LoadDialogStrings(
                             HINSTANCE   MRIHandle,
                             HWND        windowHandle,
                      int       nCaptionID,
                             USHORT      menuID,
                             HINSTANCE   menuLibHandle,
                             cwb_Boolean growAllControls);
```

Parameters

HINSTANCE MRIHandle - input
Handle of the module containing the strings for the dialog.

HWND windowHandle - input
Window handle of the dialog box.

int nCaptionID - input
ID of the caption string for the dialog box

USHORT menuID - input
ID of the menu for the dialog box.

HINSTANCE menuLibHandle - input
Handle of the module containing the menu for the dialog.

cwb_Boolean growAllControls - input
CWB_TRUE = All controls will be resized by the growthFactor CWB_FALSE = Only controls with text will be resized.

Return Codes

The following list shows common return values.

CWB_OK
Successful Completion.

CWBNL_DLG_MENU_LOAD_ERROR
Could not load the menu.

CWBNL_DLG_INVALID_HANDLE
Incorrect MRIHandle.

Usage

This process begins by enumerating, replacing the text of, and horizontally adjusting, all dialog controls within the dialog box, and finally right-adjusting the dialog box itself, relative to the adjusted controls therein. These adjustments are made only if the current window extents do not fully encompass the expansion space required for the text or all controls. After all of the text substitution has been completed, if a menu ID has been passed, it will be loaded and attached to the dialog box. It is suggested that this routine is called for every dialog-box procedure as the first thing done during the INITDLG message processing.

cwbNL_LoadMenu:

Purpose

This routine will control the loading of the given menu from a module and replacing the translatable text within the menu.

Syntax

```
HWND CWB_ENTRY cwbNL_LoadMenu(
                    HWND      windowHandle,
                    HINSTANCE menuResourceHandle,
                    USHORT    menuID,
                    HINSTANCE MRIHandle);
```

Parameters

HWND windowHandle - input
Window handle of the dialog box that contains the menu.

HINSTANCE menuResourceHandle - input
Handle of the resource dll containing the menu.

USHORT menuID - input
ID of the menu for the dialog box.

HINSTANCE MRIHandle - input
Handle of the resource dll containing the strings for the menu.

Return Codes

The following list shows common return values.

HINSTANCE
Handle of the menu.

Usage

None

cwbNL_LoadMenuStrings:

Purpose

This routine will control the replacement of translatable text within a menu.

Syntax

```
unsigned int CWB_ENTRY cwbNL_LoadMenuStrings(
                             HWND      WindowHandle,
                             HINSTANCE menuHandle,
                             HINSTANCE MRIHandle);
```

Parameters

HWND windowHandle - input
Window handle of the dialog box that contains the menu.

HMODULE menuHandle - input
Handle of the menu for the dialog.

HMODULE MRIHandle - input
Handle of the resource DLL containing the strings for the menu.

Return Codes

The following list shows common return values.

CWB_OK
Successful Completion

Usage

None

cwbNL_SizeDialog:

Purpose

This routine will control the sizing of the dialog box and its child controls. The expansion amount is based off of the length of the text extent and the length of each control. The growth of the dialog box and its controls will be proportional. By setting the growAllControls to FALSE, only controls with text will expand or contract. This allows the programmer the flexibility of non-translatable fields to remain the same size. This may be appropriate for dialogs that contain drop-down lists, combo-boxes, or spin buttons.

Syntax

```
unsigned int CWB_ENTRY cwbNL_SizeDialog(
                             HWND        windowHandle,
                             cwb_Boolean growAllControls);
```

Parameters

HWND windowHandle - input
Window handle of the window owning the controls.

cwb_Boolean growAllControls - input
CWB_TRUE = All controls will be resized by the growthFactor, CWB_FALSE = Only controls with text will be resized.

Return Codes

The following list shows common return values.

CWB_OK
Successful Completion

Usage

This routine assumes that the translated text has already been loaded into the dialog-box controls. If the text has not been loaded into the controls, use cwbNL_LoadDialog.

Example: iSeries Access for Windows NLS APIs:

This example illustrates using iSeries Access for Windows NLS APIs.

```
/* National Language Support Code Snippet                      */
/* Used to demonstrate how the APIs would be run.              */

#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include "CWBNL.H"
#include "CWBNLCNV.H"
#include "CWBSV.H"

cwbSV_ErrHandle errhandle;

/*  Return the message text associated with the top-level       */
/*  error identified by the error handle provided.   Since      */
/*  all APIs that fail use the error handle, this was moved     */
/*  into a separate routine.                                    */
void resolveErr(cwbSV_ErrHandle errhandle)
{
    static unsigned char buf[  BUFSIZ  ];
    unsigned long retlen;
    unsigned int rc;

    if ((rc = cwbSV_GetErrText(errhandle, buf, (unsigned long) BUFSIZ, &retlen)) != CWB_OK)
        printf("cwbSV_GetErrText() Service API failed with return code 0x%x.\n", rc);
    else
        printf("%s\n", (char *) buf);
}
```

```
void main(void){

    /* define some variables
        -------------------- */
    int SVrc = 0;
    int NLrc = 0;
    char *myloadpath = "";
    char *resultPtr;
    char *mylang;
    unsigned short resultlen;
    unsigned short reqlen;
    unsigned long searchhandle;
    unsigned long codepage;
    unsigned long trgtpage;
    char *srcbuf = "Change this string";
    char *trgtbuf;
    unsigned long srclen;
    unsigned long trgtlen;
    unsigned long nmbrerrs;
    unsigned long posoferr;
    unsigned long rqdlen;
    unsigned long ccsid;


    /*  Create an error message object and return a handle to   */
    /*  it.  This error handle can be passed to APIs that       */
    /*  support it.  If an error occurs, the error handle can   */
    /*  be used to retrieve the message text associated with    */
    /*  the API error.                                          */
    SVrc = cwbSV_CreateErrHandle(&errhandle);
    if (SVrc != CWB_OK) {
        printf("cwbSV_CreateErrHandle failed with return code %d.\n", SVrc);
    }

    /* Retreive the current language setting.                   */
    resultlen = CWBNL_MAX_LANG_SIZE+1;
    resultPtr = (char *) malloc(resultlen * sizeof(char));
    NLrc = cwbNL_GetLang(myloadpath, resultPtr, resultlen, &reqlen, errhandle);
    if (NLrc != CWB_NO_ERR) {
        if (NLrc == CWB_BUFFER_TOO_SMALL)
            printf("GetLang buffer too small, recommended size %d.\n", reqlen);
        resolveErr(errhandle);
    }
    printf("GetLang API returned %s.\n", resultPtr);
    mylang = (char *) malloc(resultlen * sizeof(char));
    strcpy(mylang, resultPtr);

    /* Retrieve the descriptive name of a language setting.     */
    resultlen = CWBNL_MAX_NAME_SIZE+1;
    resultPtr = (char *) realloc(resultPtr, resultlen * sizeof(char));
    NLrc = cwbNL_GetLangName(mylang, resultPtr, resultlen, &reqlen, errhandle);
    if (NLrc != CWB_NO_ERR) {
        if (NLrc == CWB_BUFFER_TOO_SMALL)
            printf("GetLangName buffer too small, recommended size %d.\n", reqlen);
        resolveErr(errhandle);
    }
    printf("GetLangName API returned %s.\n", resultPtr);

    /*  Return the complete path for language files.            */
    resultlen = CWBNL_MAX_PATH_SIZE+1;
    resultPtr = (char *) realloc(resultPtr, resultlen * sizeof(char));
    NLrc = cwbNL_GetLangPath(myloadpath, resultPtr, resultlen, &reqlen, errhandle);
    if (NLrc != CWB_NO_ERR) {
        if (NLrc == CWB_BUFFER_TOO_SMALL)
            printf("GetLangPath buffer too small, recommended size %d.\n", reqlen);
        resolveErr(errhandle);
    }
    printf("GetLangPath API returned %s.\n", resultPtr);

    /*  Get the code page of the current process.               */
    NLrc = cwbNL_GetCodePage(&codepage, errhandle);
    if (NLrc != CWB_NO_ERR) {
        resolveErr(errhandle);
    }
    printf("GetCodePage API returned %u.\n", codepage);

    /*  Convert strings from one code page to another. This     */
    /*  API combines three converter APIs for the default       */
    /*  conversion.  The three converter APIs it combines are:  */
    /*      cwbNL_CreateConverterEx                               */
    /*      cwbNL_Convert                                       */
    /*      cwbNL_DeleteConverter                               */
    srclen = strlen(srcbuf) + 1;
    trgtlen = srclen;
    trgtpage = 437;
    trgtbuf = (char *) malloc(trgtlen * sizeof(char));
    printf("String to convert is %s.\n",srcbuf);
    NLrc = cwbNL_ConvertCodePagesEx(codepage, trgtpage, srclen,
            trgtlen, srcbuf, trgtbuf, &nmbrerrs, &posoferr, &rqdlen,
            errhandle);
    if (NLrc != CWB_NO_ERR) {
        resolveErr(errhandle);
        printf("number of errors detected is %u.\n", nmbrerrs);
        printf("location of first error is %u.\n", posoferr);
    }
    printf("ConvertCodePagesEx API returned %s.\n", trgtbuf);

    /*  Map a code page to the corresponding CCSID.             */
    NLrc = cwbNL_CodePageToCCSID(codepage, &ccsid, errhandle);
    if (NLrc != CWB_NO_ERR) {
        resolveErr(errhandle);
    }
    printf("CodePageToCCSID returned %u.\n", ccsid);

    cwbSV_DeleteErrHandle(errhandle);

}
```

iSeries Access for Windows Directory Update APIs

The iSeries Access for Windows Directory Update function allows users to specify PC directories for updating from a configured network server or from multiple networked servers. This permits users to load non-iSeries Access for Windows software products on a server in the network, and to keep those files updated on PCs. Directory Update is an optionally installable iSeries Access for Windows component.

How to install iSeries Access for Windows Directory Update:

To install Directory Update, follow these steps when you install iSeries Access for Windows, or when you run Selective Setup if iSeries Access for Windows is already installed:

1. Select the **iSeries Access for Windows Optional Components** check box.
2. Expand the view and make sure that the **Directory Update** subcomponent also is selected.
3. Follow the prompts to completion.

iSeries Access for Windows Directory Update C/C++ APIs:

iSeries Access for Windows Directory Update C/C++ application programming interfaces (APIs) allow software developers to add, change and delete update entries that are used by the iSeries Access for Windows Directory Update function.

Note: iSeries Access for Windows Directory Update APIs do not actually perform the updates. They are for configuration purposes only. The task of updating files is handled exclusively by the Directory Update application.

iSeries Access for Windows Directory Update APIs enable the:

- Creation of update entries.
- Deletion of update entries.
- Modification of update entries.
- Retrieval of information from update entries.
- Retrieval of information such as return codes. For example, only one application can access the Update entries at a time. If you get a return code that indicates **locked**, use the information to find the name of the application that has the entries open.

IMPORTANT: The iSeries Access for Windows client does not include support for network drives or for universal naming conventions. This now is provided by the **iSeries NetServer** function. Network drives that you previously mapped by using iSeries Access should be mapped by using iSeries NetServer support. Set up the iSeries NetServer that comes with OS/400® V4R2 and beyond in order to perform file serving to the iSeries server.

NetServer information resources:

- iSeries NetServer topic of the iSeries Information Center
- IBM iSeries NetServer Home Page

iSeries Access for Windows Directory Update APIs required files:

Header file	Import library	Dynamic Link Library
cwbup.h	cwbapi.lib	cwbup.dll

Programmer's Toolkit:

The Programmer's Toolkit provides Directory Update documentation, access to the cwbup.h header file, and links to sample programs. To access this information, open the Programmer's Toolkit and select **Directory Update → C/C++ APIs**.

Note: By using the code examples, you agree to the terms of the "Code license and disclaimer information" on page 552.

Related reference

"Directory Update APIs return codes" on page 25

"iSeries system name formats for connection APIs" on page 5
APIs that take an iSeries system name as a parameter accept names in the following formats.

"OEM, ANSI, and Unicode considerations" on page 6
Most of the iSeries Access for Windows C/C++ APIs that accept string parameters exist in three forms: OEM, ANSI, or Unicode.

Typical use of iSeries Access for Windows Directory Update APIs

iSeries Access for Windows Directory Update APIs typically are used for creating and configuring update entries that are used to update files from a mapped network drive. It is important to note that the Update APIs do not actually update the files, but rely on the Directory Update executable file to do this.

For example, files on the iSeries system might contain customer names and addresses. The files on your iSeries system are your master files that are updated as new customers are added, deleted, or have a name or address change. The same files on your networked personal computers are used to perform selective market mailings (by zip code, state, age, number of children and so on). The files on the iSeries system are your master files, and you want them secure, but you need to provide the data for work.

You could write a program that uses Directory Update APIs to create and configure update entries, which would update the files located on your networked personal computers.

Requirements for Directory Update entries

The following are required for Directory Update entries.

Description:
A description displayed by the Directory Update application to show users what is being updated.

Source path:
The path of the source or ″master″ files. For example:

```
E:\MYSOURCE
```

or

```
\\myserver\mysource
```

Target path:
The path of the files with which you wish to keep synchronized with the master files. For example:

```
C:\mytarget
```

Options for Directory Update entries

The following are optional for Directory Update entries:

Package files:
PC files that contain information on other files to be updated. See “Directory Update package files syntax and format” on page 210 for more information. Package files are added to update entries by using the “cwbUP_AddPackageFile” on page 216 API.

Callback DLL:
A DLL provided by the application programmer that Directory Update will call into during different stages of the update process. This allows programmers to perform application unique processing during the different stages of an update. A callback DLL is added to an update entry using the “cwbUP_SetCallbackDLL” on page 218 API.

The different stages of update when Directory Update may call into the callback DLL are:

Pre-update:
This is when Directory Update is about to begin its processing of an update entry. The following entry point prototype must be in the callback DLL: **unsigned long _declspec(dllexport) cwbUP_PreUpdateCallback();**

Post-update:
This is when Directory Update has completed moving the files. The following entry point prototype must be in the callback DLL: **unsigned long _declspec(dllexport) cwbUP_PostUpdateCallback();**

Pre-migration:

This is when Directory Update is about to begin version-to-version migration of an update entry. Version-to-version migrations are triggered by QPTFIDX files. The following entry point prototype must be in the callback DLL: **unsigned long _declspec(dllexport) cwbUP_PreMigrationCallback();**

Post-migration:

This is when Directory Update has completed processing of a version-to-version migration of an update entry. The following entry point prototype must be in the callback DLL: **unsigned long _declspec(dllexport) cwbUP_PostMigrationCallback();**

Attributes:

Set the type or mode of the update to be performed. Combinations of the attributes are allowed. Attributes are:

File-driven update:

The files in the target directory are compared to the files in the source directory. Target files with dates older than the source files are updated. No new files will be created in the target.

Package-driven update:

The package files listed in the update entry are scanned for files to be updated. The dates of the files that are listed in the package file are compared between the source and the target directories. The source files with newer dates are updated or moved into the target directory. If a file that is listed in the package file does not exist in the target, but exists in the source, the file is created in the target directory.

Subdirectory update:

Subdirectories under the target directory are included in the update.

Onepass update:

Updates occur directly from source to target. If this is not specified, updates occur in two passes. The first pass of the update will copy the files to be updated into a temporary directory. Then the PC is restarted. On restart, the files are copied to the target directory. This is useful for locked files.

Backlevel update:

This controls if updates will occur if the source files are older than the target files.

Directory Update package files syntax and format

Package files contain information that specifies and describes which target files users want to be kept current with source files.

Package files syntax:

```
PKGF Description text
MBRF PROG1.EXE
MBRF INFO.TXT
MBRF SUBDIR\SHEET.XLS
DLTF PROG2.EXE
```

Note: Text must start in the first row and column of the file. Each package file must begin with the PKGF keyword.

Package files format:

Package files consist of the following elements:

PKGF description (optional):

This identifier indicates that the file is a package file. If this tag is not found in the first four characters of the file, Directory Update will not process the file while searching for files to update. A description is optional.

MBRF filename:
This identifies a file as part of the package to be updated. A path name also can be specified; this indicates that the file is in a subdirectory of the source directory.

The path should not contain the drive letter, or begin with a back-slash character (\). When you begin the update function, you specify a target directory; the path that is specified in the package file is considered a subdirectory of this target directory.

DLTF filename:
This identifies a file to be deleted from the target directory. A path name also can be specified; this indicates that the file is in a subdirectory of the target directory. As with the MBRF identifier, you should not specify a drive letter or begin with a back-slash character (\).

Related topic:
See “Directory Update sample program” for sample Directory Update APIs and detailed explanations of their attributes.

Directory Update sample program

For a Directory Update C/C++ sample program, you can go to the Programmer’s Toolkit - Directory Update Web page.

Note: By using the code examples, you agree to the terms of the “Code license and disclaimer information” on page 552.

Go to Programmer’s Toolkit – Directory Update Web page. Select **dirupdat.exe** for a description of the sample, and to download the samples.

The sample program demonstrates creating, configuring, and deleting Directory Update entries.

See the iSeries Access for Windows User’s Guide for more information.

Directory Update: Create and delete APIs

The following iSeries Access for Windows Directory Update are used to create and delete an update entry. The APIs are listed alphabetically.

Note: It is essential that is called when your application no longer is accessing the update entries. If cwbUP_FreeLock is not called, other applications will not be able to access or modify the update entries.

cwbUP_CreateUpdateEntry:

Purpose

Creates a new update entry and passes back a handle to it.

Syntax

```
unsigned int CWB_ENTRY cwbUP_CreateUpdateEntry(
                             char * entryDescription,
                             char * entrySource,
                             char * entryTarget,
                             cwbUP_EntryHandle *entryHandle);
```

Parameters

char * entryDescription - input
Points to a null-terminated string that contains a description to identify the update entry.

char * entrySource - input
Points to a null-terminated string that contains the source for the update entry. This can be either a drive and path, or a UNC name.

char * entryTarget - input
Points to a null-terminated strings that contains the target for the update entry. This can be either a drive and path, or a UNC name.

cwbUP_EntryHandle * entryHandle - input/output
Pointer to a cwbUP_EntryHandle where the handle will be returned. This handle must be used in subsequent calls to the update entry APIs.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_POINTER
NULL passed as an address.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory to create handle.

CWBUP_TOO_MANY_ENTRIES
The maximum number of update entries already exist. No more can be created.

CWBUP_STRING_TOO_LONG
An input string is longer than the maximum of CWBUP_MAX_LENGTH.

CWBUP_ENTRY_IS_LOCKED
Another application is currently changing the update entry list. No changes are allowed at this time.

Usage

When you use this call, and have completed your processing of the update entry, you must call cwbUP_FreeEntryHandle. This call will ″unlock″ the entry, and free resources that are associated with it.

cwbUP_DeleteEntry:

Purpose

Deletes the update entry from the update entry list.

Syntax

```
unsigned int CWB_ENTRY cwbUP_DeleteEntry(
                             cwbUP_EntryHandle entryHandle);
```

Parameters

cwbUP_EntryHandle entryHandle - input
Handle that was returned by a previous call to cwbUP_CreateUpdateEntryHandle, cwbUP_GetUpdateEntryHandle, or cwbUP_FindEntry.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_HANDLE
Update entry handle is not valid.

CWBUP_ENTRY_IS_LOCKED
Another application is currently changing the update entry list. No changes are allowed at this time.

Usage

After this call, you do not need to call cwbUP_FreeEntryHandle. The entry is ″freed″ when the entry is successfully deleted. If you retrieved the first update entry by using the cwbUP_GetEntryHandle API, and then called this API to delete the entry, all of the update entries would shift one position to fill the slot left by the delete. So, if you then wanted to get the next update item, you would pass the same index that you did on the previous cwbUP_GetEntryHandle API call.

Directory Update: Access APIs

The following iSeries Access for Windows Directory Update are used to obtain access to an update entry. The APIs are listed alphabetically.

Note: It is essential that is called when your application no longer is accessing the update entries. If cwbUP_FreeLock is not called, other applications will not be able to access or modify the update entries.

cwbUP_FindEntry:

Purpose

Gets a handle to an existing update entry by using entrySource and entryTarget as the search parameters.

Syntax

```
unsigned int CWB_ENTRY cwbUP_FindEntry(
                              char * entrySource,
                              char * entryTarget,
                              unsigned long *searchStart,
                              cwbUP_EntryHandle *entryHandle);
```

Parameters

char * entrySource - input
Points to a null-terminated string that contains the source for the update entry. This can be either a drive and path, or a UNC name. This string will be used to search for a */ matching update entry.

char * entryTarget - input
Points to a null-terminated string that contains the target for the update entry. This can be either a drive and path, or a UNC name. This string will be used to search for a matching update entry.

unsigned long * searchStart - input/output
Pointer to an index into the list of update entries to begin the search at. This would be used in cases where multiple update entries may have matching source and targets. You would use this parameter to ″skip″ over entries in the search, and continue on searching for a matching update entry that is after searchStart in the list. On successful return, searchStart will be set to the position in the list where the update entry was found. This should be set to CWBUP_SEARCH_FROM_BEGINNING if you want to search all update entries.

cwbUP_EntryHandle * entryHandle - input/output
Pointer to a cwbUP_EntryHandle where the handle will be returned. This handle must be used in subsequent calls to the update entry APIs.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_POINTER
NULL passed as an address.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory to create handle.

CWBUP_SEARCH_POSITION_ERROR
Search starting position is not valid.

CWBUP_ENTRY_NOT_FOUND
No update entry matched search value.

CWBUP_STRING_TOO_LONG
An input string is longer than the maximum of CWBUP_MAX_LENGTH.

Usage

The handle that is returned from this call will be used for accessing the update entry with other Update APIs. When you use this call, and have completed your processing of the update entry, you must call cwbUP_FreeEntryHandle. This call will ″unlock″ the entry, and free resources with which it is associated.

cwbUP_FreeLock:

Purpose

Frees the lock to the update entries. This should be called when the application is done accessing the update entries. If this is not called, other applications will not be able to access the update entries.

Syntax

```
unsigned int CWB_ENTRY cwbUP_FreeLock();
```

Parameters

None

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWBUP_UNLOCK_WARNING
Application did not have the update entries locked.

Usage

A lock to the update entries is obtained whenever an application accesses or changes an update entry. When the application no longer needs to access the update entries, the application should call this API.

cwbUP_GetEntryHandle:

Purpose

Gets a handle to an existing update entry at a given position in the list.

Syntax

```
unsigned int CWB_ENTRY cwbUP_GetEntryHandle(
                             unsigned long entryPosition,
                             cwbUP_EntryHandle *entryHandle);
```

Parameters

unsigned long entryPosition - input
Index into the update entry list of the entry for which you want to retrieve a handle. (Pass in 1 if you wish to retrieve the first update entry)

cwbUP_EntryHandle * entryHandle - input/output
Pointer to a cwbUP_EntryHandle where the handle will be returned. This handle must be used in subsequent calls to the update entry APIs.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_POINTER
NULL was passed as an address.

CWBUP_ENTRY_NOT_FOUND
No update entry at the given position.

CWBUP_POSITION_INVALID
Position that is given is not in range.

Usage

The handle that is returned from this call will be used for accessing the update entry with other Update APIs. When you use this call, and have completed your processing of the update entry, you must call cwbUP_FreeEntryHandle. This call will ″unlock″ the entry, and free resources that are associated with it. You must call cwbUP_FreeEntryHandle once for each time that you call an API that returns an entry handle.

Directory Update: Free Resources APIs

The following iSeries Access for Windows Directory Update are used to free resources that are associated with an entry handle. The APIs are listed alphabetically.

Note: It is essential that is called when your application no longer is accessing the update entries. If cwbUP_FreeLock is not called, other applications will not be able to access or modify the update entries.

cwbUP_FreeEntryHandle:

Purpose

Frees an entry handle and all resources with which is is associated.

Syntax

```
unsigned int CWB_ENTRY cwbUP_FreeEntryHandle(
                             cwbUP_EntryHandle entryHandle);
```

Parameters

cwbUP_EntryHandle entryHandle - input
The entry handle that is to be freed.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_HANDLE
Handle is not valid or has already been

Usage

After this call you can no longer access the update entry. To access the update entry or another update entry, you would need to get a new entry handle.

Directory Update: Change APIs

The following iSeries Access for Windows Directory Update are used to change an update entry. The APIs are listed alphabetically.

Note: It is essential that is called when your application no longer is accessing the update entries. If cwbUP_FreeLock is not called, other applications will not be able to access or modify the update entries.

cwbUP_AddPackageFile:

Purpose

Adds a package file to the package file list in the update entry.

Syntax

```
unsigned int CWB_ENTRY cwbUP_AddPackageFile(
                             cwbUP_EntryHandle entryHandle,
                             char *entryPackage);
```

Parameters

cwbUP_EntryHandle entryHandle - input
Handle that was returned by a previous call to cwbUP_CreateUpdateEntryHandle, cwbUP_GetUpdateEntryHandle, or cwbUP_FindEntry.

char * entryPackage - input
Pointer to a null-terminated string that contains the name of a package file to be added to the update entry. Do not include the path for this file. The package file must exist in the source and target paths.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_HANDLE
Update entry handle is not valid.

CWB_INVALID_POINTER
NULL was passed as an address.

CWBUP_TOO_MANY_PACKAGES
Maximum number of package files already exist for this entry.

CWBUP_STRING_TOO_LONG
The package file name is longer than CWBUP_MAX_LENGTH.

CWBUP_ENTRY_IS_LOCKED
Another application is currently changing the update entry list. No changes are allowed at this time.

Usage

None

cwbUP_RemovePackageFile:

Purpose

Removes a package file from the list of package files that belong to an update entry.

Syntax

```
unsigned int CWB_ENTRY cwbUP_RemovePackageFile(
                             cwbUP_EntryHandle entryHandle,
                             char *entryPackage);
```

Parameters

cwbUP_EntryHandle entryHandle - input
Handle that was returned by a previous call to cwbUP_CreateUpdateEntryHandle, cwbUP_GetUpdateEntryHandle, or to cwbUP_FindEntry.

char * entryPackage - input
Pointer to a null-terminated string that contains the package file name that is to be removed from the package file list.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_HANDLE
Update entry handle is not valid.

CWB_INVALID_POINTER
NULL passed as an address parameter.

CWBUP_PACKAGE_NOT_FOUND
The package file was not found.

CWBUP_STRING_TOO_LONG
The package file string is longer than the maximum of CWBUP_MAX_LENGTH.

CWBUP_ENTRY_IS_LOCKED
Another application is currently changing the update entry list. No changes are allowed at this time.

Usage

None

cwbUP_SetCallbackDLL:

Purpose

Sets the fully qualified name of the callback DLL for an update entry.

Syntax

```
unsigned int CWB_ENTRY  cwbUP_SetCallbackDLL(
                              cwbUP_EntryHandle entryHandle,
                              char *dllPath);
```

Parameters

cwbUP_EntryHandle entryHandle - input
Handle that was returned by a previous call to cwbUP_CreateUpdateEntryHandle, cwbUP_GetUpdateEntryHandle, or cwbUP_FindEntry.

char * dllPath - input
Pointer to a null-terminated string that contains the fully qualified name of the DLL that will be called when individual stages of the update occur.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_HANDLE
Update entry handle is not valid.

CWB_INVALID_POINTER
NULL passed as an address parameter.

CWBUP_STRING_TOO_LONG
The callback DLL string is longer than the maximum of CWBUP_MAX_LENGTH.

CWBUP_ENTRY_IS_LOCKED
Another application is currently changing the update entry list. No changes are allowed at this time.

Usage

None

cwbUP_SetDescription:

Purpose

Sets the description of the update entry.

Syntax

```
unsigned int CWB_ENTRY cwbUP_SetDescription(
                             cwbUP_EntryHandle entryHandle,
                             char *entryDescription);
```

Parameters

cwbUP_EntryHandle entryHandle - input
Handle that was returned by a previous call to cwbUP_CreateUpdateEntryHandle, cwbUP_GetUpdateEntryHandle, or to cwbUP_FindEntry.

char * entryDescription - input
Pointer to a null-terminated string that contains the full description to be associated with the update entry.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_HANDLE
Update entry handle is not valid.

CWB_INVALID_POINTER
NULL passed as an address parameter.

CWBUP_STRING_TOO_LONG
The description string is longer than the maximum of CWBUP_MAX_LENGTH.

CWBUP_ENTRY_IS_LOCKED
Another application is currently changing the update entry list. No changes are allowed at this time.

Usage

None

cwbUP_SetEntryAttributes:

Purpose

Sets any of the following attribute values of the update entry:

CWBUP_FILE_DRIVEN
Updates are based on file date comparisons between target and source files.

CWBUP_PACKAGE_DRIVEN
Updates are based on contents of the package file(s), and comparisons of their files' dates between target and source.

CWBUP_SUBDIRECTORY
Update compares and updates directories under the given path.

CWBUP_ONEPASS
Updates occur directly in one pass. If this isn't specified, updates occur in two passes. The first pass copies the files to be updated to a temporary directory, and then when the PC is rebooted, the files are copied to the target directory.

CWBUP_BACKLEVEL_OK
If this is set, updates will occur if the dates of the files on the source and target don't match. If this is not set, updates will only occur if the source file is more recent than the target file.

Any combination of these values is valid.

Syntax

```
unsigned int CWB_ENTRY cwbUP_SetEntryAttributes(
                             cwbUP_EntryHandle entryHandle,
                             unsigned long entryAttributes);
```

Parameters

cwbUP_EntryHandle entryHandle - input
Handle that was returned by a previous call to cwbUP_CreateUpdateEntryHandle, cwbUP_GetUpdateEntryHandle, or to cwbUP_FindEntry.

unsigned long entryAttributes - input
Combination of the attribute values. (See defines section for values)

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_HANDLE
Update entry handle is not valid.

CWBUP_ENTRY_IS_LOCKED
Another application is currently changing the update entry list. No changes are allowed at this time.

Usage

An example of this call follows:

```
rc = cwbUP_SetEntryAttributes(entryHandle, CWBUP_FILEDRIVEN | CWBUP_ONEPASS );
```

This call would result in the update entry being file driven and the update would occur in one pass.

cwbUP_SetSourcePath:

Purpose

Sets the source path of the update entry.

Syntax

```
unsigned int CWB_ENTRY cwbUP_SetSourcePath(
                             cwbUP_EntryHandle entryHandle,
                             char *entrySource);
```

Parameters

cwbUP_EntryHandle entryHandle - input
Handle that was returned by a previous call to cwbUP_CreateUpdateEntryHandle, cwbUP_GetUpdateEntryHandle, or to cwbUP_FindEntry.

char * entrySource - input
Pointer to a null-terminated string that contains the full source path for the update entry.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_HANDLE
Update entry handle is not valid.

CWB_INVALID_POINTER
NULL passed as an address parameter.

CWBUP_STRING_TOO_LONG
The source path string is longer than the maximum of CWBUP_MAX_LENGTH.

CWBUP_ENTRY_IS_LOCKED
Another application is currently changing the update entry list. No changes are allowed at this time.

Usage

None

cwbUP_SetTargetPath:

Purpose

Sets the target path of the update entry.

Syntax

```
unsigned int CWB_ENTRY cwbUP_SetTargetPath(
                             cwbUP_EntryHandle entryHandle,
                             char *entryTarget);
```

Parameters

cwbUP_EntryHandle entryHandle - input
Handle that was returned by a previous call to cwbUP_CreateUpdateEntryHandle, cwbUP_GetUpdateEntryHandle, or to cwbUP_FindEntry.

char * entryTarget - input
Pointer to a null-terminated string that contains the full target path for the update entry.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_HANDLE
Update entry handle is not valid.

CWB_INVALID_POINTER
NULL passed as an address parameter.

CWBUP_STRING_TOO_LONG
The target path string is longer than the maximum of CWBUP_MAX_LENGTH.

CWBUP_ENTRY_IS_LOCKED
Another application is currently changing the update entry list. No changes are allowed at this time.

Usage

None

Directory Update: Information APIs

The following iSeries Access for Windows Directory Update are used to obtain information from an update entry and to retrieve general Directory Update information. The APIs are listed alphabetically.

Note: It is essential that is called when your application no longer is accessing the update entries. If cwbUP_FreeLock is not called, other applications will not be able to access or modify the update entries.

cwbUP_GetCallbackDLL:

Purpose

Gets the fully qualified name of the callback DLL for an update entry.

Syntax

```
unsigned int CWB_ENTRY  cwbUP_GetCallbackDLL(
                             cwbUP_EntryHandle entryHandle,
                             char *dllPath,
                             unsigned long bufferLength,
                             unsigned long *actualLength);
```

Parameters

cwbUP_EntryHandle entryHandle - input
Handle that was returned by a previous call to cwbUP_CreateUpdateEntryHandle, cwbUP_GetUpdateEntryHandle, or to cwbUP_FindEntry.

char * dllPath - input/output
Pointer to a buffer that will receive the fully qualified name of the DLL that will be called when individual stages of the update occur.

unsigned long bufferLength - input
Length of the dllPath buffer. Space should be included for the null termination character. If the buffer is not large enough to hold the entire DLL name, an error will be returned and the actualLength parameter will be set to the number of bytes the dllPath buffer needs to be.

unsigned long * actualLength - input/output
Pointer to a length variable that will be set to the size of the buffer needed to contain the fully qualified DLL name.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_HANDLE
Update entry handle is not valid.

CWB_INVALID_POINTER
NULL passed as an address parameter.

CWB_BUFFER_OVERFLOW
Buffer is too small to hold return data.

Usage

None

cwbUP_GetDescription:

Purpose

Gets the description of the update entry.

Syntax

```
unsigned int CWB_ENTRY cwbUP_GetDescription(
                             cwbUP_EntryHandle entryHandle,
                             char *entryDescription,
                             unsigned long bufferLength,
                             unsigned long *actualLength);
```

Parameters

cwbUP_EntryHandle entryHandle - input
Handle that was returned by a previous call to cwbUP_CreateUpdateEntryHandle, cwbUP_GetUpdateEntryHandle, or to cwbUP_FindEntry.

char * entryDescription - input/output
Pointer to a buffer that will receive the description of the update entry.

unsigned long bufferLength - input
Length of the buffer. An extra byte should be included for the null termination character. If the buffer is not large enough to hold the entire description, an error will be returned and the actualLength parameter will be set to the number of bytes the entryDescription buffer needs to be to contain the data.

unsigned long * actualLength - input/output
Pointer to a length variable that will be set to the size of the buffer needed to contain the description.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_HANDLE
Update entry handle is not valid.

CWB_INVALID_POINTER
NULL passed as an address parameter.

CWB_BUFFER_OVERFLOW
Buffer is too small to hold return data.

Usage

None

cwbUP_GetEntryAttributes:

Purpose

Gets the attributes of the update entry. These include: one pass update, file driven update, package driven update, and update subdirectories. Any combination of these is valid.

Syntax

```
unsigned int CWB_ENTRY cwbUP_GetEntryAttributes(
                             cwbUP_EntryHandle entryHandle,
                             unsigned long *entryAttributes);
```

Parameters

cwbUP_EntryHandle entryHandle - input
Handle that was returned by a previous call to cwbUP_CreateUpdateEntryHandle, cwbUP_GetUpdateEntryHandle, or to cwbUP_FindEntry.

unsigned long * entryAttributes - input/output
Pointer to area to receive the attribute values. (See defines section for values)

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_HANDLE
Update entry handle is not valid.

CWB_INVALID_POINTER
NULL passed as an address parameter.

Usage

The value that is contained in entryAttributes after this call is made may be a combination of the attribute flags that are listed near the top of this file.

cwbUP_GetLockHolderName:

Purpose

Gets the name of the program that currently has the update entries in a locked state.

Syntax

```
unsigned int CWB_ENTRY cwbUP_GetLockHolderName(char *lockHolder,
                                               unsigned long bufferLength,
                                               unsigned long *actualLength);
```

Parameters

char * lockHolder - input/output
Pointer to a buffer that will receive the name of the application that is currently locking the update entries.

unsigned long bufferLength - input
Length of the buffer. An extra byte should be included for the null termination character. If the buffer is not large enough to hold the entire name, an error will be returned and the actualLength parameter will be set to the number of bytes the lockHolder buffer needs to be to contain the data.

unsigned long * actualLength - input/output
Pointer to a length variable that will be set to the size of the buffer needed to contain the application name.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_POINTER
NULL passed as an address parameter.

CWB_BUFFER_OVERFLOW
Buffer is too small to hold return data.

Usage

None

cwbUP_GetSourcePath:

Purpose

Gets the source path of the update entry.

Syntax

```
unsigned int CWB_ENTRY cwbUP_GetSourcePath(
                            cwbUP_EntryHandle entryHandle,
                            char *entrySource,
                            unsigned long bufferLength,
                            unsigned long *actualLength);
```

Parameters

cwbUP_EntryHandle entryHandle - input
Handle that was returned by a previous call to cwbUP_CreateUpdateEntryHandle, cwbUP_GetUpdateEntryHandle, or to cwbUP_FindEntry.

char * entrySource - input/output
Pointer to a buffer that will receive the source path of the update entry.

unsigned long bufferLength - input
Length of the buffer. An extra byte should be included for the null termination character. If the buffer is not large enough to hold the entire source path, an error will be returned and the actualLength parameter will be set to the number of bytes the entrySource buffer needs to be to contain the data.

unsigned long * actualLength - input/output
Pointer to a length variable that will be set to the size of the buffer needed to contain the source path.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_HANDLE
Update entry handle is not valid.

CWB_INVALID_POINTER
NULL passed as an address parameter.

CWB_BUFFER_OVERFLOW
Buffer is too small to hold return data.

Usage

None

cwbUP_GetTargetPath:

Purpose

Gets the target path of the update entry.

Syntax

```
unsigned int CWB_ENTRY cwbUP_GetTargetPath(
                             cwbUP_EntryHandle entryHandle,
                             char *entryTarget,
                             unsigned long bufferLength,
                             unsigned long *actualLength);
```

Parameters

cwbUP_EntryHandle entryHandle - input
Handle that was returned by a previous call to cwbUP_CreateUpdateEntryHandle, cwbUP_GetUpdateEntryHandle, or to cwbUP_FindEntry.

char * entryTarget - input/output
Pointer to a buffer that will receive the target path of the update entry.

unsigned long bufferLength - input
Length of the buffer. An extra byte should be included for the null termination character. If the buffer is not large enough to hold the entire target path, an error will be returned and the actualLength parameter will be set to the number of bytes the entryTarget buffer needs to be to contain the data.

unsigned long * actualLength - input/output
Pointer to a length variable that will be set to the size of the buffer needed to contain the target path.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_HANDLE
Update entry handle is not valid.

CWB_INVALID_POINTER
NULL passed as an address parameter.

CWB_BUFFER_OVERFLOW
Buffer is too small to hold return data.

Usage

None

iSeries Access for Windows PC5250 emulation APIs

The iSeries Access for Windows PC5250 emulator provides desktop users with a graphical user interface for existing iSeries applications. PC5250 allows users to easily and transparently interact with data and applications that are stored on the iSeries server.

PC5250 provides C/C++ application programming interfaces (APIs) for enabling workstation programs to interact with iSeries host systems.

iSeries Access for Windows PC5250 C/C++ APIs:

Emulator high-level language API (EHLLAPI)
A simple, single-entry point interface that interprets the emulator screen.

Personal communications session API (PCSAPI)
Use this interface to start, stop, and control emulator sessions.

Host Access Class Library (HACL)
This interface provides a set of classes and methods for developing applications that access host information at the data-stream level.

iSeries Access for Windows emulation APIs required files:

Emulation interface	Header file	Import library	Dynamic Link Library
Standard HLLAPI	hapi_c.h	pscal32.lib	pcshll.dll pcshll32.dll
Enhanced HLLAPI	ehlapi32.h	ehlapi32.lib	ehlapi32.dll
Windows EHLLAPI	whllapi.h	whllapi.lib whlapi32.lib	whllapi.dll whllapi32.dll
HACL interface	eclall.hpp	pcseclva.lib pcseclvc.lib	pcseclva.dll pcseclvc.dll
PCSAPI interface	pcsapi.h	pcscal32.lib	pcsapi.dll pcsapi32.dll

Programmer’s Toolkit:

The Programmer’s Toolkit provides Emulator interfaces documentation, access to header files, and links to sample applications. To access this information, open the Programmer’s Toolkit and select **Emulation —> C/C++ APIs**.

Note: By using the code examples, you agree to the terms of the “Code license and disclaimer information” on page 552.

iSeries Objects APIs for iSeries Access for Windows

iSeries Objects for iSeries Access for Windows application programming interfaces (APIs) allow you to work with iSeries print-related objects. These APIs make it possible to work with iSeries spooled files, writer jobs, output queues, printers, and more.

By using iSeries Objects APIs, you can write workstation applications that are customized for the user’s environment. For example, you can write an application to manage spooled files for a single user, or for all users across a network of iSeries servers. This includes holding, releasing, changing attributes of, deleting, sending, retrieving and answering messages for the spooled files.

iSeries Objects APIs for iSeries Access for Windows required files:

Header file	Import library	Dynamic Link Library
cwbobj.h	cwbapi.lib	cwbobj.dll

Programmer's Toolkit:

The Programmer's Toolkit provides iSeries Objects documentation, access to the cwbobj.h header file, and links to sample programs. To access this information, open the Programmer's Toolkit and select **iSeries Operations** → **C/C++ APIs**.

Note: By using the code examples, you agree to the terms of the "Code license and disclaimer information" on page 552.

Related reference

"iSeries Object APIs return codes" on page 26

"iSeries system name formats for connection APIs" on page 5
APIs that take an iSeries system name as a parameter accept names in the following formats.

"OEM, ANSI, and Unicode considerations" on page 6
Most of the iSeries Access for Windows C/C++ APIs that accept string parameters exist in three forms: OEM, ANSI, or Unicode.

iSeries objects attributes

Network Print Server objects have attributes. The Network Print Server supports the following attributes. Refer to the data stream description for each object/action to determine the attributes that are supported for that combination.

Advanced Function Printing:

Key CWBOBJ_KEY_AFP

ID 0x000A

Type char[11]

Description
Indicates whether this spooled file uses AFP resources external to the spooled file. Valid values are *YES and *NO.

Align Page:

Key CWBOBJ_KEY_ALIGN

ID 0x000B

Type char[11]

Description
Indicates whether a forms alignment message is sent prior to printing this spooled file. Valid values are *YES, *NO.

Allow Direct Print:

Key CWBOBJ_KEY_ALWDRTPRT

ID 0x000C

Type char[11]

Description
Indicates whether the printer writer allows the printer to be allocated to a job that prints directly to a printer. Valid values are *YES, *NO.

Authority:

Key CWBOBJ_KEY_AUT

ID 0x000D

Type char[11]

Description
Specifies the authority that is given to users who do not have specific authority to the output queue. Valid values are *USE, *ALL, *CHANGE, *EXCLUDE, *LIBCRTAUT.

Authority to Check:

Key CWBOBJ_KEY_AUTCHK

ID 0x000E

Type char[11]

Description
Indicates what type of authorities to the output queue allow the user to control all the files on the output queue. Valid values are *OWNER, *DTAAUT.

Automatically End Writer:

Key CWBOBJ_KEY_AUTOEND

ID 0x0010

Type char[11]

Description
Specifies if the writer should be automatically ended. Valid values are *NO, *YES.

Back Margin Offset Across:

Key CWBOBJ_KEY_BACKMGN_ACR

ID 0x0011

Type float

Description
For the back side of a piece of paper, it specifies, how far in from the left side of the page printing starts. The special value *FRONTMGN will be encoded as -1.

Back Margin Offset Down:

Key CWBOBJ_KEY_BACKMGN_DWN

ID 0x0012

Type float

Description
For the back side of a piece of paper, it specifies, how far down from the top of the page printing starts. The special value *FRONTMGN will be encoded as -1.

Backside Overlay Library Name:

Key CWBOBJ_KEY_BKOVRLLIB

ID 0x0013

Type char[11]

Description
The name of the library that contains the back overlay. If the back overlay name field has a special value, this library field will be blank.

Backside Overlay Name:

Key CWBOBJ_KEY_BKOVRLAY

ID 0x0014

Type char[11]

Description
The name of the back overlay. Valid special values include *FRONTMGN.

Back Overlay offset across:

Key CWBOBJ_KEY_BKOVL_ACR

ID 0x0016

Type float

Description
The offset across from the point of origin where the overlay is printed.

Back Overlay Offset Down:

Key CWBOBJ_KEY_BKOVL_DWN

ID 0x0015

Type float

Description
The offset down from the point of origin where the overlay is printed.

Characters per Inch:

Key CWBOBJ_KEY_CPI

ID 0x0017

Type float

Description
The number of characters per horizontal inch.

Code Page:

Key CWBOBJ_KEY_CODEPAGE

ID 0x0019

Type char[11]

Description
The mapping of graphic characters to code points for this spooled file. If the graphic character set field contains a special value, this field may contain a zero (0).

Coded Font Name:

Key CWBOBJ_KEY_CODEDFNT

ID 0x001A

Type char[11]

Description
The name of the coded font. A coded font is an AFP resource that is composed of a character set and a code page. Special values include *FNTCHRSET.

Coded Font Library Name:

Key CWBOBJ_KEY_CODEDFNTLIB

ID 0x0018

Type char[11]

Description
The name of the library that contains the coded font. This field may contain blanks if the coded font name field has a special value.

Copies:

Key CWBOBJ_KEY_COPIES

ID 0x001C

Type long

Description
The total number of copies to be produced for this spooled file.

Copies left to Produce:

Key CWBOBJ_KEY_COPIESLEFT

ID 0x001D

Type long

Description
The remaining number of copies to be produced for this spooled file.

Current Page:

Key CWBOBJ_KEY_CURPAGE

ID 0x001E

Type long

Description
Current page that is being written by the writer job.

Data Format:

Key CWBOBJ_KEY_DATAFORMAT

ID 0x001F

Type char[11]

Description
Data format. Valid values are *RCDDATA, *ALLDATA.

Data Queue Library Name:

Key CWBOBJ_KEY_DATAQUELIB

ID 0x0020

Type char[11]

Description
The name of the library that contains the data queue.

Data Queue Name:

Key CWBOBJ_KEY_DATAQUE

ID 0x0021

Type char[11]

Description
Specifies the name of the data queue that is associated with the output queue.

Date File Opened:

Key CWBOBJ_KEY_DATE

ID 0x0022

Type char[8]

Description
The date the spooled file was opened. The date is encoded in a character string with the following format, C YY MM DD.

User Specified DBCS Data:

Key CWBOBJ_KEY_DBCSDATA

ID 0x0099

Type char[11]

Description
Whether the spooled file contains double-byte character set (DBCS) data. Valid values are *NO and *YES.

DBCS Extension Characters:

Key CWBOBJ_KEY_DBCSEXTENSN

ID 0x009A

Type char[11]

Description
Whether the system is to process the DBCS extension characters. Valid values are *NO and *YES.

DBCS Character Rotation:

Key CWBOBJ_KEY_DBCAROTATE

ID 0x009B

Type char[11]

Description
Whether the DBCS characters are rotated 90 degrees counterclockwise before printing. Valid values are *NO and *YES.

DBCS Characters per Inch:

Key CWBOBJ_KEY_DBCSCPI

ID 0x009C

Type long

Description
The number of double-byte characters to be printed per inch. Valid values are -1, -2, 5, 6, and 10. The value *CPI is encoded as -1. The value *CONDENSED is encoded as -2.

DBCS SO/SI Spacing:

Key CWBOBJ_KEY_DBCSSISO

ID 0x009D

Type char[11]

Description
Determines the presentation of shift-out and shift-in characters when printed. Valid values are *NO, *YES, and *RIGHT.

Defer Write:

Key CWBOBJ_KEY_DFR_WRITE

ID 0x0023

Type char[11]

Description
Whether print data is held in system buffers before

Degree of Page Rotation:

Key CWBOBJ_KEY_PAGRTT

ID 0x0024

Type long

Description
The degree of rotation of the text on the page, with respect to the way the form is loaded into the printer. Valid values are -1, -2, -3, 0, 90, 180, 270. The value *AUTO is encoded as -1, the value *DEVD is encoded as -2, and the value *COR is encoded as -3.

Delete File After Sending:

Key CWBOBJ_KEY_DELETESPLF

ID 0x0097

Type char[11]

Description
Delete the spooled file after sending? Valid values are *NO and *YES.

Destination Option:

Key CWBOBJ_KEY_DESTOPTION

ID 0x0098

Type char[129]

Description
Destination option. A text string that allows the user to pass options to the receiving system.

Destination Type:

Key CWBOBJ_KEY_DESTINATION

ID 0x0025

Type char[11]

Description
Destination type. Valid values are *OTHER, *AS400, *PSF2.

Device Class:

Key CWBOBJ_KEY_DEVCLASS

ID 0x0026

Type char[11]

Description
The device class.

Device Model:

Key CWBOBJ_KEY_DEVMODEL

ID 0x0027

Type char[11]

Description
The model number of the device.

Device Type:

Key CWBOBJ_KEY_DEVTYPE

ID 0x0028

Type char[11]

Description
The device type.

Display any File:

Key CWBOBJ_KEY_DISPLAYANY

ID 0x0029

Type char[11]

Description
Whether users who have authority to read this output queue can display the output data of any output file on this queue, or only the data in their own files. Valid values are *YES, *NO, *OWNER.

Drawer for Separators:

Key CWBOBJ_KEY_DRWRSEP

ID 0x002A

Type long

Description
Identifies the drawer from which the job and file separator pages are to be taken. Valid values are -1, -2, 1, 2, 3. The value *FILE is encoded as -1, and the value *DEVD is encoded as -2.

Ending Page:

Key CWBOBJ_KEY_ENDPAGE

ID 0x002B

Type long

Description

The page number at which to end printing the spooled file. Valid values are 0 or the ending page number. The value *END is encoded as 0.

File Separators:

Key CWBOBJ_KEY_FILESEP

ID 0x002C

Type long

Description

The number of file separator pages that are placed at the beginning of each copy of the spooled file. Valid values are -1, or the number of separators. The value *FILE is encoded as -1.

Fold Records:

Key CWBOBJ_KEY_FOLDREC

ID 0x002D

Type char[11]

Description

Whether records that exceed the printer forms width are folded (wrapped) to the next line. Valid values are *YES, *NO.

Font Identifier:

Key CWBOBJ_KEY_FONTID

ID 0x002E

Type char[11]

Description

The printer font that is used. Valid special values include *CPI and *DEVD.

Form Feed:

Key CWBOBJ_KEY_FORMFEED

ID 0x002F

Type char[11]

Description

The manner in which forms feed to the printer. Valid values are *CONT, *CUT, *AUTOCUT, *DEVD.

Form Type:

Key CWBOBJ_KEY_FORMTYPE

ID 0x0030

Type char[11]

Description

The type of form to be loaded in the printer to print this spooled file.

Form Type Message Option:

Key CWBOBJ_KEY_FORMTYPEMSG

ID 0x0043

Type char[11]

Description
Message option for sending a message to the writer's message queue when the current form type is finished. Valid values are *MSG, *NOMSG, *INFOMSG, *INQMSG.

Front Margin Offset Across:

Key CWBOBJ_KEY_FTMGN_ACR

ID 0x0031

Type float

Description
For the front side of a piece of paper, it specifies, how far in from the left side of the page printing starts. The special value *DEVD is encoded as -2.

Front Margin Offset Down:

Key CWBOBJ_KEY_FTMGN_DWN

ID 0x0032

Type float

Description
For the front side of a piece of paper, it specifies, how far down from the top of the page printing starts. The special value *DEVD is encoded as -2.

Front Overlay Library Name:

Key CWBOBJ_KEY_FTOVRLLIB

ID 0x0033

Type char[11]

Description
The name of the library that contains the front overlay. This field may be blank if the front overlay name field contains a special value.

Front Overlay Name:

Key CWBOBJ_KEY_FTOVRLAY

ID 0x0034

Type char[11]

Description
The name of the front overlay. Valid special values include *NONE.

Front Overlay Offset Across:

Key CWBOBJ_KEY_FTOVL_ACR

ID 0x0036

Type float

Description
The offset across from the point of origin where the overlay is printed.

Front Overlay Offset Down:

Key CWBOBJ_KEY_FTOVL_DWN

ID 0x0035

Type float

Description
The offset down from the point of origin where the overlay is printed.

Graphic Character Set:

Key CWBOBJ_KEY_CHAR_ID

ID 0x0037

Type char[11]

Description
The set of graphic characters to be used when printing this file. Valid special values include *DEVD, *SYSVAL, and *JOBCCSID.

Hardware Justification:

Key CWBOBJ_KEY_JUSTIFY

ID 0x0038

Type long

Description
The percentage that the output is right justified. Valid values are 0, 50, 100.

Hold Spool File:

Key CWBOBJ_KEY_HOLD

ID 0x0039

Type char[11]

Description
Whether the spooled file is held. Valid values are *YES, *NO.

Initialize the writer:

Key CWBOBJ_KEY_WTRINIT

ID 0x00AC

Type char[11]

Description
The user can specify when to initialize the printer device. Valid values are *WTR, *FIRST, *ALL.

Internet Address:

Key CWBOBJ_KEY_INTERNETADDR

ID 0x0094

Type char[16]

Description
The internet address of the receiving system.

Job Name:

Key CWBOBJ_KEY_JOBNAME

ID 0x003B

Type char[11]

Description
The name of the job that created the spooled file.

Job Number:

Key CWBOBJ_KEY_JOBNUMBER

ID 0x003C

Type char[7]

Description
The number of the job that created the spooled file.

Job Separators:

Key CWBOBJ_KEY_JOBSEPRATR

ID 0x003D

Type long

Description
The number of job separators to be placed at the beginning of the output for each job having spooled files on this output queue. Valid values are -2, 0-9. The value *MSG is encoded as -2. Job separators are specified when the output queue is created.

Job User:

Key CWBOBJ_KEY_USER

ID 0x003E

Type char[11]

Description
The name of the user that created the spooled file.

Last Page Printed:

Key CWBOBJ_KEY_LASTPAGE

ID 0x003F

Type long

Description
The number of the last printed page is the file if printing ended before the job completed processing.

Length of Page:

Key CWBOBJ_KEY_PAGELEN

ID 0x004E

Type float

Description
The length of a page. Units of measurement are specified in the measurement method attribute.

Library Name:

Key CWBOBJ_KEY_LIBRARY

ID 0x000F

Type char[11]

Description
The name of the library.

Lines Per Inch:

Key CWBOBJ_KEY_LPI

ID 0x0040

Type float

Description
The number of lines per vertical inch in the spooled file.

Manufacturer Type and Model:

Key CWBOBJ_KEY_MFGTYPE

ID 0x0041

Type char[21]

Description
Specifies the manufacturer, type, and model when transforming print data from SCS to ASCII.

Maximum Spooled Output Records:

Key CWBOBJ_KEY_MAXRECORDS

ID 0x0042

Type long

Description
The maximum number of records allowed in this file at the time this file was opened. The value *NOMAX is encoded as 0.

Measurement Method:

Key CWBOBJ_KEY_MEASMETHOD

ID 0x004F

Type char[11]

Description
The measurement method that is used for the length of page and width of page attributes. Valid values are *ROWCOL, *UOM.

Message Help:

Key CWBOBJ_KEY_MSGHELP

ID 0x0081

Type char(*)

Description
The message help, which is sometimes known as second-level text, can be returned by a ″retrieve message″ request. The system limits the length to 3000 characters (English version must be 30 % less to allow for translation).

Message ID:

Key CWBOBJ_KEY_MESSAGEID

ID 0x0093

Type char[8]

Description
The message ID.

Message Queue Library Name:

Key CWBOBJ_KEY_MSGQUELIB

ID 0x0044

Type char[11]

Description
The name of the library that contains the message queue.

Message Queue:

Key CWBOBJ_KEY_MSGQUE

ID 0x005E

Type char[11]

Description
The name of the message queue that the writer uses for operational messages.

Message Reply:

Key CWBOBJ_KEY_MSGREPLY

ID 0x0082

Type char[133]

Description
The message reply. Text string to be provided by the client which answers a message of type ″inquiry″. In the case of message retrieved, the attribute value is returned by the server and contains the default reply which the client can use. The system limits the length to 132 characters. Should be null-terminated due to variable length.

Message Text:

Key CWBOBJ_KEY_MSGTEXT

ID 0x0080

Type char[133]

Description
The message text, that is sometimes known as first-level text, can be returned by a ″retrieve message″ request. The system limits the length to 132 characters.

Message Type:

Key CWBOBJ_KEY_MSGTYPE

ID 0x008E

Type char[3]

Description
The message type, a 2-digit, EBCDIC encoding. Two types of messages indicate whether one can ″answer″ a ″retrieved″ message: ′04′ Informational messages convey information without asking for a reply (may require a corrective action instead), ′05′ Inquiry messages convey information and ask for a reply.

Message Severity:

Key CWBOBJ_KEY_MSGSEV

ID 0x009F

Type long

Description
Message severity. Values range from 00 to 99. The higher the value, the more severe or important the condition.

Number of Bytes to Read/Write:

Key CWBOBJ_KEY_NUMBYTES

ID 0x007D

Type long

Description
The number of bytes to read for a read operation, or the number of bytes to write for a write operation. The object action determines how to interpret this attribute.

Number of Files:

Key CWBOBJ_KEY_NUMFILES

ID 0x0045

Type long

Description
The number of spooled files that exist on the output queue.

Number of Writers Started to Queue:

Key CWBOBJ_KEY_NUMWRITERS

ID 0x0091

Type long

Description
The number of writer jobs started to the output queue.

Object Extended Attribute:

Key CWBOBJ_KEY_OBJEXTATTR

ID 0x000B1

Type char[11]

Description
An ″extended″ attribute used by some objects like font resources. This value shows up via

WRKOBJ and DSPOBJD commands on the iSeries server. The title on an iSeries server screen may just indicate ″Attribute″. In the case of object types of font resources, for example, common values are CDEPAG, CDEFNT, and FNTCHRSET.

Open time commands:

Key CWBOBJ_KEY_OPENCMDS

ID 0x00A0

Type char[11]

Description
Specifies whether the user wants SCS open time commands to be inserted into datastream prior to spool file data. Valid values are *YES, *NO.

Operator Controlled:

Key CWBOBJ_KEY_OPCNTRL

ID 0x0046

Type char[11]

Description
Whether users with job control authority are allowed to manage or control the spooled files on this queue. Valid values are *YES, *NO.

Order of Files On Queue:

Key CWBOBJ_KEY_ORDER

ID 0x0047

Type char[11]

Description
The order of spooled files on this output queue. Valid values are *FIFO, *JOBNBR.

Output Priority:

Key CWBOBJ_KEY_OUTPTY

ID 0x0048

Type char[11]

Description
The priority of the spooled file. The priority ranges from 1 (highest) to 9 (lowest). Valid values are 0-9, where 0 represents *JOB.

Output Queue Library Name:

Key CWBOBJ_KEY_OUTQUELIB

ID 0x0049

Type char[11]

Description
The name of the library that contains the output queue.

Output Queue Name:

Key CWBOBJ_KEY_OUTQUE

ID 0x004A

Type char[11]

Description
The name of the output queue.

Output Queue Status:

Key CWBOBJ_KEY_OUTQUESTS

ID 0x004B

Type char[11]

Description
The status of the output queue. Valid values are RELEASED, HELD.

Overflow Line Number:

Key CWBOBJ_KEY_OVERFLOW

ID 0x004C

Type long

Description
The last line to be printed before the data that is being printed overflows to the next page.

Pages Per Side:

Key CWBOBJ_KEY_MULTIUP

ID 0x0052

Type long

Description
The number of logical pages that print on each side of each physical page when the file is printed. Valid values are 1, 2, 4.

Pel Density:

Key CWBOBJ_KEY_PELDENSITY

ID 0x00B2

Type char[2]

Description
For font resources only, this value is an encoding of the number of pels (″1″ represents a pel size of 240, ″2″ represents a pel size of 320). Additional values may become meaningful as the iSeries system defines them.

Point Size:

Key CWBOBJ_KEY_POINTSIZE

ID 0x0053

Type float

Description
The point size in which this spooled file's text is printed. The special value *NONE will be encoded as 0.

Print Fidelity:

Key CWBOBJ_KEY_FIDELITY

ID 0x0054

Type char[11]

Description
The kind of error handling that is performed when printing. Valid values are *ABSOLUTE, *CONTENT.

Print on Both Sides:

Key CWBOBJ_KEY_DUPLEX

ID 0x0055

Type char[11]

Description
How the information prints. Valid values are *FORMDF, *NO, *YES, *TUMBLE.

Print Quality:

Key CWBOBJ_KEY_PRTQUALITY

ID 0x0056

Type char[11]

Description
The print quality that is used when printing this spooled file. Valid values are *STD, *DRAFT, *NLQ, *FASTDRAFT.

Print Sequence:

Key CWBOBJ_KEY_PRTSEQUENCE

ID 0x0057

Type char[11]

Description
Print sequence. Valid values are *NEXT.

Print Text:

Key CWBOBJ_KEY_PRTTEXT

ID 0x0058

Type char[31]

Description
The text that is printed at the bottom of each page of printed output and on separator pages. Valid special values include *BLANK and *JOB.

Printer:

Key CWBOBJ_KEY_PRINTER

ID 0x0059

Type char[11]

Description
The name of the printer device.

Printer Device Type:

Key CWBOBJ_KEY_PRTDEVTYPE

ID 0x005A

Type char[11]

Description
The printer data stream type. Valid values are *SCS, *IPDS(*), *USERASCII, *AFPDS.

Printer File Library Name:

Key CWBOBJ_KEY_PRTRFILELIB

ID 0x005B

Type char[11]

Description
The name of the library that contains the printer file.

Printer File Name:

Key CWBOBJ_KEY_PRTRFILE

ID 0x005C

Type char[11]

Description
The name of the printer file.

Printer Queue:

Key CWBOBJ_KEY_RMTPRTQ

ID 0x005D

Type char[129]

Description
The name of the destination printer queue when sending spooled files via SNDTCPSPLF (LPR).

Record Length:

Key CWBOBJ_KEY_RECLENGTH

ID 0x005F

Type long

Description
Record length.

Remote System:

Key CWBOBJ_KEY_RMTSYSTEM

ID 0x0060

Type char[256]

Description
Remote system name. Valid special values include *INTNETADR.

Replace Unprintable Characters:

Key CWBOBJ_KEY_RPLUNPRT

ID 0x0061

Type char[11]

Description
Whether characters that cannot be printed are to be replaced with another character. Valid values are *YES or *NO.

Replacement Character:

Key CWBOBJ_KEY_RPLCHAR

ID 0x0062

Type char[2]

Description
The character that replaces any unprintable characters.

Resource library name:

Key CWBOBJ_KEY_RSCLIB

ID 0x00AE

Type char[11]

Description
The name of the library that contains the external AFP (Advanced Function Print) resource.

Resource name:

Key CWBOBJ_KEY_RSCNAME

ID 0x00AF

Type char[11]

Description
The name of the external AFP resource.

Resource object type:

Key CWBOBJ_KEY_RSCTYPE

ID 0x00B0

Type Long

Description
A numerical, bit encoding of external AFP resource object type. Values are 0x0001, 0x0002, 0x0004, 0x0008, 0x0010 corresponding to *FNTRSC, *FORMDF, *OVL, *PAGSEG, *PAGDFN, respectively.

Restart Printing:

Key CWBOBJ_KEY_RESTART

ID 0x0063

Type long

Description
Restart printing. Valid values are -1, -2, -3, or the page number to restart at. The value *STRPAGE is encoded as -1, the value *ENDPAGE is encoded as -2, and the value *NEXT is encoded as -3.

Save Spooled File:

Key CWBOBJ_KEY_SAVESPLF

ID 0x0064

Type char[11]

Description
Whether the spooled file is to be saved after it is written. Valid values are *YES, *NO.

Seek Offset:

Key CWBOBJ_KEY_SEEKOFF

ID 0x007E

Type long

Description
Seek offset. Allows both positive and negative values relative to the seek origin.

Seek Origin:

Key CWBOBJ_KEY_SEEKORG

ID 0x007F

Type long

Description
Valid values include 1 (beginning or top), 2 (current), and 3 (end or bottom).

Send Priority:

Key CWBOBJ_KEY_SENDPTY

ID 0x0065

Type char[11]

Description
Send priority. Valid values are *NORMAL, *HIGH.

Separator page:

Key CWBOBJ_KEY_SEPPAGE

ID 0x00A1

Type char[11]

Description
Allows a user the option of printing a banner page. Valid values are *YES or *NO.

Source Drawer:

Key CWBOBJ_KEY_SRCDRWR

ID 0x0066

Type long

Description
The drawer to be used when the automatic cut sheet feed option is selected. Valid values are -1, -2, 1-255. The value *E1 is encode as -1, and the value *FORMDF is encoded as -2.

Spool SCS:

Key CWBOBJ_KEY_SPLSCS

ID 0x00AD

Type Long

Description
Determines how SCS data is used during create spool file. Valid values are -1, 0, 1, or the page number. The value *ENDPAGE is encoded as -1. For the value 0, printing starts on page 1. For the value 1, the entire file prints.

Spool the Data:

Key CWBOBJ_KEY_SPOOL

ID 0x0067

Type char[11]

Description
Whether the output data for the printer device is spooled. Valid values are *YES, *NO.

Spooled File Name:

Key CWBOBJ_KEY_SPOOLFILE

ID 0x0068

Type char[11]

Description
The name of the spooled file.

Spooled File Number:

Key CWBOBJ_KEY_SPLFNUM

ID 0x0069

Type long

Description
The spooled file number.

Spooled File Status:

Key CWBOBJ_KEY_SPLFSTATUS

ID 0x006A

Type char[11]

Description
The status of the spooled file. Valid values are *CLOSED, *HELD, *MESSAGE, *OPEN, *PENDING, *PRINTER, *READY, *SAVED, *WRITING.

Spooled Output Schedule:

Key CWBOBJ_KEY_SCHEDULE

ID 0x006B

Type char[11]

Description
Specifies, for spooled files only, when the spooled file is available to the writer. Valid values are *IMMED, *FILEEND, *JOBEND.

Starting Page:

Key CWBOBJ_KEY_STARTPAGE

ID 0x006C

Type long

Description
The page number at which to start printing the spooled file. Valid values are -1, 0, 1, or the page number. The value *ENDPAGE is encoded as -1. For the value 0, printing starts on page 1. For the value 1, the entire file prints.

Text Description:

Key CWBOBJ_KEY_DESCRIPTION

ID 0x006D

Type [51]

Description
Text to describe an instance of an iSeries object.

Time File Opened:

Key CWBOBJ_KEY_TIMEOPEN

ID 0x006E

Type char[7]

Description
The time this spooled file was opened. The time is encoded in a character 0x0005 with the following format, HH MM SS.

Total Pages:

Key CWBOBJ_KEY_PAGES

ID 0x006F

Type long

Description
The number of pages that are contained in a spooled file.

Transform SCS to ASCII:

Key CWBOBJ_KEY_SCS2ASCII

ID 0x0071

Type char[11]

Description
Whether the print data is to be transformed from SCS to ASCII. Valid values are *YES, *NO.

Unit of Measure:

Key CWBOBJ_KEY_UNITOFMEAS

ID 0x0072

Type char[11]

Description
The unit of measure to use for specifying distances. Valid values are *CM, *INCH.

User Comment:

Key CWBOBJ_KEY_USERCMT

ID 0x0073

Type char[101]

Description
The 100 characters of user-specified comment that describe the spooled file.

User Data:

Key CWBOBJ_KEY_USERDATA

ID 0x0074

Type char[11]

Description
The 10 characters of user-specified data that describe the spooled file. Valid special values include *SOURCE.

User defined data:

Key CWBOBJ_KEY_USRDFNDTA

ID 0x00A2

Type char[]

Description
User defined data to be utilized by user applications or user specified programs that process spool files. All characters are acceptable. Max size is 255.

User defined object library:

Key CWBOBJ_KEY_USRDFNOBJLIB

ID 0x00A4

Type char[11]

Description
User defined object library to search by user applications that process spool files.

User defined object name:

Key CWBOBJ_KEY_USRDFNOBJ

ID 0x00A5

Type char[11]

Description
User defined object name to be utilized by user applications that process spool files.

User defined object type:

Key CWBOBJ_KEY_USRDFNOBJTYP

ID 0x00A6

Type char[11]

Description
User defined object type pertaining to the user defined object.

User defined option(s):

Key CWBOBJ_KEY_USEDFNOPTS

ID 0x00A3

Type char[*]

Description
User defined options to be utilized by user applications that process spool files. Up to 4 options may be specifies, each value is length char(10). All characters are acceptable.

User driver program:

Key CWBOBJ_KEY_USRDRVPGMDTA

ID 0x00A9

Type char[11]

Description
User data to be used with the user driver program. All characters are acceptable. Maximum size is 5000 characters.

User driver program library:

Key CWBOBJ_KEY_USRDRVPGMLIB

ID 0x00AA

Type char[11]

Description
User defined library to search for driver program that processes spool files.

User driver program name:

Key CWBOBJ_KEY_USRDRVPGM

ID 0x00AB

Type char[11]

Description
User defined program name that processes spool files.

User ID:

Key CWBOBJ_KEY_TOUSERID

ID 0x0075

Type char[9]

Description
User ID to which the spooled file is sent.

User ID Address:

Key CWBOBJ_KEY_TOADDRESS

ID 0x0076

Type char[9]

Description
Address of user to whom the spooled file is sent.

User transform program library:

Key CWBOBJ_KEY_USRTFMPGMLIB

ID 0x00A7

Type char[11]

Description
User defined library search for transform program.

User transform program name:

Key CWBOBJ_KEY_USETFMPGM

ID 0x00A8

Type char[11]

Description
User defined transform program name that transforms spool file data before it is processed by the driver program.

VM/MVS Class:

Key CWBOBJ_KEY_VMMVSCLASS

ID 0x0077

Type char[2]

Description
VM/MVS class. Valid values are A-Z and 0-9.

When to Automatically End Writer:

Key CWBOBJ_KEY_WTRAUTOEND

ID 0x0078

Type char[11]

Description
When to end the writer if it is to be ended automatically. Valid values are *NORDYF, *FILEEND. Attribute Automatically end writer must be set to *YES.

When to End Writer:

Key CWBOBJ_KEY_WTREND

ID 0x0090

Type char[11]

Description
When to end the writer. Valid value are *CNTRLD, *IMMED, and *PAGEEND. This is different from when to automatically end the writer.

When to Hold File:

Key CWBOBJ_KEY_HOLDTYPE

ID 0x009E

Type char[11]

Description
When to hold the spooled file. Valid values are *IMMED, and *PAGEEND.

Width of Page:

Key CWBOBJ_KEY_PAGEWIDTH

ID 0x0051

Type float

Description
The width of a page. Units of measurement are specified in the measurement method attribute.

Workstation Customizing Object Name:

Key CWBOBJ_KEY_WSCUSTMOBJ

ID 0x0095

Type char[11]

Description
The name of the workstation customizing object.

Workstation Customizing Object Library:

Key CWBOBJ_KEY_WSCUSTMOBJL

ID 0x0096

Type char[11]

Description
the name of the library that contains the workstation customizing object.

Writer Job Name:

Key CWBOBJ_KEY_WRITER

ID 0x0079

Type char[11]

Description
The name of the writer job.

Writer Job Number:

Key CWBOBJ_KEY_WTRJOBNUM

ID 0x007A

Type char[7]

Description
The writer job number.

Writer Job Status:

Key CWBOBJ_KEY_WTRJOBSTS

ID 0x007B

Type char[11]

Description
The status of the writer job. Valid values are STR, END, JOBQ, HLD, MSGW.

Writer Job User Name:

Key CWBOBJ_KEY_WTRJOBUSER

ID 0x007C

Type char[11]

Description
The name of the user that started the writer job.

Writer Starting Page:

Key CWBOBJ_KEY_WTRSTRPAGE

ID 0x008F

Type long

Description
Specifies the page number of the first page to print from the first spooled file when the writer job starts. This is only valid if the spooled file name is also specified when the writer starts.

Network Print Server Object Attributes:

The follow list is for object attributes for the network print server.

NPS Attribute Default Value:

Key CWBOBJ_KEY_ATTRDEFAULT

ID 0x0083

Type dynamic

Description
Default value for the attribute.

NPS Attribute High Limit:

Key CWBOBJ_KEY_ATTRMAX

ID 0x0084

Type dynamic

Description
High limit of the attribute value.

NPS Attribute ID:

Key CWBOBJ_KEY_ATTRID

ID 0x0085

Type long

Description
ID of the attribute.

NPS Attribute Low Limit:

Key CWBOBJ_KEY_ATTRMIN

ID 0x0086

Type dynamic

Description
Low limit of the attribute value.

NPS Attribute Possible Value:

Key CWBOBJ_KEY_ATTRPOSSIBL

ID 0x0087

Type dynamic

Description
Possible value for the attribute. More than one NPS possible value instance may be present in a code point.

NPS Attribute Text Description:

Key CWBOBJ_KEY_ATTRDESCRIPT

ID 0x0088

Type char(*)

Description
Text description that provides a name for the attribute.

NPS Attribute Type:

Key CWBOBJ_KEY_ATTRTYPE

ID 0x0089

Type long

Description
The type of the attribute. Valid values are the types that are defined by the Network Print Server.

NPS CCSID:

Key CWBOBJ_KEY_NPSCCSID

ID 0x008A

Type long

Description
CCSID that the Network Print Server expects that all strings will be encoded in.

NPS Object:

Key CWBOBJ_KEY_NPSOBJECT

ID 0x008B

Type long

Description
Object ID. Valid values are the objects that are defined by the Network Print Server.

NPS Object Action:

Key CWBOBJ_KEY_NPSACTION

ID 0x008C

Type long

Description
Action ID. Valid values are the actions that are defined by the Network Print Server.

NPS Level:

Key CWBOBJ_KEY_NPSLEVEL

ID 0x008D

Type char[7]

Description

The version, release, and modification level of the Network Print Server. This attribute is a character string encoded as VXRYMY (ie. ″V3R1M0″) where

```
                X is in (0..9)
                Y is in (0..9,A..Z)
```

List APIs for iSeries Access for Windows

The following iSeries Access for Windows APIs pertain to List objects. The APIs are listed alphabetically.

Note: When working with handles in the following APIs, 0 never will be returned as a valid handle.

cwbOBJ_CloseList:

Purpose

Closes an opened list.

Syntax

```
unsigned int CWB_ENTRY  cwbOBJ_CloseList(
                                cwbOBJ_ListHandle  listHandle,
                                cwbSV_ErrHandle    errorHandle);
```

Parameters

cwbOBJ_ListHandle listHandle - input
Handle of the list to be closed. This list must be opened.

cwbSV_ErrHandle errorHandle - output
Optional, may be 0. Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle() API. The messages may be retrieved through the cwbSV_GetErrText() API. If the parameter is set to zero, no messages will be retrievable.

Return Codes

The following list shows common return values.

CWB_NO_ERROR
Successful completion.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory.

CWB_INVALID_HANDLE
Handle is not an allocated list handle.

CWBOBJ_RC_LIST_NOT_OPEN
The list isn't open.

Usage

Closing the list frees the memory used by the list to hold its items. Any object handles gotten with cwbOBJ_GetObjHandle() API should be released before closing the list to free resources. These handles are no longer valid.

cwbOBJ_CreateListHandle:

Purpose

Allocates a handle for a list of objects. After a list handle has been allocated, the filter criteria may be set for the list with the cwbOBJ_SetListFilter() API, the list may be built with the cwbOBJ_OpenList() API, etc. cwbOBJ_DeleteListHandle() should be called to deallocated this list handle and free any resources used by it.

Syntax

```
unsigned int CWB_ENTRY  cwbOBJ_CreateListHandle(
                              const char        *systemName,
                              cwbOBJ_ListType    type,
                              cwbOBJ_ListHandle *listHandle,
                              cwbSV_ErrHandle    errorHandle);
```

Parameters

const char *systemName - input
Pointer to the system name contained in ASCIIZ string

cwbOBJ_ListType type - input
Type of list to allocate (eg. spooled file list, output queue list, etc).

cwbOBJ_ListHandle *listHandle - output
Pointer to a list handle that will be passed back on output. This handle is needed for other calls using the list.

cwbSV_ErrHandle errorHandle - output
Optional, may be 0. Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle() API. The messages may be retrieved through the cwbSV_GetErrText() API. If the parameter is set to zero, no messages will be retrievable.

Return Codes

The following list shows common return values.

CWB_NO_ERROR
Successful completion.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory.

CWB_NON_REPRESENTABLE_UNICODE_CHAR
One or more input Unicode characters have no representation in the codepage that is being used.

CWB_API_ERROR
General API failure.

Usage

Caller must call cwbOBJ_DeleteListHandle when done using this list handle. Typical calling sequence for retrieving a list of objects would be:

1. cwbOBJ_CreateListHandle()
2. cwbOBJ_SetListFilter() { repeated as needed }
3. cwbOBJ_OpenList()
4. cwbOBJ_GetListSize() to get the size of the list.
5. For n=0 to list size - 1 cwbOBJ_GetObjHandle for list item in position n do something with the object cwbOBJ_DeleteObjHandle()
6. cwbOBJ_CloseList() - You may go back to step 2 here.
7. cwbOBJ_DeleteListHandle()

cwbOBJ_DeleteListHandle:

Purpose

Deallocates a list handle that was previously allocated with the cwbOBJ_CreateListHandle() API. This will free any resources associated with the list.

Syntax

```
unsigned int CWB_ENTRY  cwbOBJ_DeleteListHandle(
                              cwbOBJ_ListHandle  listHandle,
                              cwbSV_ErrHandle    errorHandle);
```

Parameters

cwbOBJ_ListHandle listHandle - input
List handle that will be deleted.

cwbSV_ErrHandle errorHandle - output
Optional, may be 0. Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle() API. The messages may be retrieved through the cwbSV_GetErrText() API. If the parameter is set to zero, no messages will be retrievable.

Return Codes

The following list shows common return values.

CWB_NO_ERROR
Successful completion.

CWB_INVALID_HANDLE
List handle not found.

Usage

If the list associated with this handle is opened, this call will close it. If there are opened handles to objects in this list, they will no longer be valid. After this call returns successfully, the list handle is no longer valid.

cwbOBJ_GetListSize:

Purpose

Get the size of an opened list.

Syntax

```
unsigned int CWB_ENTRY  cwbOBJ_GetListSize(
                              cwbOBJ_ListHandle   listHandle,
                              unsigned long      *size,
                              cwbOBJ_List_Status *listStatus,
                              cwbSV_ErrHandle     errorHandle);
```

Parameters

cwbOBJ_ListHandle listHandle - input
Handle of the list to get the size of. This list must be opened.

unsigned long *size - output
On output, this will be set to the current size of the list.

cwbOBJ_List_Status *listStatus - output
Optional, may be NULL. This will always be CWBOBJ_LISTSTS_COMPLETED for lists opened synchronously.

cwbSV_ErrHandle errorHandle - output
Optional, may be 0. Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle() API. The messages may be retrieved through the cwbSV_GetErrText() API. If the parameter is set to zero, no messages will be retrievable.

Return Codes

The following list shows common return values.

CWB_NO_ERROR
Successful completion.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory.

CWB_INVALID_HANDLE
Handle is not an allocated list handle.

CWBOBJ_RC_HOST_ERROR
Host error occurred. Text may be in errorHandle.

CWBOBJ_RC_LIST_NOT_OPEN
The list isn't open.

Usage

None

cwbOBJ_OpenList:

Purpose

Open the list. This actually builds the list. Caller must call the cwbOBJ_ClostList() API when done with the list to free resources. After the list is opened, the caller may use other APIs on the list to do things such as get the list size and get object handles to items in the list.

Syntax

```
unsigned int CWB_ENTRY  cwbOBJ_OpenList(
                             cwbOBJ_ListHandle     listHandle,
                             cwbOBJ_List_OpenType  openType,
                             cwbSV_ErrHandle       errorHandle);
```

Parameters

cwbOBJ_ListHandle listHandle - input
Handle of the list to open.

cwbOBJ_List_OpenType openHandle - input
Manner in which to open the list. Must be set to CWBOBJ_LIST_OPEN_SYNCH

cwbSV_ErrHandle errorHandle - output
Optional, may be 0. Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle() API. The messages may be retrieved through the cwbSV_GetErrText() API. If the parameter is set to zero, no messages will be retrievable.

Return Codes

The following list shows common return values.

CWB_NO_ERROR
Successful completion.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory.

CWB_INVALID_HANDLE
Handle is not an allocated list handle.

CWBOBJ_RC_LIST_OPEN
The list is already open.

CWBOBJ_RC_HOST_ERROR
Host error occurred. Text may be in errorHandle.

CWBOBJ_RC_NOHOSTSUPPORT
Host doesn't support this type of list.

Usage

None

cwbOBJ_ResetListAttrsToRetrieve:

Purpose

Resets the list attributes to retrieve information to its default list.

Syntax

```
unsigned int CWB_ENTRY  cwbOBJ_ResetListAttrsToRetrieve(
                              cwbOBJ_ListHandle   listHandle,
                              cwbSV_ErrHandle     errorHandle);
```

Parameters

cwbOBJ_ListHandle listHandle - input
List handle to reset.

cwbSV_ErrHandle errorHandle - output
Optional, may be 0. Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle() API. The messages may be retrieved through the cwbSV_GetErrText() API. If the parameter is set to zero, no messages will be retrievable.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion

CWB_INVALID_HANDLE
Handle is not an allocated list handle.

Usage

Use this call to reset the list handle's list of attributes to retrieve after calling cwbOBJ_SetListAttrsToRetrieve().

cwbOBJ_ResetListFilter:

Purpose

Resets the filter on a list to what it was when the list was first allocated (the default filter).

Syntax

```
unsigned int CWB_ENTRY  cwbOBJ_ResetListFilter(
                            cwbOBJ_ListHandle  listHandle,
                            cwbSV_ErrHandle    errorHandle);
```

Parameters

cwbOBJ_ListHandle listHandle - input
Handle of the list to have its filter reset.

cwbSV_ErrHandle errorHandle - output
Optional, may be 0. Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle() API. The messages may be retrieved through the cwbSV_GetErrText() API. If the parameter is set to zero, no messages will be retrievable.

Return Codes

The following list shows common return values.

CWB_NO_ERROR
Successful completion.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory.

CWB_INVALID_HANDLE
Handle is not allocated list handle.

Usage

The list must be closed and reopened for the change to take affect.

cwbOBJ_SetListAttrsToRetrieve:

Purpose

An optional function that may be applied to list handle before the list is opened. The purpose of doing this is to improve efficiency by allowing the cwbOBJ_OpenList() API to retrieve just the attributes of each object that the application will be using.

Syntax

```
unsigned int CWB_ENTRY  cwbOBJ_SetListAttrsToRetrieve(
                            cwbOBJ_ListHandle    listHandle,
                            unsigned long        numKeys,
                            const cwbOBJ_KeyID  *keys,
                            cwbSV_ErrHandle      errorHandle);
```

Parameters

cwbOBJ_ListHandle listHandle - input
List handle to apply the list of attribute keys to.

unsigned long numKeys - input
The number of keys pointed to by the 'keys' parameter. May be 0, which means that no attributes are needed for objects in the list.

const cwbOBJ_KeyID *keys - input
An array of numKeys keys that are the IDs of the attributes to be retrieved for each object in the list when the list is opened.

cwbSV_ErrHandle errorHandle - output
Optional, may be 0. Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle() API. The messages may be retrieved through the cwbSV_GetErrText() API. If the parameter is set to zero, no messages will be retrievable.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion

CWB_NOT_ENOUGH_MEMORY
Insufficient memory.

CWB_INVALID_HANDLE
Handle is not an allocated list handle.

CWB_INVALID_PARAMETER
Invalid parameter specified.

Usage

This call is used to provide a clue to the cwbOBJ_OpenList() API as to what attributes the application is interested in for the objects that are listed. Using this information, the cwbOBJ_OpenList() API can be more efficient. The attribute keys that are valid in the 'keys' list depend on type of object being listed (set on cwbOBJ_CreateListHandle()) Call cwbOBJ_ResetListAttrsToRetrieve() to reset the list to its default list of keys.

cwbOBJ_SetListFilter:

Purpose

Sets filters for the list. This filter is applied the next time cwbOBJ_OpenList() is called.

Syntax

```
unsigned int CWB_ENTRY  cwbOBJ_SetListFilter(
                             cwbOBJ_ListHandle  listHandle,
                             cwbOBJ_KeyID       key,
                             const char        *value,
                             cwbSV_ErrHandle    errorHandle);
```

Parameters

cwbOBJ_ListHandle listHandle - input
List handle that this filter will be applied to.

cwbOBJ_KeyID key - input
The id of the filtering field to be set.

const void *value - input
The value this field should be set to.

cwbSV_ErrHandle errorHandle - output
Optional, may be 0. Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle() API. The messages may be retrieved through the cwbSV_GetErrText() API. If the parameter is set to zero, no messages will be retrievable.

Return Codes

The following list shows common return values.

CWB_NO_ERROR
Successful completion.

CWB_INVALID_HANDLE
List handle not found.

CWB_NON_REPRESENTABLE_UNICODE_CHAR
One or more input Unicode characters have no representation in the codepage being used.

CWB_API_ERROR
General API failure.

Usage

The value of key will determine the type that is pointed to value. The length of value is determined by its type. The following filters may be set against these list types Spooled File Lists:

- CWBOBJ_LIST_SPLF:
  - CWBOBJ_KEY_USER

    Specifies which user's spooled files are to be listed. May be a specific user ID or one of these special values: *ALL - all users. *CURRENT - list spooled files for the current user only. *CURRENT is the default.
  - CWBOBJ_KEY_OUTQUELIB

    Specifies which libraries to search for output queues in. May be a specific name or one of these special values: ″″ - if the OUTQUEUE key word is *ALL, this combination will search all output queue on the system. *CURLIB - the current library *LIBL - the library list *LIBL is the default if the OUTQUE filter is not *ALL. ″″ is the default if the OUTQU filter is set to *ALL.
  - CWBOBJ_KEY_OUTQUE

    Specifies which output queues to search for spooled files on May be a specific name or the special value *ALL. *ALL is the default.
  - CWBOBJ_KEY_FORMTYPE

    Specifies which spooled files are listed by the form type attribute that they have. May be a specific name or one of these special values: *ALL - spooled files with any form type are listed. *STD - spooled files with the form type of *STD are listed *ALL is the default.
  - CWBOBJ_KEY_USERDATA

    Specifies which spooled files are listed by the user data that they have. May be a specific value or one of these special values: *ALL - spooled files with any user data value are listed. *ALL is the default.

Output Queue Lists:

- CWBOBJ_LIST_OUTQ:
  - CWBOBJ_KEY_OUTQUELIB

    Specifies which libraries to search for output queues in. May be a specific name, a generic name or any of these special values: *ALL - all libraries *ALLUSER - all user-defined libraries, plus libraries containing user data and having names starting with Q *CURLIB - the current library *LIBL - the library list *USRLIBL - the user portion o the library list. *LIBL is the default.
  -
    - CWBOBJ_KEY_OUTQUE

      Specifies which output queues to list. May be a specific name, a generic name or *ALL. *ALL is the default.

Printer Device Description Lists:

- CWBOBJ_LIST_PRTD:
  - CWBOBJ_KEY_PRINTER

Specifies which printer device to list. May be a specific name, a generic name or *ALL. *ALL is the default.

Printer File Lists:

- CWBOBJ_LIST_PRTF:
  - CWBOBJ_KEY_PRTRFILELIB

    Specifies which libraries to search for printer files in. May be a specific name, a generic name or any of these special values:
    - *ALL - all libraries
    - *ALLUSER - all user-defined libraries, plus libraries containing user data and having names starting with Q
    - *CURLIB - the current library
    - *LIBL - the library list
    - *USRLIBL - the user portion o the library list.
    - *ALL is the default.
  - CWBOBJ_KEY_PRTRFILE

    Specifies which printer files to list. May be a specific name, a generic name or *ALL. *ALL is the default.

Writer Job Lists:

- CWBOBJ_LIST_WTR:
  - CWBOBJ_KEY_WRITER

    Specifies which writer jobs to list. May be a specific name, a generic name or *ALL. *ALL is the default.
  - CWBOBJ_KEY_OUTQUELIB & CWBOBJ_KEY_OUTQUE

    These filters are used together to get a list of writers active to a particular output queue. If the OUTQUE key is specified the WRITER key is ignored. (all writers for the specified output queue are listed). If the OUTQUE key is specified and the OUTQUELIB isn't, the OUTQUEULIB will default to *LIBL - the system library list. The default is for neither of these to be specified.

Library Lists:

- CWBOBJ_LIST_LIB:
  - CWBOBJ_KEY_LIBRARY

    Specifies which libraries to list. May be a specific name, a generic name or any of these special values:
    - *ALL - all libraries
    - *CURLIB - the current library
    - *LIBL - the library list
    - *USRLIBL - the user portion o the library list.
    - *USRLIBL is the default.
- CWBOBJ_LIST_RSC:
  - Resources can be lists in a spooled file (lists all of the external AFP resources used by this spooled file) or in a library or set of libraries. To list resources for a spooled file, use the cwbOBJ_SetListFilterWithSplF API along with the SetListFilter API for the RSCTYPE and RSCNAME attributes.
    - CWBOBJ_KEY_RSCLIB

      Specifies which libraries to search for resources in. This filter is ignored if the list is filter by spooled file (for example, SetListFilterWithSplF). May be a specific name, a generic name or any of these special values:

- *ALL - all libraries
- *ALLUSR - All user-defined libraries, plus libraries containing user data and having names starting with Q.
- *CURLIB - the current library
- *LIBL - the library list
- *USRLIBL - the user portion o the library list.
- *LIBL is the default.

- CWBOBJ_KEY_RSCNAME

  Specifies which resources to list by name. May be a specific name, a generic name or *ALL.

  *ALL is the default.

- CWBOBJ_KEY_RESCTYPE

  Specifies which type of resources to list. May be any combination of the following bits logically OR'd together:

  - CWBOBJ_AFPRSC_FONT
  - CWBOBJ_AFPRSC_FORMDEF
  - CWBOBJ_AFPRSC_OVERLAY
  - CWBOBJ_AFPRSC_PAGESEG
  - CWBOBJ_AFPRSC_PAGEDEF

cwbOBJ_SetListFilterWithSplF:

Purpose

Sets filter for a list to a spooled file. For listing resources this limits the resources returned by the openList to those used by the spooled file.

Syntax

```
unsigned int CWB_ENTRY  cwbOBJ_SetListFilterWithSplF(
                              cwbOBJ_ListHandle  listHandle,
                              cwbOBJ_ObjHandle   splFHandle,
                              cwbSV_ErrHandle    errorHandle);
```

Parameters

cwbOBJ_ListHandle listHandle - input
List handle that this filter will be applied to.

cwbOBJ_ObjHandle splFHandle - input
Handle of the spooled file to filter on.

cwbSV_ErrHandle errorHandle - output
Optional, may be 0. Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle() API. The messages may be retrieved through the cwbSV_GetErrText() API. If the parameter is set to zero, no messages will be retrievable.

Return Codes

The following list shows common return values.

CWB_NO_ERROR
Successful completion.

CWBOBJ_RC_INVALID_TYPE
Incorrect type of list.

CWB_INVALID_HANDLE
List handle not found or bad spooled file handle.

Usage

Filtering by spooled file is used when listing AFP resources so the list type must be CWBOBJ_LIST_RSC. If you filter resources based on a spooled file you cannot also filter based on a library or libraries. The resource library filter will be ignored if both are specified. Resetting a list filter will also reset the spooled file filter to nothing.

Object APIs for iSeries Access for Windows

The following iSeries Access for Windows APIs pertain to Objects. The APIs are listed alphabetically.

Note: When working with handles in the following APIs, 0 never will be returned as a valid handle.

cwbOBJ_CopyObjHandle:

Purpose

Creates a duplicate handle to an object. Use this API to get another handle to the same iSeries object. This new handle will be valid until the cwbOBJ_DeleteObjHandle() API has been called to release it.

Syntax

```
unsigned int CWB_ENTRY  cwbOBJ_CopyObjHandle(
                              cwbOBJ_ObjHandle   objectHandle,
                              cwbOBJ_ObjHandle  *newObjectHandle,
                              cwbSV_ErrHandle    errorHandle);
```

Parameters

cwbOBJ_ObjHandle objectHandle - input
Handle of the object to copy.

cwbOBJ_ObjHandle *newObjectHandle - output
Upon successful competition of this call, this handle will contain the new object handle.

cwbSV_ErrHandle errorHandle - output
Optional, may be 0. Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle() API. The messages may be retrieved through the cwbSV_GetErrText() API. If the parameter is set to zero, no messages will be retrievable.

Return Codes

The following list shows common return values.

CWB_NO_ERROR
Successful completion.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory.

CWB_INVALID_HANDLE
Handle is not an allocated object handle.

Usage

If you have a handle to an object in a list and wish to maintain a handle to that object after the list has been close this API allows you to do that. cwbOBJ_DeleteObjHandle() must be called to release resources for this handle.

cwbOBJ_DeleteObjHandle:

Purpose

Releases a handle to an object.

Syntax

```
unsigned int CWB_ENTRY  cwbOBJ_DeleteObjHandle(
                              cwbOBJ_ObjHandle  objectHandle,
                              cwbSV_ErrHandle   errorHandle);
```

Parameters

cwbOBJ_ObjHandle objectHandle - input
Handle of the object to release.

cwbSV_ErrHandle errorHandle - output
Optional, may be 0. Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle() API. The messages may be retrieved through the cwbSV_GetErrText() API. If the parameter is set to zero, no messages will be retrievable.

Return Codes

The following list shows common return values.

CWB_NO_ERROR
Successful completion.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory.

CWB_INVALID_HANDLE
Handle is not an allocated object handle.

Usage

None

cwbOBJ_GetObjAttr:

Purpose

Get an attribute of an object.

Syntax

```
unsigned int CWB_ENTRY cwbOBJ_GetObjAttr(
                             cwbOBJ_ObjHandle  objectHandle,
                             cwbOBJ_KeyID      key,
                             void             *buffer,
                             unsigned long     bufLen,
                             unsigned long    *bytesNeeded,
                             cwbOBJ_DataType  *keyType,
                             cwbSV_ErrHandle   errorHandle);
```

Parameters

cwbOBJ_ObjHandle objectHandle - input
Handle of the object to get the attribute for.

cwbOBJ_KeyID key - input
Identifying key of the attribute to retrieve. The CWBOBJ_KEY_XXX constants define the key ids. The type of object pointed to by objectHandle determine which keys are valid.

void *buffer - output
The buffer that will hold the attribute value, if this call returns successfully. The value of the key determines what type of data will be put into pBuffer. The type is also returned to the *keyType parameter, if provided.

unsigned long bufLen - input
The length of the buffer pointed to by pBuffer.

unsigned long *bytesNeeded - output
On output, this will be the number of bytes needed to hold result.

cwbOBJ_DataType *keyType - output
Optional, may be NULL. On output this will contain the type of data used to represent this attribute and what is stored at *buffer.

cwbSV_ErrHandle errorHandle - output
Optional, may be 0. Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle() API. The messages may be retrieved through the cwbSV_GetErrText() API. If the parameter is set to zero, no messages will be retrievable.

Return Codes

The following list shows common return values.

CWB_NO_ERROR
Successful completion.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory.

CWB_INVALID_HANDLE
Handle is not an allocated object handle.

CWB_BUFFER_OVERFLOW
Buffer too small.

CWBOBJ_RC_HOST_ERROR
Host error occurred. Text may be in errorHandle.

CWBOBJ_RC_INVALID_KEY
Key isn't valid.

CWB_API_ERROR
General API failure.

Usage

The following attributes may be retrieved for these object types:

- CWBOBJ_LIST_SPLF:

```
CWBOBJ_KEY_AFP         - AFP resources used
CWBOBJ_KEY_ALIGN       - Align page
CWBOBJ_KEY_BKMGN_ACR   - Back margin across
CWBOBJ_KEY_BKMGN_DWN   - Back margin down
CWBOBJ_KEY_BKOVRLLIB   - Back overlay library name
CWBOBJ_KEY_BKOVRLAY    - Back overlay name
CWBOBJ_KEY_BKOVL_ACR   - Back overlay offset across
CWBOBJ_KEY_BKOVL_DWN   - Back overlay offset down
CWBOBJ_KEY_CPI         - Characters per inch
CWBOBJ_KEY_CODEDFNTLIB - Coded font library name
```

```
CWBOBJ_KEY_CODEDFNT    - Coded font
CWBOBJ_KEY_COPIES      - Copies (total)
CWBOBJ_KEY_COPIESLEFT  - Copies left to produce
CWBOBJ_KEY_CURPAGE     - Current page
CWBOBJ_KEY_DATE        - Date file was opened
CWBOBJ_KEY_PAGRTT      - Degree of page rotation
CWBOBJ_KEY_ENDPAGE     - Ending page
CWBOBJ_KEY_FILESEP     - File separators
CWBOBJ_KEY_FOLDREC     - Wrap text to next line
CWBOBJ_KEY_FONTID      - Font identifier to use (default)
CWBOBJ_KEY_FORMFEED    - Form feed
CWBOBJ_KEY_FORMTYPE    - Form type
CWBOBJ_KEY_FTMGN_ACR   - Front margin across
CWBOBJ_KEY_FTMGN_DWN   - Front margin down
CWBOBJ_KEY_FTOVRLLIB   - Front overlay library name
CWBOBJ_KEY_FTOVRLAY    - Front overlay
CWBOBJ_KEY_FTOVL_ACR   - Front overlay offset across
CWBOBJ_KEY_FTOVL_DWN   - Front overlay offset down
CWBOBJ_KEY_CHAR_ID     - Graphic character set
CWBOBJ_KEY_JUSTIFY     - Hardware justification
CWBOBJ_KEY_HOLD        - Hold the spool file
CWBOBJ_KEY_JOBNAME     - Name of the job that created file
CWBOBJ_KEY_JOBNUMBER   - Number of the job that created file
CWBOBJ_KEY_USER        - Name of the user that created file
CWBOBJ_KEY_LASTPAGE    - Last page that printed
CWBOBJ_KEY_LPI         - Lines per inch
CWBOBJ_KEY_MAXRECORDS  - Maximum number of records allowed
CWBOBJ_KEY_OUTPTY      - Output priority
CWBOBJ_KEY_OUTQUELIB   - Output queue library name
CWBOBJ_KEY_OUTQUE      - Output queue
CWBOBJ_KEY_OVERFLOW    - Overflow line number
CWBOBJ_KEY_PAGELEN     - Page length
CWBOBJ_KEY_MEASMETHOD  - Measurement method
CWBOBJ_KEY_PAGEWIDTH   - Page width
CWBOBJ_KEY_MULTIUP     - Logical pages per physical side
CWBOBJ_KEY_POINTSIZE   - The default font's point size
CWBOBJ_KEY_FIDELITY    - The error handling when printing
CWBOBJ_KEY_DUPLEX      - Print on both sides of paper
CWBOBJ_KEY_PRTQUALITY  - Print quality
CWBOBJ_KEY_PRTTEXT     - Text printed at bottom of each page
CWBOBJ_KEY_PRTDEVTYPE  - Printer dev type (data stream type)
CWBOBJ_KEY_PRTRFILELIB - Printer file library
CWBOBJ_KEY_PRTRFILE    - Printer file
CWBOBJ_KEY_RECLENGTH   - Record length
CWBOBJ_KEY_RPLUNPRT    - Replace unprintable characters
CWBOBJ_KEY_RPLCHAR     - Character to replace unprintables
CWBOBJ_KEY_RESTART     - Where to restart printing at
CWBOBJ_KEY_SAVESPLF    - Save file after printing
CWBOBJ_KEY_SRCDRWR     - Source drawer
CWBOBJ_KEY_SPOOLFILE   - Spool file name
CWBOBJ_KEY_SPLFNUM     - Spool file number
CWBOBJ_KEY_SPLFSTATUS  - Spool file status
CWBOBJ_KEY_STARTPAGE   - Starting page to print
CWBOBJ_KEY_TIME        - Time spooled file was opened at
CWBOBJ_KEY_PAGES       - Number of pages in spool file
CWBOBJ_KEY_UNITOFMEAS  - Unit of measure
CWBOBJ_KEY_USERCMT     - User comment
CWBOBJ_KEY_USERDATA    - User data
CWBOBJ_KEY_USRDFNDTA   - User defined data
CWBOBJ_KEY_USRDFNOPTS  - User defined options
CWBOBJ_KEY_USRDFNOBJ   - User defined object
CWBOBJ_KEY_USRDFNOBJLIB- User defined object library
CWBOBJ_KEY_USRDFNOBJTYP- User defined object type
```

- CWBOBJ_LIST_OUTQ:

```
CWBOBJ_KEY_AUTHCHCK    - authority to check
CWBOBJ_KEY_DATAQUELIB  - data queue library
CWBOBJ_KEY_DATAQUE     - data queue
CWBOBJ_KEY_DESCRIPTION - text description
CWBOBJ_KEY_DISPLAYANY  - users can display any file on queue
CWBOBJ_KEY_JOBSEPRATR  - number of job separators
CWBOBJ_KEY_NUMFILES    - total spooled files on output queue
CWBOBJ_KEY_NUMWRITERS  - number of writers started to queue
CWBOBJ_KEY_OPCNTRL     - operator controlled
CWBOBJ_KEY_ORDER       - order on queue (sequence)
CWBOBJ_KEY_OUTQUELIB   - output queue library name
CWBOBJ_KEY_OUTQUE      - output queue
CWBOBJ_KEY_OUTQUESTS   - output queue status
CWBOBJ_KEY_PRINTER     - printer
CWBOBJ_KEY_SEPPAGE     - print banner page
CWBOBJ_KEY_USRDFNDTA   - user defined data
CWBOBJ_KEY_USRDFNOBJ   - user defined object
CWBOBJ_KEY_USRDFNOBJLIB- user defined object library
CWBOBJ_KEY_USRDFNOBJTYP- user defined object type
CWBOBJ_KEY_USRDFNOPTS  - user defined options
CWBOBJ_KEY_USRDRVPGM   - user driver program
CWBOBJ_KEY_USRDRVPGMLIB- user driver program library
CWBOBJ_KEY_USRDRVPGMDTA- user driver program data
CWBOBJ_KEY_USRTFMPGM   - user data transform program
CWBOBJ_KEY_USRTFMPGMLIB- user data transform program library
CWBOBJ_KEY_WRITER      - writer job name
CWBOBJ_KEY_WTRJOBNUM   - writer job number
CWBOBJ_KEY_WTRJOBSTS   - writer job status
CWBOBJ_KEY_WTRJOBUSER  - writer job user
```

- CWBOBJ_LIST_PRTD:

```
CWBOBJ_KEY_AFP         - AFP resources used
CWBOBJ_KEY_CODEPAGE    - code page
CWBOBJ_KEY_DEVCLASS    - device class
CWBOBJ_KEY_DEVMODEL    - device model
CWBOBJ_KEY_DEVTYPE     - device type
CWBOBJ_KEY_DRWRSEP     - drawer to use for separators
CWBOBJ_KEY_FONTID      - font identifier
CWBOBJ_KEY_FORMFEED    - form feed
CWBOBJ_KEY_CHAR_ID     - graphic character set
CWBOBJ_KEY_MFGTYPE     - manufacturer's type & model
CWBOBJ_KEY_MSGQUELIB   - message queue library
CWBOBJ_KEY_MSGQUE      - message queue
CWBOBJ_KEY_POINTSIZE   - default font's point size
CWBOBJ_KEY_PRINTER     - printer
CWBOBJ_KEY_PRTQUALITY  - print quality
CWBOBJ_KEY_DESCRIPTION - text description
CWBOBJ_KEY_SCS2ASCII   - transform SCS to ASCII
CWBOBJ_KEY_USRDFNDTA   - user defined data
CWBOBJ_KEY_USRDFNOPTS  - user defined options
CWBOBJ_KEY_USRDFNOBJLIB- user defined object library
CWBOBJ_KEY_USRDFNOBJ   - user defined object
CWBOBJ_KEY_USRDFNOBJTYP- user defined object type
CWBOBJ_KEY_USRTFMPGMLIB- user data transform
                         program library
CWBOBJ_KEY_USRTFMPGM   - user data transform program
CWBOBJ_KEY_USRDRVPGMDTA- user driver program data
CWBOBJ_KEY_USRDRVPGMLIB- user driver program library
CWBOBJ_KEY_USRDRVPGM   - user driver program
```

- CWBOBJ_LIST_PRTF:

```
CWBOBJ_KEY_ALIGN       - align page
CWBOBJ_KEY_BKMGN_ACR   - back margin across
CWBOBJ_KEY_BKMGN_DWN   - back margin down
CWBOBJ_KEY_BKOVRLLIB   - back side overlay library
CWBOBJ_KEY_BKOVRLAY    - back side overlay name
CWBOBJ_KEY_BKOVL_DWN   - back overlay offset down
```

```
CWBOBJ_KEY_BKOVL_ACR   - back overlay offset across
CWBOBJ_KEY_CPI         - characters per inch
CWBOBJ_KEY_CODEDFNTLIB - coded font library name
CWBOBJ_KEY_CODEPAGE    - code page
CWBOBJ_KEY_CODEDFNT    - coded font
CWBOBJ_KEY_COPIES      - copies (total)
CWBOBJ_KEY_DBCSDATA    - contains DBCS character set data
CWBOBJ_KEY_DBCSEXTENSN - process DBCS extension
                         characters
CWBOBJ_KEY_DBCSROTATE  - rotate DBCS characters
CWBOBJ_KEY_DBCSCPI     - DBCS CPI
CWBOBJ_KEY_DBCSSISO    - DBCS SI/SO positioning
CWBOBJ_KEY_DFR_WRITE   - defer write
CWBOBJ_KEY_PAGRTT      - degree of page rotation
CWBOBJ_KEY_ENDPAGE     - ending page number to print
CWBOBJ_KEY_FILESEP     - number of file separators
CWBOBJ_KEY_FOLDREC     - wrap text to next line
CWBOBJ_KEY_FONTID      - Font identifier to use (default)
CWBOBJ_KEY_FORMFEED    - type of paperfeed to be used
CWBOBJ_KEY_FORMTYPE    - name of the form to be used
CWBOBJ_KEY_FTMGN_ACR   - front margin across
CWBOBJ_KEY_FTMGN_DWN   - front margin down
CWBOBJ_KEY_FTOVRLLIB   - front side overlay library
CWBOBJ_KEY_FTOVRLAY    - front side overlay name
CWBOBJ_KEY_FTOVL_ACR   - front overlay offset across
CWBOBJ_KEY_FTOVL_DWN   - front overlay offset down
CWBOBJ_KEY_CHAR_ID     - graphic character set for this file
CWBOBJ_KEY_JUSTIFY     - hardware justification
CWBOBJ_KEY_HOLD        - hold the spool file
CWBOBJ_KEY_LPI         - lines per inch
CWBOBJ_KEY_MAXRCDS     - maximum number of records allowed
CWBOBJ_KEY_OUTPTY      - output priority
CWBOBJ_KEY_OUTQUELIB   - output queue library
CWBOBJ_KEY_OUTQUE      - output queue
CWBOBJ_KEY_OVERFLOW    - overflow line number
CWBOBJ_KEY_LINES_PAGE  - page length in lines per page
CWBOBJ_KEY_PAGELEN     - page length in Units of Measurement
CWBOBJ_KEY_MEASMETHOD  - measurement method
                         (*ROWCOL or *UOM)
CWBOBJ_KEY_CHAR_LINE   - page width in characters per line
CWBOBJ_KEY_PAGEWIDTH   - width of page in Units of Measure
CWBOBJ_KEY_MULTIUP     - logical pages per physical side
CWBOBJ_KEY_POINTSIZE   - the default font's point size
CWBOBJ_KEY_FIDELITY    - the error handling when printing
CWBOBJ_KEY_DUPLEX      - print on both sides of paper
CWBOBJ_KEY_PRTQUALITY  - print quality
CWBOBJ_KEY_PRTTEXT     - text printed at bottom of each page
CWBOBJ_KEY_PRINTER     - printer device name
CWBOBJ_KEY_PRTDEVTYPE  - printer dev type (data stream type)
CWBOBJ_KEY_PRTRFILELIB - printer file library
CWBOBJ_KEY_PRTRFILE    - printer file
CWBOBJ_KEY_RPLUNPRT    - replace unprintable characters
CWBOBJ_KEY_RPLCHAR     - character to replace unprintables
CWBOBJ_KEY_SAVE        - save spooled file after printing
CWBOBJ_KEY_SRCDRWR     - source drawer
CWBOBJ_KEY_SPOOL       - spool the data
CWBOBJ_KEY_SCHEDULE    - when available to the writer
CWBOBJ_KEY_STARTPAGE   - starting page to print
CWBOBJ_KEY_DESCRIPTION - text description
CWBOBJ_KEY_UNITOFMEAS  - unit of measure
CWBOBJ_KEY_USERDATA    - user data
CWBOBJ_KEY_USRDFNDTA   - User defined data
CWBOBJ_KEY_USRDFNOPTS  - User defined options
CWBOBJ_KEY_USRDFNOBJLIB- User defined object library
CWBOBJ_KEY_USRDFNOBJ   - User defined object
CWBOBJ_KEY_USRDFNOBJTYP- User defined object type
```

- CWBOBJ_LIST_WTR:

```
CWBOBJ_KEY_WRITER      - writer job name
CWBOBJ_KEY_WTRJOBNUM   - writer job number
CWBOBJ_KEY_WTRJOBSTS   - writer job status
CWBOBJ_KEY_WTRJOBUSER  - writer job user
```

- CWBOBJ_LIST_LIB:

```
CWBOBJ_KEY_LIBRARY      - the library name
CWBOBJ_KEY_DESCRIPTION  - description of the library
```

- CWBOBJ_LIST_RSC:

```
CWBOBJ_KEY_RSCNAME      - resource name
CWBOBJ_KEY_RSCLIB       - resource library
CWBOBJ_KEY_RSCTYPE      - resource object type
CWBOBJ_KEY_OBJEXTATTR   - object extended attribute
CWBOBJ_KEY_DESCRIPTION  - description of the resource
CWBOBJ_KEY_DATE         - date object was last modified
CWBOBJ_KEY_TIME         - time object was last modified
```

cwbOBJ_GetObjAttrs:

Purpose

Get several attributes of an object.

Syntax

```
unsigned int CWB_ENTRY cwbOBJ_GetObjAttrs(
                              cwbOBJ_ObjHandle        objectHandle,
                              unsigned long           numAttrs,
                              cwbOBJ_GetObjAttrParms *getAttrParms,
                              cwbSV_ErrHandle         errorHandle);
```

Parameters

cwbOBJ_ObjHandle objectHandle - input
Handle of the object to get the attribute for.

unsigned long numAttrs - input
number of attributes to retrieve

cwbOBJ_GetObjAttrParms *getAttrParms - input
an array of numAttrs elements that for each attribute to retrieve gives the attribute key (id), the buffer where to store the value for that attribute and the size of the buffer

cwbSV_ErrHandle errorHandle - output
Optional, may be 0. Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle() API. The messages may be retrieved through the cwbSV_GetErrText() API. If the parameter is set to zero, no messages will be retrievable.

Return Codes

The following list shows common return values.

CWB_NO_ERROR
Successful completion.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory.

CWB_INVALID_HANDLE
Handle is not an allocated object handle.

CWB_BUFFER_OVERFLOW
Buffer too small.

CWBOBJ_RC_HOST_ERROR
Host error occurred. Text may be in errorHandle.

CWBOBJ_RC_INVALID_KEY
Key isn't valid.

CWB_API_ERROR
General API failure.

Usage

See the Usage Notes in cwbOBJ_GetObjAttr to see which attribute are valid for the various types of objects.

cwbOBJ_GetObjHandle:

Purpose

Get list object. This call gets a handle to an object in an opened list. The handle returned must be released with the cwbOBJ_DeleteObjHandle when the caller is done with it to release resources. The handle returned is only valid while the list is opened.

Syntax

```
unsigned int CWB_ENTRY  cwbOBJ_GetObjHandle(
                               cwbOBJ_ListHandle  listHandle,
                               unsigned long      ulPosition,
                               cwbOBJ_ObjHandle  *objectHandle,
                               cwbSV_ErrHandle    errorHandle);
```

Parameters

cwbOBJ_ListHandle listHandle - input
Handle of the list to get the object handle from. This list must be opened.

unsigned long ulPosition - input
The position within the list of the object to get a handle for. It is 0 based. Valid values are 0 to the number of objects in the list - 1. You can use cwbOBJ_GetListSize() to get the size of the list.

cwbOBJ_ObjHandle *objectHandle - output
On return, this will contain the handle of the object.

cwbSV_ErrHandle errorHandle - output
Optional, may be 0. Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle() API. The messages may be retrieved through the cwbSV_GetErrText() API. If the parameter is set to zero, no messages will be retrievable.

Return Codes

The following list shows common return values.

CWB_NO_ERROR
Successful completion.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory.

CWB_INVALID_HANDLE
Handle is not an allocated list handle.

CWBOBJ_RC_HOST_ERROR
Host error occurred. Text may be in errorHandle.

CWBOBJ_RC_LIST_NOT_OPEN
The list isn't open.

CWBOBJ_RC_INVALID_INDEX
The ulPosition is out of range.

Usage

None

cwbOBJ_GetObjHandleFromID:

Purpose

Regenerate an object handle from it's binary ID and type. cwbOBJ_DeleteObjHandle() must be called to free resources when you are done using the object handle.

Syntax

```
unsigned int CWB_ENTRY  cwbOBJ_GetObjHandleFromID(
                               void              *idBuffer,
                               unsigned long      bufLen,
                               cwbOBJ_ObjType     objectType,
                               cwbOBJ_ObjHandle  *objectHandle,
                               cwbSV_ErrHandle    errorHandle);
```

Parameters

void *idBuffer - input
The buffer that holds the id of this object.

unsigned long bufLen - input
The length of the data pointed to by pIDBuffer.

cwbOBJ_ObjType type - input
Type of object this ID is for. This must match the type of object the ID was taken from.

cwbOBJ_ObjHandle *objectHandle - output
If this call returns successfully, this will be the handle to the object. This handle should be released with the cwbOBJ_DeleteObjHandle() API when done using it.

cwbSV_ErrHandle errorHandle - output
Optional, may be 0. Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle() API. The messages may be retrieved through the cwbSV_GetErrText() API. If the parameter is set to zero, no messages will be retrievable.

Return Codes

The following list shows common return values.

CWB_NO_ERROR
Successful completion.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory.

CWB_INVALID_HANDLE
Handle is not an allocated object handle.

CWB_INVALID_PARAMETER
Invalid parameter specified.

CWBOBJ_RC_INVALID_TYPE
objectType is not correct.

CWBOBJ_RC_HOST_ERROR
Host error occurred. Text may be in errorHandle.

Usage

None

cwbOBJ_GetObjID:

Purpose

Get the id of an object. This is the data the uniquely identifies this object on the server. The data gotten is not readable and is binary. It can be passed back on the cwbOBJ_GetObjHandleFromID() API to get a handle back to that object.

Syntax

```
unsigned int CWB_ENTRY  cwbOBJ_GetObjID(
                               cwbOBJ_ObjHandle  objectHandle,
                               void             *idBuffer,
                               unsigned long     bufLen,
                               unsigned long    *bytesNeeded,
                               cwbSV_ErrHandle   errorHandle);
```

Parameters

cwbOBJ_ObjHandle objectHandle - input
Handle of the object to get the ID from.

void *idBuffer - output
The buffer that will hold the ID of this object.

unsigned long bufLen - input
The length of the buffer pointed to by pIDBuffer.

unsigned long *bytesNeeded - output
On output, this will be the number of bytes needed to hold the ID.

cwbSV_ErrHandle errorHandle - output
Optional, may be 0. Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle() API. The messages may be retrieved through the cwbSV_GetErrText() API. If the parameter is set to zero, no messages will be retrievable.

Return Codes

The following list shows common return values.

CWB_NO_ERROR
Successful completion.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory.

CWB_INVALID_HANDLE
Handle is not an allocated object handle.

CWB_BUFFER_OVERFLOW
Buffer too small.

Usage

None

cwbOBJ_RefreshObj:

Purpose

Refreshes the object with the latest information from the iSeries server. This will ensure the attributes returned for the object are up to date.

Syntax

```
unsigned int CWB_ENTRY cwbOBJ_RefreshObj(
                              cwbOBJ_ObjHandle  objectHandle,
                              cwbSV_ErrHandle   errorHandle);
```

Parameters

cwbOBJ_ObjHandle objectHandle - input
Handle of the object to be refreshed.

cwbSV_ErrHandle errorHandle - output
Optional, may be 0. Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle() API. The messages may be retrieved through the cwbSV_GetErrText() API. If the parameter is set to zero, no messages will be retrievable.

Return Codes

The following list shows common return values.

CWB_NO_ERROR
Successful completion.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory.

CWB_INVALID_HANDLE
Handle is not an allocated object handle.

CWBOBJ_RC_HOST_ERROR
Host error occurred. Text may be in errorHandle.

Usage

The following object types may be refreshed:

- CWBOBJ_LIST_SPLF (spooled files)
- CWBOBJ_LIST_PRTF (printer files)
- CWBOBJ_LIST_OUTQ (output queues)
- CWBOBJ_LIST_PRTD (printer devices)
- CWBOBJ_LIST_WTR (writers)

Example: Assume listHandle points to a spooled file list with at least one entry in it.

```
cwbOBJ_ObjHandle splFileHandle;
ulRC = cwbOBJ_GetObjHandle(listHandle,
0,
&splFileHandle,
NULL);
if (ulRC == CWB_NO_ERROR)
{
  ulRC = cwbOBJ_RefreshObj(splFileHandle);
  .....
  get attributes for object
  .....
  ulRC = cwbOBJ_DeleteObjHandle(splFileHandle);
}
```

cwbOBJ_SetObjAttrs:

Purpose

Change the attributes of the object on the server.

Syntax

```
unsigned int CWB_ENTRY cwbOBJ_SetObjAttrs(
                              cwbOBJ_ObjHandle   objectHandle,
                              cwbOBJ_ParmHandle  parmListHandle,
                              cwbSV_ErrHandle    errorHandle);
```

Parameters

cwbOBJ_ObjHandle objectHandle - input
Handle to the object that is to be changed.

cwbOBJ_ParmHandle parmListHandle - input
Handle to the parameter object which contains the attributes that are to be modified for the object.

cwbSV_ErrHandle errorHandle - output
Optional, may be 0. Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle() API. The messages may be retrieved through the cwbSV_GetErrText() API. If the parameter is set to zero, no messages will be retrievable.

Return Codes

The following list shows common return values.

CWB_NO_ERROR
Successful completion.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory.

CWB_INVALID_HANDLE
Handle is not an allocated object handle.

CWBOBJ_RC_HOST_ERROR
Host error occurred. Text may be in errorHandle.

Usage

The following objects allow these attributes to be changed:

- CWBOBJ_LIST_SPLF (spooled files):

```
CWBOBJ_KEY_ALIGN        - Align page
CWBOBJ_KEY_BKOVRLLIB    - Back overlay library name
CWBOBJ_KEY_BKOVRLAY     - Back overlay
CWBOBJ_KEY_BKOVL_ACR    - Back overlay offset across
CWBOBJ_KEY_BKOVL_DWN    - Back overlay offset down
CWBOBJ_KEY_COPIES       - Copies
CWBOBJ_KEY_ENDPAGE      - Ending page
CWBOBJ_KEY_FILESEP      - File separators
CWBOBJ_KEY_FORMFEED     - Form feed
CWBOBJ_KEY_FORMTYPE     - Form type
```

```
CWBOBJ_KEY_FTOVRLLIB    - Front overlay library name
CWBOBJ_KEY_FTOVRLAY     - Front overlay
CWBOBJ_KEY_FTOVL_ACR    - Front overlay offset across
CWBOBJ_KEY_FTOVL_DWN    - Front overlay offset down
CWBOBJ_KEY_OUTPTY       - Output priority
CWBOBJ_KEY_OUTQUELIB    - Output queue library name
CWBOBJ_KEY_OUTQUE       - Output queue
CWBOBJ_KEY_MULTIUP      - Logical number of pages per side
CWBOBJ_KEY_FIDELITY     - Print fidelity
CWBOBJ_KEY_DUPLEX       - Print on both sides
CWBOBJ_KEY_PRTQUALITY   - Print quality
CWBOBJ_KEY_PRTSEQUENCE  - Print sequence
CWBOBJ_KEY_PRINTER      - Printer
CWBOBJ_KEY_RESTART      - Where to restart printing at
CWBOBJ_KEY_SAVESPLF     - Save spooled file after printing
CWBOBJ_KEY_SCHEDULE     - When spooled file available
CWBOBJ_KEY_STARTPAGE    - Starting page
CWBOBJ_KEY_USERDATA     - User data
CWBOBJ_KEY_USRDFNDTA    - User defined data
CWBOBJ_KEY_USRDFNOPTS   - User defined options
CWBOBJ_KEY_USRDFNOBJLIB - User defined object library
CWBOBJ_KEY_USRDFNOBJ    - User defined object
CWBOBJ_KEY_USRDFNOBJTYP - User defined object type
```

- CWBOBJ_LIST_PRTF (printer files):

```
CWBOBJ_KEY_ALIGN        - Align page
CWBOBJ_KEY_BKMGN_ACR    - Back margin offset across
CWBOBJ_KEY_BKMGN_DWN    - Back margin offset down
CWBOBJ_KEY_BKOVRLLIB    - Back overlay library name
CWBOBJ_KEY_BKOVRLAY     - Back overlay
CWBOBJ_KEY_BKOVL_ACR    - Back overlay offset across
CWBOBJ_KEY_BKOVL_DWN    - Back overlay offset down
CWBOBJ_KEY_CPI          - Characters Per Inch
CWBOBJ_KEY_CODEPAGE     - Code page
CWBOBJ_KEY_CODEDFNTLIB  - Coded font library name
CWBOBJ_KEY_CODEDFNT     - Coded font name
CWBOBJ_KEY_COPIES       - Copies
CWBOBJ_KEY_DBCSDATA     - Contains DBCS Data
CWBOBJ_KEY_DBCSEXTENSN  - Process DBCS Extension characters
CWBOBJ_KEY_DBCSROTATE   - DBCS character rotation
CWBOBJ_KEY_DBCSCPI      - DBCS CPI
CWBOBJ_KEY_DBCSSISO     - DBCS SO/SI spacing
CWBOBJ_KEY_DFR_WRITE    - Defer writing
CWBOBJ_KEY_ENDPAGE      - Ending page
CWBOBJ_KEY_FILESEP      - File Separators(*FILE not
                          allowed)
CWBOBJ_KEY_FOLDREC      - Fold records
CWBOBJ_KEY_FONTID       - Font identifier
CWBOBJ_KEY_FORMFEED     - Form feed
CWBOBJ_KEY_FORMTYPE     - Form type
CWBOBJ_KEY_FTMGN_ACR    - Front margin offset across
CWBOBJ_KEY_FTMGN_DWN    - Front margin offset down
CWBOBJ_KEY_FTOVRLLIB    - Front overlay library name
CWBOBJ_KEY_FTOVRLAY     - Front overlay
CWBOBJ_KEY_FTOVL_ACR    - Front overlay offset across
CWBOBJ_KEY_FTOVL_DWN    - Front overlay offset down
CWBOBJ_KEY_CHAR_ID      - Graphic character set ID
CWBOBJ_KEY_JUSTIFY      - Hardware Justification
CWBOBJ_KEY_HOLD         - Hold spooled file
CWBOBJ_KEY_LPI          - Lines per inch
CWBOBJ_KEY_MAXRECORDS   - Maximum spooled file records
CWBOBJ_KEY_OUTPTY       - Output priority
CWBOBJ_KEY_OUTQUELIB    - Output queue library name
CWBOBJ_KEY_OUTQUE       - Output queue
CWBOBJ_KEY_OVERFLOW     - Overflow line number
CWBOBJ_KEY_PAGELEN      - Page Length
CWBOBJ_KEY_MEASMETHOD   - Measurement method
```

```
  CWBOBJ_KEY_PAGEWIDTH    - Page width
  CWBOBJ_KEY_MULTIUP      - Logical number of pages per side
  CWBOBJ_KEY_POINTSIZE    - The default font's point size
  CWBOBJ_KEY_FIDELITY     - Print fidelity
  CWBOBJ_KEY_DUPLEX       - Print on both sides
  CWBOBJ_KEY_PRTQUALITY   - Print quality
  CWBOBJ_KEY_PRTTEXT      - Print text
  CWBOBJ_KEY_PRINTER      - Printer
  CWBOBJ_KEY_PRTDEVTYPE   - Printer Device Type
  CWBOBJ_KEY_RPLUNPRT     - Replace unprintable characters
  CWBOBJ_KEY_RPLCHAR      - Replacement character
  CWBOBJ_KEY_SAVESPLF     - Save spooled file after printing
  CWBOBJ_KEY_SRCDRWR      - Source drawer
  CWBOBJ_KEY_SPOOL        - Spool the data
  CWBOBJ_KEY_SCHEDULE     - When spooled file available
  CWBOBJ_KEY_STARTPAGE    - Starting page
  CWBOBJ_KEY_DESCRIPTION  - Text description
  CWBOBJ_KEY_UNITOFMEAS   - Unit of measure
  CWBOBJ_KEY_USERDATA     - User data
  CWBOBJ_KEY_USRDFNDTA    - User defined data
  CWBOBJ_KEY_USRDFNOPTS   - User defined options
  CWBOBJ_KEY_USRDFNOBJLIB - User defined object library
  CWBOBJ_KEY_USRDFNOBJ    - User defined object
  CWBOBJ_KEY_USRDFNOBJTYP - User defined object type
```

- CWBOBJ_LIST_OUTQ (output queues):
- CWBOBJ_LIST_PRTD (printer devices):
- CWBOBJ_LIST_WTR (writers):
- CWBOBJ_LIST_LIB (libraries):
  - NONE

Parameter object APIs for iSeries Access for Windows

The following iSeries Access for Windows APIs pertain to Parameter objects. The APIs are listed alphabetically.

Note: When working with handles in the following APIs, 0 never will be returned as a valid handle.

cwbOBJ_CopyParmObjHandle:

Purpose

Creates a duplicate parameter list object. All attribute keys and values in the parameter list object will be copied to the new parameter list object.

Syntax

```
unsigned int CWB_ENTRY  cwbOBJ_CopyParmObjHandle(
                              cwbOBJ_ParmHandle   parmListHandle,
                              cwbOBJ_ParmHandle  *newParmListHandle,
                              cwbSV_ErrHandle     errorHandle);
```

Parameters

cwbOBJ_ParmHandle parmListHandle - input
Handle of the parameter list object to copy.

cwbOBJ_ParmHandle *newParmListHandle - output
Upon successful competition of this call, this handle will contain the new parameter list object handle.

cwbSV_ErrHandle errorHandle - output
Optional, may be 0. Any returned messages will be written to this object. It is created with the

cwbSV_CreateErrHandle() API. The messages may be retrieved through the cwbSV_GetErrText() API. If the parameter is set to zero, no messages will be retrievable.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory.

CWB_INVALID_HANDLE
Handle is not an allocated object handle.

Usage

The cwbOBJ_DeleteParmObjectHandle API must be called to free resources allocated by this call.

cwbOBJ_CreateParmObjHandle:

Purpose

Allocate a parameter list object handle. The parameter list object can be used to hold a list of parameters that can be passed in on other APIs.

Syntax

```
unsigned int CWB_ENTRY  cwbOBJ_CreateParmObjHandle(
                              cwbOBJ_ParmHandle  *parmListHandle,
                              cwbSV_ErrHandle     errorHandle);
```

Parameters

cwbOBJ_ParmHandle *parmListHandle - output
Handle of the parameter object.

cwbSV_ErrHandle errorHandle - output
Optional, may be 0. Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle() API. The messages may be retrieved through the cwbSV_GetErrText() API. If the parameter is set to zero, no messages will be retrievable.

Return Codes

The following list shows common return values.

CWB_NO_ERROR
Successful completion.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory.

Usage

The cwbOBJ_DeleteParmObjectHandle API must be called to free resources allocated by this call.

cwbOBJ_DeleteParmObjHandle:

Purpose

Deallocate a parameter list object handle and free the resources used by it.

Syntax

```
unsigned int CWB_ENTRY  cwbOBJ_DeleteParmObjHandle(
                              cwbOBJ_ParmHandle  parmListHandle,
                              cwbSV_ErrHandle    errorHandle);
```

Parameters

cwbOBJ_ParmHandle parmListHandle - input
Handle of the parameter object.

cwbSV_ErrHandle errorHandle - output
Optional, may be 0. Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle() API. The messages may be retrieved through the cwbSV_GetErrText() API. If the parameter is set to zero, no messages will be retrievable.

Return Codes

The following list shows common return values.

CWB_NO_ERROR
Successful completion.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory.

CWB_INVALID_HANDLE
Handle is not a parameter object handle.

Usage

After this call returns successfully, the parmListHandle is no longer valid.

cwbOBJ_GetParameter:

Purpose

Gets the value of a parameter in a parameter list object.

Syntax

```
unsigned int CWB_ENTRY cwbOBJ_GetParameter(
                             cwbOBJ_ParmHandle parmListHandle,
                             cwbOBJ_KeyID      key,
                             void             *buffer,
                             unsigned long     bufLen,
                             unsigned long    *bytesNeeded,
                             cwbOBJ_DataType  *keyType,
                             cwbSV_ErrHandle   errorHandle);
```

Parameters

cwbOBJ_ParmHandle parmListHandle - input
Handle of the parameter object.

cwbOBJ_KeyID key - input
The id of the parameter to set.

void *buffer - output
The buffer that will hold the attribute value. If this call returns successfully. The value of the key determines what type of data will be put into pBuffer. The type is also returned to the *keyType parameter, if provided.

unsigned long bufLen - input
The length of the buffer pointed to by buffer.

unsigned long *bytesNeeded - output
On output, this will be the number of bytes needed to hold result.

cwbOBJ_DataType *keyType - output
Optional, may be NULL. On output this will contain the type of data used to represent this attribute and what is stored at *buffer.

cwbSV_ErrHandle errorHandle - output
Optional, may be 0. Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle() API. The messages may be retrieved through the cwbSV_GetErrText() API. If the parameter is set to zero, no messages will be retrievable.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory.

CWB_INVALID_HANDLE
Handle is not an allocated object handle.

CWB_BUFFER_OVERFLOW
Buffer too small.

CWBOBJ_RC_KEY_NOT_FOUND
Key isn't specified in parameter list.

CWB_API_ERROR
General API failure.

Usage

None

cwbOBJ_SetParameter:

Purpose

Sets the value of a parameter in a parameter list object.

Syntax

```
unsigned int CWB_ENTRY  cwbOBJ_SetParameter(
                              cwbOBJ_ParmHandle  parmListHandle,
                              cwbOBJ_KeyID       key,
                              const void        *value,
                              cwbSV_ErrHandle    errorHandle);
```

Parameters

cwbOBJ_ParmHandle parmListHandle - input
Handle of the parameter object.

cwbOBJ_KeyID key - input
The id of the parameter to set.

void *value - input
The value to set the parameter to. The type that value points to is determined by the value of key.

cwbSV_ErrHandle errorHandle - output
Optional, may be 0. Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle() API. The messages may be retrieved through the cwbSV_GetErrText() API. If the parameter is set to zero, no messages will be retrievable.

Return Codes

The following list shows common return values.

CWB_NO_ERROR
Successful completion.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory.

CWB_INVALID_HANDLE
Handle is not a parameter object handle.

CWB_NON_REPRESENTABLE_UNICODE_CHAR
One or more input Unicode characters have no representation in the codepage being used.

CWB_API_ERROR
General API failure.

Usage

None

Writer job APIs for iSeries Access for Windows

The following iSeries Access for Windows APIs pertain to Writer job. The APIs are listed alphabetically.

Note: When working with handles in the following APIs, 0 never will be returned as a valid handle.

cwbOBJ_EndWriter:

Purpose

Ends an iSeries writer job.

Syntax

```
unsigned int CWB_ENTRY  cwbOBJ_EndWriter(
                              cwbOBJ_ObjHandle   writerHandle,
                              cwbOBJ_ParmHandle *parmListHandle,
                              cwbSV_ErrHandle    errorHandle);
```

Parameters

cwbOBJ_ObjHandle writerHandle - input
Handle of the writer job to be stopped. This handle can be obtained by either listing writers and getting the writer handle from that list or from starting a writer and asking for the writer handle to be returned.

cwbOBJ_ParmHandle *parmListHandle - input
Optional. A pointer to a valid parameter list object handle that contains parameters for ending the writer.

cwbSV_ErrHandle errorHandle - output
Optional, may be 0. Any returned messages will be written to this object. It is created with the

cwbSV_CreateErrHandle() API. The messages may be retrieved through the cwbSV_GetErrText() API. If the parameter is set to zero, no messages will be retrievable.

Return Codes

The following list shows common return values.

CWB_NO_ERROR
Successful completion.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory.

CWB_INVALID_HANDLE
Handle is not valid.

CWB_INVALID_PARAMETER
Invalid parameter specified.

CWBOBJ_RC_HOST_ERROR
Host error occurred. Text may be in errorHandle.

Usage

After this calls returns successfully, cwbOBJ_DeleteObjHandle() should be called to release the writerHandle. The following parameter key's may be set in the pParmListHandl object:

- CWBOBJ_KEY_WTREND - When to end the writer. May be any these special values:
  - *CNTRLD - end the writer after the current file is done printing.
  - *IMMED - end the writer immediately
  - *PAGEEND - end the writer at the end of the current page.

cwbOBJ_StartWriter:

Purpose

Starts an iSeries writer job.

Syntax

```
unsigned int CWB_ENTRY  cwbOBJ_StartWriter(
                              cwbOBJ_ObjHandle   *printerHandle,
                              cwbOBJ_ObjHandle   *outputQueueHandle,
                              cwbOBJ_ParmHandle  *parmListHandle,
                              cwbOBJ_ObjHandle   *writerHandle,
                              cwbSV_ErrHandle     errorHandle);
```

Parameters

cwbOBJ_ObjHandle *printerHandle - input
Required. A pointer to a valid printer object handle that identifies which printer this writer is to be started to.

cwbOBJ_ObjHandle *outputQueueHandle - input
Optional. A pointer to a valid output queue object handle that identifies which output queue this writer is to be started from. If the parmListHandle is also specified and contains the CWBOBJ_KEY_OUTQUE parameter key, this parameter is ignored.

cwbOBJ_ParmHandle *parmListHandle - input
Optional. A pointer to a valid parameter list object handle that contains parameters for starting the writer.

cwbOBJ_ObjHandle *writerHandle - output

Optional. A pointer to a writer object handle that will be filled in upon successful return from this API. If this parameter is specified, the caller must call cwbOBJ_DeleteObjHandle() to release resources allocated for this writer handle.

cwbSV_ErrHandle errorHandle - output

Optional, may be 0. Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle() API. The messages may be retrieved through the cwbSV_GetErrText() API. If the parameter is set to zero, no messages will be retrievable.

Return Codes

The following list shows common return values.

CWB_NO_ERROR

Successful completion.

CWB_NOT_ENOUGH_MEMORY

Insufficient memory.

CWB_INVALID_HANDLE

Handle is not valid.

CWB_INVALID_PARAMETER

Invalid parameter specified.

CWBOBJ_RC_HOST_ERROR

Host error occurred. Text may be in errorHandle.

Usage

Calling this API causes the writer job to be submitted to run. The writer job may fail to start even though this API returns successfully (the job may be successfully submitted, but fail to start). This is the behavior of the STRPRTWTR command on the iSeries server. The following parameter keys may be set in the parmListHandle object:

```
CWBOBJ_KEY_ALIGN       - Align page
CWBOBJ_KEY_ALWDRTPRT   - Allow direct printing
CWBOBJ_KEY_AUTOEND     - Automatically end writer (*YES,*NO)
CWBOBJ_KEY_DRWRSEP     - Drawer to use for separators
CWBOBJ_KEY_FILESEP     - Number of file separators
CWBOBJ_KEY_FORMTYPE    - Name of the form to be used
CWBOBJ_KEY_JOBNAME     - Name of the job that created file
CWBOBJ_KEY_JOBNUMBER   - Number of the job that created file
CWBOBJ_KEY_USER        - Name of the user that created file
CWBOBJ_KEY_FORMTYPEMSG - Form type message option
CWBOBJ_KEY_MSGQUELIB   - Message queue library
CWBOBJ_KEY_MSGQUE      - Message queue name
CWBOBJ_KEY_OUTQUELIB   - Output queue library
CWBOBJ_KEY_OUTQUE      - Output queue
CWBOBJ_KEY_SPOOLFILE   - Spool file name
CWBOBJ_KEY_SPLFNUM     - Spool file number
CWBOBJ_KEY_WTRSTRPAGE  - Page to start the writer on
CWBOBJ_KEY_WTREND      - When to end the writer
CWBOBJ_KEY_WRITER      - Writer job name
CWBOBJ_KEY_WTRINIT     - When to initialize the printer device
```

Output queues APIs for iSeries Access for Windows

The following iSeries Access for Windows APIs pertain to Output queues. The APIs are listed alphabetically.

Note: When working with handles in the following APIs, 0 never will be returned as a valid handle.

cwbOBJ_HoldOutputQueue:

Purpose

Holds an iSeries output queue.

Syntax

```
unsigned int CWB_ENTRY  cwbOBJ_HoldOutputQueue(
                              cwbOBJ_ObjHandle  queueHandle,
                              cwbSV_ErrHandle   errorHandle);
```

Parameters

cwbOBJ_ObjHandle queueHandle - input
Handle of the output queue to be held.

cwbSV_ErrHandle errorHandle - output
Optional, may be 0. Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle() API. The messages may be retrieved through the cwbSV_GetErrText() API. If the parameter is set to zero, no messages will be retrievable.

Return Codes

The following list shows common return values.

CWB_NO_ERROR
Successful completion.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory.

CWB_INVALID_HANDLE
Handle is not a valid queue handle.

CWBOBJ_RC_HOST_ERROR
Host error occurred. Text may be in errorHandle.

Usage

None

cwbOBJ_PurgeOutputQueue:

Purpose

Purges spooled files on an iSeries output queue.

Syntax

```
unsigned int CWB_ENTRY  cwbOBJ_PurgeOutputQueue(
                              cwbOBJ_ObjHandle    queueHandle,
                              cwbOBJ_ParmHandle  *parmListHandle,
                              cwbSV_ErrHandle     errorHandle);
```

Parameters

cwbOBJ_ObjHandle queueHandle - input
Handle of the output queue to be purged.

cwbOBJ_ParmHandle * parmListHandle - input
Optional. A pointer to a valid parameter list object handle that contains parameters for purging the output queue.

cwbSV_ErrHandle errorHandle - output
Optional, may be 0. Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle() API. The messages may be retrieved through the cwbSV_GetErrText() API. If the parameter is set to zero, no messages will be retrievable.

Return Codes

The following list shows common return values.

CWB_NO_ERROR
Successful completion.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory.

CWB_INVALID_HANDLE
Handle is not valid.

CWB_INVALID_PARAMETER
Invalid parameter specified.

CWBOBJ_RC_HOST_ERROR
Host error occurred. Text may be in errorHandle.

Usage

The parameters specified in parmListHandle, if provided, will specify which spooled files are purged. If parmListHandle is NULL, all spooled files for the current user are purged. The following parameter key's may be set in the parmListHandle object:

- CWBOBJ_KEY_USER

  which user's spooled files to purge. May be a specific user ID, ″*ALL″ or ″*CURRENT″. ″*CURRENT″ is the default.
- CWBOBJ_KEY_FORMTYPE

  which spooled files to purge base on what formtype they have. May be a specific formtype, ″*ALL″ or ″*STD″. ″*ALL″ is the default.
- CWBOBJ_KEY_USERDATA

  which spooled files to purge base on what userdata they have. May be a specific value or ″*ALL″. ″*ALL″ is the default.

cwbOBJ_ReleaseOutputQueue:

Purpose

Releases an iSeries output queue.

Syntax

```
unsigned int CWB_ENTRY  cwbOBJ_ReleaseOutputQueue(
                              cwbOBJ_ObjHandle  queueHandle,
                              cwbSV_ErrHandle   errorHandle);
```

Parameters

cwbOBJ_ObjHandle queueHandle - input
Handle of the output queue to be released.

cwbSV_ErrHandle errorHandle - output
Optional, may be 0. Any returned messages will be written to this object. It is created with the

cwbSV_CreateErrHandle() API. The messages may be retrieved through the cwbSV_GetErrText() API. If the parameter is set to zero, no messages will be retrievable.

Return Codes

The following list shows common return values.

CWB_NO_ERROR
Successful completion.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory.

CWB_INVALID_HANDLE
Handle is not a valid queue handle.

CWBOBJ_RC_HOST_ERROR
Host error occurred. Text may be in errorHandle.

Usage

None

AFP resource APIs for iSeries Access for Windows

The following iSeries Access for Windows APIs pertain to AFP resources. The APIs are listed alphabetically.

Note: When working with handles in the following APIs, 0 never will be returned as a valid handle.

cwbOBJ_CloseResource:

Purpose

Closes an AFP Resource object that was previously opened for reading.

Syntax

```
unsigned int CWB_ENTRY  cwbOBJ_CloseResource(
                              cwbOBJ_ObjHandle   resourceHandle,
                              cwbSV_ErrHandle    errorHandle);
```

Parameters

cwbOBJ_ObjHandle resourceHandle - input
Handle of the resource to be closed.

cwbSV_ErrHandle errorHandle - output
Optional, may be 0. Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle() API. The messages may be retrieved through the cwbSV_GetErrText() API. If the parameter is set to zero, no messages will be retrievable.

Return Codes

The following list shows common return values.

CWB_NO_ERROR
Successful completion.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory.

CWB_INVALID_HANDLE
Handle is not valid resource handle.

CWBOBJ_RC_HOST_ERROR
Host error occurred. Text may be in errorHandle.

CWBOBJ_RC_RSCNOTOPEN
Resource not opened.

CWBOBJ_RC_SPLFNOTOPEN
Spooled file not open.

Usage

If the handle for the resource was obtained via a call to the cwbOBJ_OpenResourceForSplF() API, then this api will delete the handle for you (the handle was dynamically allocated for you when you opened the resource and this call deallocates it).

cwbOBJ_CreateResourceHandle:

Purpose

Create a resource handle for a particular AFP resource on a specified system.

Syntax

```
unsigned int CWB_ENTRY  cwbOBJ_CreateResourceHandle(
                               const char            *systemName,
                               const char            *resourceName,
                               const char            *resourceLibrary,
                               cwbOBJ_AFPResourceType  resourceType,
                               cwbOBJ_ObjHandle      *objectHandle,
                               cwbSV_ErrHandle        errorHandle);
```

Parameters

const char *systemName - input
Pointer to the system name contained in an ASCIIZ string.

const char *resourceName - input
Pointer to the name of the AFP resource.

const char *resourceLibrary - input
Pointer to the name of the iSeries library that contains the resource.

cwbOBJ_AFPResourceType resourceType - input
Specifies what type of resource this is. Must be one of the following:

- CWBOBJ_AFPRSC_FONT
- CWBOBJ_AFPRSC_FORMDEF
- CWBOBJ_AFPRSC_OVERLAY
- CWBOBJ_AFPRSC_PAGESEG
- CWBOBJ_AFPRSC_PAGEDEF

cwbOBJ_ObjHandle *objectHandle - output
On output this will contain the resource handle.

cwbSV_ErrHandle errorHandle - output
Optional, may be 0. Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle() API. The messages may be retrieved through the cwbSV_GetErrText() API. If the parameter is set to zero, no messages will be retrievable.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory; may have failed to allocate temporary buffer.

CWB_INVALID_PARAMETER
Invalid parameter specified.

CWB_NON_REPRESENTABLE_UNICODE_CHAR
One or more input Unicode characters have no representation in the code page being used.

CWB_API_ERROR
General API failure.

Usage

Use this API to get a handle to a resource if you know the name library and type of resource. If you don't know either of these or want to choose from a list, use the list APIs to list AFP resources instead. This API does no checking of the AFP resource on the host. The first time this handle is used to retrieve data for the resource, a host error will be encountered if the resource file doesn't exist.

cwbOBJ_DisplayResource:

Purpose

Displays the specified AFP resource to the user.

Syntax

```
unsigned int CWB_ENTRY  cwbOBJ_DisplayResource(
                             cwbOBJ_ObjHandle     resourceHandle,
                             const char          *view,
                             const unsigned long  flags,
                             cwbSV_ErrHandle      errorHandle);
```

Parameters

cwbOBJ_ObjHandle resourceHandle - input
Handle of the AFP Resource object. It must be an overlay or a pagesegment type of resource.

const char *view - input
Optional, may be NULL. If specified, it is a pointer to an ASCIIZ string that specifies the view to use when invoking the AFP viewer. There are two predefined views shipped with the viewer: LETTER (8.5″ x 11″) and SFLVIEW (132 column). Users may also add their own.

const unsigned long flags - input
Any of following bits may be set: CWBOBJ_DSPSPLF_WAIT - instructs this call to wait until the viewer process has successfully opened the resource before returning. If this bit is 0, this API will return after it starts the viewer process. If it is 1, this API will wait for the viewer to get the resource open before returning. All other bits must be set to 0.

cwbSV_ErrHandle errorHandle - output
Optional, may be 0. Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle() API. The messages may be retrieved through the cwbSV_GetErrText() API. If the parameter is set to zero, no messages will be retrievable.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory; may have failed to allocate a temporary buffer.

CWB_INVALID_HANDLE
Handle is not an allocated object handle.

CWB_NO_VIEWER
The viewer support for ClientAccess/400 was not installed.

CWB_NON_REPRESENTABLE_UNICODE_CHAR
One or more input Unicode characters have no representation in the code page that is being used.

CWB_API_ERROR
General API failure.

CWBOBJ_RC_INVALID_TYPE
The handle given for resourceHandle is not a handle to an overlay or pagesegment resource.

Usage

Use this API to bring up the AFP viewer on the specified AFP resource. The type of the resource must be an overlay or a pagesegment. A return code of CWB_NO_VIEWER means that the viewer component was not installed on the workstation.

cwbOBJ_OpenResource:

Purpose

Opens an AFP resource object for reading.

Syntax

```
unsigned int CWB_ENTRY  cwbOBJ_OpenResource(
                            cwbOBJ_ObjHandle  resourceHandle,
                            cwbSV_ErrHandle   errorHandle);
```

Parameters

cwbOBJ_ObjHandle resourceHandle - input
Handle of the AFP resource file to be opened for reading.

cwbSV_ErrHandle errorHandle - output
Optional, may be 0. Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle() API. The messages may be retrieved through the cwbSV_GetErrText() API. If the parameter is set to zero, no messages will be retrievable.

Return Codes

The following list shows common return values.

CWB_NO_ERROR
Successful completion.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory.

CWB_INVALID_HANDLE
Handle is not valid resource handle.

CWBOBJ_RC_HOST_ERROR
Host error occurred. Text may be in errorHandle.

CWBOBJ_RC_NOHOSTSUPPORT
Host doesn't support working with resources.

Usage

The resource should be closed with the cwbOBJ_CloseResource() API when done reading from it.

cwbOBJ_OpenResourceForSplF:

Purpose

Opens an AFP Resource object for reading for a spooled file that is already opened for reading. The API is useful if you are reading an AFP Spooled file and run into an external AFP Resource that you need to read. By using this API you can open that resource for reading without having to first list the resource.

Syntax

```
unsigned int CWB_ENTRY  cwbOBJ_OpenResourceForSplF(
                              cwbOBJ_ObjHandle    splFHandle,
                              const char         *resourceName,
                              const char         *resourceLibrary,
                              unsigned long       resourceType,
                              const char         *reserved,
                              cwbOBJ_ObjHandle   *resourceHandle,
                              cwbSV_ErrHandle     errorHandle);
```

Parameters

cwbOBJ_ObjHandle splFHandle - input
Handle of the spooled file that is already opened for reading and that the resource will be opened against. The same conversation (and same instance of the network print server program on the iSeries server) will be used for reading the resource and spooled file.

const char *resourceName - input
Pointer to the name of the AFP Resource in an ASCIIZ string.

const char *resourceLibrary - input
Optional, may be NULL. Pointer to the iSeries library of the AFP Resource in an ASCIIZ string. If no library is specified, the library list of the spooled file is used to search for the resource.

unsigned long resourceType - input
An unsigned long integer with one of the following bits on:

- CWBOBJ_AFPRSC_FONT
- CWBOBJ_AFPRSC_FORMDEF
- CWBOBJ_AFPRSC_OVERLAY
- CWBOBJ_AFPRSC_PAGESEG
- CWBOBJ_AFPRSC_PAGEDEF

Specifies what type of resource to open.

const char *reserved -
Reserved, must be NULL.

cwbOBJ_OBJHandle *resourceHandle - output
Pointer to an OBJHandle that on successful return will contain the dynamically allocated resource handle that can be used to read, seek and eventually close the resource.

cwbSV_ErrHandle errorHandle - output
Optional, may be 0. Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle() API. The messages may be retrieved through the cwbSV_GetErrText() API. If the parameter is set to zero, no messages will be retrievable.

Return Codes

The following list shows common return values.

CWB_NO_ERROR
Successful completion.

CWB_FILE_NOT_FOUND
The resource wasn't found.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory; may have failed to allocate temporary buffer.

CWB_INVALID_HANDLE
Handle is not valid resource handle.

CWB_INVALID_PARAMETER
Invalid parameter specified.

CWBOBJ_RC_HOST_ERROR
Host error occurred. Text may be in errorHandle.

CWBOBJ_RC_SPLFNOTOPEN
The spooled file is not opened.

CWBOBJ_RC_NOHOSTSUPPORT
Host doesn't support working with resources.

CWB_NON_REPRESENTABLE_UNICODE_CHAR
One or more input Unicode characters have no representation in the code page being used.

CWB_API_ERROR
General API failure.

Usage

This call, if successful, will generate a temporary resource handle and return it in the resourceHandle parameter. This handle will be deleted automatically when the caller calls the cwbOBJ_CloseResource() API with it.

The resource should be closed with the cwbOBJ_CloseResource()) API when done reading from it.

cwbOBJ_ReadResource:
Purpose

Reads bytes from the current read location.

Syntax

```
unsigned int CWB_ENTRY  cwbOBJ_ReadResource(
                              cwbOBJ_ObjHandle  resourceHandle,
                              char             *bBuffer,
                              unsigned long     bytesToRead,
                              unsigned long    *bytesRead,
                              cwbSV_ErrHandle   errorHandle);
```

Parameters

cwbOBJ_ObjHandle resourceHandle - input
Handle of the AFP resource object to be read from.

char *buffer - input
Pointer to buffer to hold the bytes read from the resource.

unsigned long bytesToRead - input
Maximum number of bytes to read. The number read may be less than this.

unsigned long *bytesRead - output
Number of bytes actually read.

cwbSV_ErrHandle errorHandle - output
Optional, may be 0. Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle() API. The messages may be retrieved through the cwbSV_GetErrText() API. If the parameter is set to zero, no messages will be retrievable.

Return Codes

The following list shows common return values.

CWB_NO_ERROR
Successful completion.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory.

CWB_INVALID_HANDLE
Handle is not valid spooled file handle.

CWBOBJ_RC_HOST_ERROR
Host error occurred. Text may be in errorHandle.

CWBOBJ_RC_RSCNOTOPEN
Resource file has not been opened yet.

CWBOBJ_RC_ENDOFFILE
The end of file was read.

Usage

The cwbOBJ_OpenResource() API must be called with this resource handle before this API is called OR the handle must be retrieved with a call to the cwbOBJ_OpenResourceForSplF() API. If the end of file is reached when reading, the return code will be CWBOBJ_RC_ENDOFFILE and bytesRead will contain the actual number of bytes read.

cwbOBJ_SeekResource:

Purpose

Moves the current read position on a resource that is open for reading.

Syntax

```
unsigned int CWB_ENTRY  cwbOBJ_SeekResource(
                              cwbOBJ_ObjHandle   resourceHandle,
                              cwbOBJ_SeekOrigin  seekOrigin,
                              signed long        seekOffset,
                              cwbSV_ErrHandle    errorHandle);
```

Parameters

cwbOBJ_ObjHandle resourceHandle - input
Handle of the AFP resource file to be seeked.

cwbOBJ_SeekOrigin seekOrigin - input
Where to seek from. Valid values are:

- CWBOBJ_SEEK_BEGINNING - seek from the beginning of file
- CWBOBJ_SEEK_CURRENT - seek from the current read position
- CWBOBJ_SEEK_ENDING - seek from the end of the file

signed long seekOffset - input
Offset (negative or positive) from the seek origin in bytes to move the current read pointer to.

cwbSV_ErrHandle errorHandle - output
Optional, may be 0. Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle() API. The messages may be retrieved through the cwbSV_GetErrText() API. If the parameter is set to zero, no messages will be retrievable.

Return Codes

The following list shows common return values.

CWB_NO_ERROR
Successful completion.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory.

CWB_INVALID_HANDLE
Handle is not valid spooled file handle.

CWB_INVALID_PARAMETER
Invalid parameter specified.

CWBOBJ_RC_HOST_ERROR
Host error occurred. Text may be in errorHandle.

CWBOBJ_RC_RSCNOTOPEN
Resource has not been opened yet.

CWBOBJ_RC_SEEKOUTOFRANGE
Seek offset out of range.

Usage

The cwbOBJ_OpenResource() API must be called with this resource handle before this API is called OR the handle must be retrieved with a call to the cwbOBJ_OpenResourceForSplF() API.

APIs for new spooled files for iSeries Access for Windows

The following iSeries Access for Windows APIs pertain to working with new spooled files. The APIs are listed alphabetically.

Note: When working with handles in the following APIs, 0 never will be returned as a valid handle.

cwbOBJ_CloseNewSplF:

Purpose

Closes a newly created spooled file.

Syntax

```
unsigned int CWB_ENTRY cwbOBJ_CloseNewSplF(
                              cwbOBJ_ObjHandle   newSplFHandle,
                              cwbSV_ErrHandle    errorHandle);
```

Parameters

cwbOBJ_ObjHandle newSplFHandle - input
New spooled file handle. This is the handle passed back on the cwbOBJ_CreateNewSplF() API.

cwbSV_ErrHandle errorHandle - output
Optional, may be 0. Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle() API. The messages may be retrieved through the cwbSV_GetErrText() API. If the parameter is set to zero, no messages will be retrievable.

Return Codes

The following list shows common return values.

CWB_NO_ERROR
Successful completion.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory.

CWB_INVALID_HANDLE
Handle is not valid spooled file handle.

CWBOBJ_RC_HOST_ERROR
Host error occurred. Text may be in errorHandle.

Usage

Once a spooled file is closed, you can no longer write to it.

cwbOBJ_CloseNewSplFAndGetHandle:

Purpose

Closes a newly created spooled file and returns a handle to it.

Syntax

```
unsigned int CWB_ENTRY cwbOBJ_CloseNewSplFAndGetHandle(
                              cwbOBJ_ObjHandle      newSplFHandle,
                              cwbOBJ_ObjHandle     *splFHandle,
                              cwbSV_ErrHandle       errorHandle);
```

Parameters

cwbOBJ_ObjHandle newSplFHandle - input
New spooled file handle. This is the handle passed back on the cwbOBJ_CreateNewSplF() API.

cwbOBJ_ObjHandle *splFHandle - output
Pointer to an object handle that, upon successful, completion of this call, will hold the spooled file handle. This handle may be used with other APIs that take a spooled file handle as input.

cwbSV_ErrHandle errorHandle - output
Optional, may be 0. Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle() API. The messages may be retrieved through the cwbSV_GetErrText() API. If the parameter is set to zero, no messages will be retrievable.

Return Codes

The following list shows common return values.

CWB_NO_ERROR
Successful completion.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory.

CWB_INVALID_HANDLE
Handle is not valid spooled file handle.

CWBOBJ_RC_HOST_ERROR
Host error occurred. Text may be in errorHandle.

Usage

The handle returned in splFHandle must be released with the cwbOBJ_DeleteObjHandle() API in order to free resources.

cwbOBJ_CreateNewSplF:

Purpose

Creates a new spooled file on the iSeries server.

Syntax

```
unsigned int CWB_ENTRY cwbOBJ_CreateNewSplF(
                             const char         *systemName,
                             cwbOBJ_ParmHandle  *parmListHandle,
                             cwbOBJ_ObjHandle   *printerFileHandle,
                             cwbOBJ_ObjHandle   *outputQueueHandle,
                             cwbOBJ_ObjHandle   *newSplFHandle,
                             cwbSV_ErrHandle     errorHandle);
```

Parameters

const char *systemName - input
Pointer to the system name contained in ASCIIZ string

cwbOBJ_ParmHandle *parmListHandle - input
Optional. A pointer to a valid parameter list object handle that contains parameters for creating the spooled file. Parameters set in this list override what is in the printer file and the *outputQueueHandle parameter.

cwbOBJ_ObjHandle *printerFileHandle - input
Optional. A pointer to a valid printer file object handle that references the printer file to be used when creating this spooled file. The printer file must exist on the same system that this spooled file is being created on.

cwbOBJ_ObjHandle *outputQueueHandle - input
Optional. A pointer to a valid output queue object handle that references the output queue that this spooled file should be created on. The output queue must exist on the same system that this spooled

file is being created on. If the output queue is set in the *parmListHandle parameter (with CWBOBJ_KEY_OUTQUELIB & CWBOBJ_KEY_OUTQUE) it will override the output queue specified by this output queue handle.

cwbOBJ_ObjHandle *newSplFHandle - output
A pointer to a object handle that will be filled in upon successful completion of this call with the newly created spooled file handle. This handle is needed to write data into and close the new spooled file.

cwbSV_ErrHandle errorHandle - output
Optional, may be 0. Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle() API. The messages may be retrieved through the cwbSV_GetErrText() API. If the parameter is set to zero, no messages will be retrievable.

Return Codes

The following list shows common return values.

CWB_NO_ERROR
Successful completion.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory.

CWB_INVALID_HANDLE
Handle is not valid

CWB_INVALID_PARAMETER
Invalid parameter specified.

CWB_NON_REPRESENTABLE_UNICODE_CHAR
One or more input Unicode characters have no representation in the codepage being used.

CWB_API_ERROR
General API failure.

Usage

If the parmListHandle is NULL, or doesn't specify an attribute, the attribute is taken from the printer file used. If the output queue is specified with the *parmListHandle, this will override what is specified in the *outputQueueHandle parameter. If the output queue is not specified (not in the *parmListHandle AND outputQueueHandle is NULL), the output queue used is taken from the printer file. If the printer file is not specified (printerFileHandle is NULL), the server will use the default network print printer file, *LIBL/QNPSPRTF. The following parameter keys may be set in the pParmListHandl object:

```
CWBOBJ_KEY_ALIGN        - Align page
CWBOBJ_KEY_BKOVRLLIB    - Back overlay library name
CWBOBJ_KEY_BKOVRLAY     - Back overlay
CWBOBJ_KEY_BKOVL_ACR    - Back overlay offset across
CWBOBJ_KEY_BKOVL_DWN    - Back overlay offset down
CWBOBJ_KEY_CPI          - Characters Per Inch
(1)CWBOBJ_KEY_CODEPAGE  - Code page
CWBOBJ_KEY_COPIES       - Copies
CWBOBJ_KEY_DBCSDATA     - Contains DBCS Data
CWBOBJ_KEY_DBCSEXTENSN  - Process DBCS Extension
                          characters
CWBOBJ_KEY_DBCSROTATE   - DBCS character rotation
CWBOBJ_KEY_DBCSCPI      - DBCS CPI
CWBOBJ_KEY_DBCSSISO     - DBCS SO/SI spacing
CWBOBJ_KEY_DFR_WRITE    - Defer writing
CWBOBJ_KEY_ENDPAGE      - Ending page
(2)CWBOBJ_KEY_FILESEP   - File Separators
CWBOBJ_KEY_FOLDREC      - Fold records
CWBOBJ_KEY_FONTID       - Font identifier
```

```
CWBOBJ_KEY_FORMFEED      - Form feed
CWBOBJ_KEY_FORMTYPE      - Form type
CWBOBJ_KEY_FTOVRLLIB     - Front overlay library name
CWBOBJ_KEY_FTOVRLAY      - Front overlay
CWBOBJ_KEY_FTOVL_ACR     - Front overlay offset across
CWBOBJ_KEY_FTOVL_DWN     - Front overlay offset down
(1)CWBOBJ_KEY_CHAR_ID    - Graphic character set ID
CWBOBJ_KEY_JUSTIFY       - Hardware Justification
CWBOBJ_KEY_HOLD          - Hold spooled file
CWBOBJ_KEY_LPI           - Lines per inch
CWBOBJ_KEY_MAXRECORDS    - Maximum spooled file records
CWBOBJ_KEY_OUTPTY        - Output priority
CWBOBJ_KEY_OUTQUELIB     - Output queue library name
CWBOBJ_KEY_OUTQUE        - Output queue
CWBOBJ_KEY_OVERFLOW      - Overflow line number
CWBOBJ_KEY_PAGELEN       - Page length
CWBOBJ_KEY_MEASMETHOD    - Measurement method
CWBOBJ_KEY_PAGEWIDTH     - Page width
CWBOBJ_KEY_MULTIUP       - Logical number of pages
                           per side
CWBOBJ_KEY_POINTSIZE     - The default font's point size
CWBOBJ_KEY_FIDELITY      - Print fidelity
CWBOBJ_KEY_DUPLEX        - Print on both sides
CWBOBJ_KEY_PRTQUALITY    - Print quality
CWBOBJ_KEY_PRTTEXT       - Print text
CWBOBJ_KEY_PRINTER       - Printer device name
CWBOBJ_KEY_PRTDEVTYPE    - Printer device type
CWBOBJ_KEY_RPLUNPRT      - Replace unprintable characters
CWBOBJ_KEY_RPLCHAR       - Replacement character
CWBOBJ_KEY_SAVESPLF      - Save spooled file after
                           printing
CWBOBJ_KEY_SRCDRWR       - Source drawer
CWBOBJ_KEY_SPOOL         - Spool the data
CWBOBJ_KEY_SPOOLFILE     - Spool file name
CWBOBJ_KEY_SCHEDULE      - When spooled file available
CWBOBJ_KEY_STARTPAGE     - Starting page
CWBOBJ_KEY_UNITOFMEAS    - Unit of measure
CWBOBJ_KEY_USERCMT       - User comment (100 chars)
CWBOBJ_KEY_USERDATA      - User data    (10 chars)
CWBOBJ_KEY_SPLSCS        - Spool SCS Data
CWBOBJ_KEY_USRDFNDTA     - User defined data
(3)CWBOBJ_KEY_USRDFNOPTS - User defined options
CWBOBJ_KEY_USRDFNOBJLIB  - User defined object library
CWBOBJ_KEY_USRDFNOBJ     - User defined object
CWBOBJ_KEY_USRDFNOBJTYP  - User defined object type
```

Note:

1. Code page and graphic character set are dependent on each other. If you specify one of these, you must specify the other.
2. The special value of *FILE is not allowed when using this attribute to create a new spooled file.
3. Up to 4 user defined options may be specified.

cwbOBJ_GetSplFHandleFromNewSplF:

Purpose

Uses a new spooled file handle to generate a spooled file handle. See notes below about using this API on a new spool file that was created with data type automatic.

Syntax

```
unsigned int CWB_ENTRY cwbOBJ_GetSplFHandleFromNewSplF(
                              cwbOBJ_ObjHandle    newSplFHandle,
                              cwbOBJ_ObjHandle   *splFHandle,
                              cwbSV_ErrHandle     errorHandle);
```

Parameters

cwbOBJ_ObjHandle newSplFHandle - input
New spooled file handle. This is the handle passed back on the cwbOBJ_CreateNewSplF() API.

cwbOBJ_ObjHandle *splFHandle - output
Pointer to an object handle that, upon successful completion of this call, will hold the spooled file handle. This handle may be used with other APIs that take a spooled file handle as input.

cwbSV_ErrHandle errorHandle - output
Optional, may be 0. Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle() API. The messages may be retrieved through the cwbSV_GetErrText() API. If the parameter is set to zero, no messages will be retrievable.

Return Codes

The following list shows common return values.

CWB_NO_ERROR
Successful completion.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory.

CWB_INVALID_HANDLE
Handle is not valid spooled file handle.

CWBOBJ_RC_HOST_ERROR
Host error occurred. Text may be in errorHandle.

CWBOBJ_RC_SPLFNOTOPEN
Spooled file hasn't been created on the host yet.

Usage

The handle returned in splFHandle must be released with the cwbOBJ_DeleteObjHandle() API in order to free resources.

If you are using automatic data typing for the spooled file (the attribute of CWBOBJ_KEY_PRTDEVTYPE was set to *AUTO or or wasn't specified on the cwbOBJ_CreateNewSplF() API) then creation of the spooled file will be delayed until sufficient data has been written to the spooled file to determine the type of the data (*SCS, *AFPDS or *USERASCII). If the new spooled file is in this state when you call this API, the return code will be CWBOBJ_RC_SPLFNOTOPEN.

cwbOBJ_WriteNewSplF:

Purpose

Writes data into a newly created spooled file.

Syntax

```
unsigned int CWB_ENTRY cwbOBJ_WriteNewSplF(
                              cwbOBJ_ObjHandle  newSplFHandle,
                              const char       *data,
                              unsigned long     dataLen,
                              cwbSV_ErrHandle   errorHandle);
```

Parameters

cwbOBJ_ObjHandle newSplFHandle - input
New spooled file handle. This is the handle passed back on the cwbOBJ_CreateNewSplF() API.

const char *data - input
Pointer to the data buffer that will be written into the spooled file.

unsigned long ulDataLen - input
Length of the data to be written.

cwbSV_ErrHandle errorHandle - output
Optional, may be 0. Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle() API. The messages may be retrieved through the cwbSV_GetErrText() API. If the parameter is set to zero, no messages will be retrievable.

Return Codes

The following list shows common return values.

CWB_NO_ERROR
Successful completion.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory.

CWB_INVALID_HANDLE
Handle is not valid spooled file handle.

CWBOBJ_RC_HOST_ERROR
Host error occurred. Text may be in errorHandle.

Usage

None

APIs for reading spooled files for iSeries Access for Windows

The following iSeries Access for Windows APIs pertain to reading spooled files. The APIs are listed alphabetically.

Note: When working with handles in the following APIs, 0 never will be returned as a valid handle.

cwbOBJ_CloseSplF:

Purpose

Closes an iSeries spooled file that was previously opened for reading.

Syntax

```
unsigned int CWB_ENTRY  cwbOBJ_CloseSplF(
                              cwbOBJ_ObjHandle  splFHandle,
                              cwbSV_ErrHandle   errorHandle);
```

Parameters

cwbOBJ_ObjHandle splFHandle - input
Handle of the spooled file to be closed.

cwbSV_ErrHandle errorHandle - output
Optional, may be 0. Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle() API. The messages may be retrieved through the cwbSV_GetErrText() API. If the parameter is set to zero, no messages will be retrievable.

Return Codes

The following list shows common return values.

CWB_NO_ERROR
Successful completion.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory.

CWB_INVALID_HANDLE
Handle is not valid spooled file handle.

CWBOBJ_RC_HOST_ERROR
Host error occurred. Text may be in errorHandle.

Usage

None

cwbOBJ_OpenSplF:

Purpose

Opens an iSeries spooled file for reading.

Syntax

```
unsigned int CWB_ENTRY  cwbOBJ_OpenSplF(
                              cwbOBJ_ObjHandle  splFHandle,
                              cwbSV_ErrHandle   errorHandle);
```

Parameters

cwbOBJ_ObjHandle splFHandle - input
Handle of the spooled file to be opened for reading.

cwbSV_ErrHandle errorHandle - output
Optional, may be 0. Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle() API. The messages may be retrieved through the cwbSV_GetErrText() API. If the parameter is set to zero, no messages will be retrievable.

Return Codes

The following list shows common return values.

CWB_NO_ERROR
Successful completion.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory.

CWB_INVALID_HANDLE
Handle is not valid spooled file handle.

CWBOBJ_RC_HOST_ERROR
Host error occurred. Text may be in errorHandle.

Usage

The spooled file should be closed with the cwbOBJ_CloseSplF() API when done reading from it.

cwbOBJ_ReadSplF:

Purpose

Reads bytes from the current read location.

Syntax

```
unsigned int CWB_ENTRY  cwbOBJ_ReadSplF(
                               cwbOBJ_ObjHandle  splFHandle,
                               char             *bBuffer,
                               unsigned long     bytesToRead,
                               unsigned long    *bytesRead,
                               cwbSV_ErrHandle   errorHandle);
```

Parameters

cwbOBJ_ObjHandle splFHandle - input
Handle of the spooled file to be read from.

char *buffer - input
Pointer to buffer to hold the bytes read from the spooled file.

unsigned long bytesToRead - input
Maximum number of bytes to read. The number read may be less than this.

unsigned long *bytesRead - output
Number of bytes actually read.

cwbSV_ErrHandle errorHandle - output
Optional, may be 0. Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle() API. The messages may be retrieved through the cwbSV_GetErrText() API. If the parameter is set to zero, no messages will be retrievable.

Return Codes

The following list shows common return values.

CWB_NO_ERROR
Successful completion.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory.

CWB_INVALID_HANDLE
Handle is not valid spooled file handle.

CWBOBJ_RC_HOST_ERROR
Host error occurred. Text may be in errorHandle.

CWBOBJ_RC_SPLFNOTOPEN
Spooled file has not been opened yet.

CWBOBJ_RC_SPLFENDOFFILE
The end of file was read.

Usage

The cwbOBJ_OpenSplF() API must be called with this spooled fil handle before this API is called. If the end of file is reached when reading, the return code will be CWBOBJ_SPLF_ENDOFFILE and bytesRead will contain the actual number of bytes read.

cwbOBJ_SeekSplF:

Purpose

Moves the current read position on a spooled file that is open for reading.

Syntax

```
unsigned int CWB_ENTRY  cwbOBJ_SeekSplF(
                              cwbOBJ_ObjHandle   splFHandle,
                              cwbOBJ_SeekOrigin  seekOrigin,
                              signed long        seekOffset,
                              cwbSV_ErrHandle    errorHandle);
```

Parameters

cwbOBJ_ObjHandle splFHandle - input
Handle of the spooled file to be closed.

cwbOBJ_SeekOrigin seekOrigin - input
Where to seek from. Valid values are:

- CWBOBJ_SEEK_BEGINNING - seek from the beginning of file
- CWBOBJ_SEEK_CURRENT - seek from the current read position
- CWBOBJ_SEEK_ENDING - seek from the end of the file

signed long seekOffset - input
Offset (negative or positive) from the seek origin in bytes to move the current read pointer to.

cwbSV_ErrHandle errorHandle - output
Optional, may be 0. Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle() API. The messages may be retrieved through the cwbSV_GetErrText() API. If the parameter is set to zero, no messages will be retrievable.

Return Codes

The following list shows common return values.

CWB_NO_ERROR
Successful completion.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory.

CWB_INVALID_HANDLE
Handle is not valid spooled file handle.

CWB_INVALID_PARAMETER
Invalid parameter specified.

CWBOBJ_RC_HOST_ERROR
Host error occurred. Text may be in errorHandle.

CWBOBJ_RC_SPLFNOTOPEN
Spooled file has not been opened yet.

CWBOBJ_RC_SEEKOUTOFRANGE
Seek offset out of range.

Usage

The cwbOBJ_OpenSplF() API must be called with this spooled file handle before this API is called.

APIs for manipulating spooled files for iSeries Access for Windows

The following iSeries Access for Windows APIs pertain to manipulating spooled files. The APIs are listed alphabetically.

Note: When working with handles in the following APIs, 0 never will be returned as a valid handle.

cwbOBJ_CallExitPgmForSplF:

Purpose

Instructs the iSeries Access Netprint server program, QNPSERVR, to call down its exit program chain passing this spooled file's ID and some application specified data as parameters.

Syntax

```
unsigned int CWB_ENTRY  cwbOBJ_CallExitPgmForSplF(
                              cwbOBJ_ObjHandle    splFHandle,
                              void               *data,
                              unsigned long       dataLen,
                              cwbSV_ErrHandle     errorHandle);
```

Parameters

cwbOBJ_ObjHandle splFHandle - input
Handle of the spooled file to be passes as a parameter to the exit programs.

void *data - input
Pointer to a block of date that will be passed to the exit programs. The format of this data is exit program specific.

unsigned long dataLen - input
length of data pointed to by pData.

cwbSV_ErrHandle errorHandle - output
Optional, may be 0. Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle() API. The messages may be retrieved through the cwbSV_GetErrText() API. If the parameter is set to zero, no messages will be retrievable.

Return Codes

The following list shows common return values.

CWB_NO_ERROR
Successful completion.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory.

CWB_INVALID_HANDLE
Handle is not valid spooled file handle.

CWBOBJ_RC_HOST_ERROR
Host error occurred. Text may be in errorHandle.

CWBOBJ_RC_INVALID_TYPE
Handle is not a spooled file handle.

CWBOBJ_RC_NO_EXIT_PGM
No exit program is registered with the Network Print server.

Usage

This is a way for a client program to communicate with its server portion to do processing of spooled files. All exit programs registered with the QNPSERVR program on the iSeries server will be called, so it is up to the client program and exit program to architect the format of the data in *data such that the exit program can recognize it. See the iSeries server 'Guide to Programming for Print' for information on the interface between the QNPSERVR server program and the exit programs.

cwbOBJ_CreateSplFHandle:

Purpose

Create a spooled file handle for a particular spooled file on a specified system.

Syntax

```
unsigned int CWB_ENTRY  cwbOBJ_CreateSplFHandle(
                              const char          *systemName,
                              const char          *jobName,
                              const char          *jobNumber,
                              const char          *jobUser,
                              const char          *splFName,
                              const unsigned long  splFNumber,
                              cwbOBJ_ObjHandle    *objectHandle,
                              cwbSV_ErrHandle      errorHandle);
```

Parameters

const char *systemName - input
Pointer to the system name contained in an ASCIIZ string.

const char *jobName - input
Pointer to the name of the iSeries job that created the spooled file in an ASCIIZ string.

const char *jobNumber - input
Pointer to the number of the iSeries job that created the spooled file in an ASCIIZ string.

const char *jobNumber - input
Pointer to the user of the iSeries job that created the spooled file in an ASCIIZ string.

const char *splFName - input
Pointer to the name of the spooled file in an ASCIIZ string.

const unsigned long splFNumber - input
The number of the spooled file.

cwbOBJ_ObjHandle *objectHandle - output
On output this will contain the spooled file handle.

cwbSV_ErrHandle errorHandle - output
Optional, may be 0. Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle() API. The messages may be retrieved through the cwbSV_GetErrText() API. If the parameter is set to zero, no messages will be retrievable.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory.

CWB_INVALID_PARAMETER
Invalid parameter specified.

CWB_NON_REPRESENTABLE_UNICODE_CHAR
One or more input Unicode characters have no representation in the codepage being used.

CWB_API_ERROR
General API failure.

Usage

This API does no checking of the spooled file on the host. The first time this handle is used to retrieve data for the spooled file, a host error will be encountered if the spooled file doesn't exist.

cwbOBJ_CreateSplFHandleEx:

Purpose

Create a spooled file handle for a particular spooled file on a specified system.

Syntax

```
unsigned int CWB_ENTRY  cwbOBJ_CreateSplFHandleEx(
                              const char          *systemName,
                              const char          *jobName,
                              const char          *jobNumber,
                              const char          *jobUser,
                              const char          *splFName,
                              const unsigned long  splFNumber,
                              const char          *createdSystem,
                              const char          *createdDate,
                              const char          *createdTime,
                              cwbOBJ_ObjHandle    *objectHandle,
                              cwbSV_ErrHandle      errorHandle);
```

Parameters

const char *systemName - input
Pointer to the system name contained in an ASCIIZ string.

const char *jobName - input
Pointer to the name of the iSeries job that created the spooled file in an ASCIIZ string.

const char *jobNumber - input
Pointer to the number of the iSeries job that created the spooled file in an ASCIIZ string.

const char *jobNumber - input
Pointer to the user of the iSeries job that created the spooled file in an ASCIIZ string.

const char *splFName - input
Pointer to the name of the spooled file in an ASCIIZ string.

const unsigned long splFNumber - input
The number of the spooled file.

const char *createdSystem - input
Pointer to the name of the system the spooled file was created on in an ASCIIZ string.

const char *createdDate - input
Pointer to the date the spooled file was created in an ASCIIZ string.

const char *createdTime - input
Pointer to the time the spooled file was created in an ASCIIZ string.

cwbOBJ_ObjHandle *objectHandle - output
On output this will contain the spooled file handle.

cwbSV_ErrHandle errorHandle - output
Optional, may be 0. Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle() API. The messages may be retrieved through the cwbSV_GetErrText() API. If the parameter is set to zero, no messages will be retrievable.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory.

CWB_INVALID_PARAMETER
Invalid parameter specified.

CWB_NON_REPRESENTABLE_UNICODE_CHAR
One or more input Unicode characters have no representation in the codepage being used.

CWB_API_ERROR
General API failure.

Usage

This API does not check the spooled file on the host. The first time this handle is used to retrieve data for the spooled file, a host error will be encountered if the spooled file doesn't exist.

cwbOBJ_DeleteSplF:

Purpose

Delete an iSeries spooled file.

Syntax

```
unsigned int CWB_ENTRY  cwbOBJ_DeleteSplF(
                              cwbOBJ_ObjHandle  splFHandle,
                              cwbSV_ErrHandle   errorHandle);
```

Parameters

cwbOBJ_ObjHandle splFHandle - input
Handle of the spooled file to be deleted.

cwbSV_ErrHandle errorHandle - output
Optional, may be 0. Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle() API. The messages may be retrieved through the cwbSV_GetErrText() API. If the parameter is set to zero, no messages will be retrievable.

Return Codes

The following list shows common return values.

CWB_NO_ERROR
Successful completion.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory.

CWB_INVALID_HANDLE
Handle is not valid.

CWBOBJ_RC_HOST_ERROR
Host error occurred. Text may be in errorHandle.

CWBOBJ_RC_INVALID_TYPE
Handle is not a spooled file handle.

Usage

After this calls returns successfully, cwbOBJ_DeleteObjHandle() should be called to release the splFHandle.

cwbOBJ_DisplaySplF:

Purpose

Displays the specified spooled file to the user.

Syntax

```
unsigned int CWB_ENTRY  cwbOBJ_DisplaySplF(
                             cwbOBJ_ObjHandle     splFHandle,
                             const char          *view,
                             const unsigned long  flags,
                             cwbSV_ErrHandle      errorHandle);
```

Parameters

cwbOBJ_ObjHandle splFHandle - input
Handle of the parameter object.

const char *view - input
Optional, may be NULL. If specified it is a pointer to an ASCIIZ string that specifies the view to use when invoking the spooled file viewer. The are two predefined views shipped with the viewer:

1. LETTER (8.5″ x 11″)
2. SFLVIEW (132 column)

Users may also add their own.

const unsigned long flags - input
Any of following bits may be set: CWBOBJ_DSPSPLF_WAIT - instructs this call to wait until the viewer process has successfully opened the spooled file before returning. If this bit is 0, this API will return after it starts the viewer process. If it is 1, this API will wait for the viewer to get the spooled file open before returning. All other bits must be set to 0.

cwbSV_ErrHandle errorHandle - output
Optional, may be 0. Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle() API. The messages may be retrieved through the cwbSV_GetErrText() API. If the parameter is set to zero, no messages will be retrievable.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory.

CWB_INVALID_HANDLE
Handle is not an allocated object handle.

CWB_NO_VIEWER
The viewer support for ClientAccess/400 was not installed.

CWB_NON_REPRESENTABLE_UNICODE_CHAR
One or more input Unicode characters have no representation in the codepage being used.

CWB_API_ERROR
General API failure.

Usage

Use this API to bring up the AFP viewer on the specified spooled file. The AFP viewer can view AFP data, SCS data and plain ASCII text data. A return code of CWB_NO_VIEWER means that the viewer component was not installed on the workstation.

cwbOBJ_HoldSplF:

Purpose

Holds a spooled file.

Syntax

```
unsigned int CWB_ENTRY  cwbOBJ_HoldSplF(
                             cwbOBJ_ObjHandle    splFHandle,
                             cwbOBJ_ParmHandle  *parmListHandle,
                             cwbSV_ErrHandle     errorHandle);
```

Parameters

cwbOBJ_ObjHandle splFHandle - input
Handle of the spooled file to be held.

cwbOBJ_ParmHandle *parmListHandle - input
Optional. A pointer to a valid parameter list object handle that contains parameters for holding the spooled file.

cwbSV_ErrHandle errorHandle - output
Optional, may be 0. Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle() API. The messages may be retrieved through the cwbSV_GetErrText() API. If the parameter is set to zero, no messages will be retrievable.

Return Codes

The following list shows common return values.

CWB_NO_ERROR
Successful completion.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory.

CWB_INVALID_HANDLE
Handle is not valid.

CWB_INVALID_PARAMETER
Invalid parameter specified.

CWBOBJ_RC_HOST_ERROR
Host error occurred. Text may be in errorHandle.

CWBOBJ_RC_INVALID_TYPE
Handle is not a spooled file handle.

Usage

The following parameter key may be set in the parmListHandle object:

- CWBOBJ_KEY_HOLDTYPE

  what type of hold to do. May be "*IMMED" or "*PAGEEND". "*IMMED" is the default.

cwbOBJ_IsViewerAvailable:

Purpose

Checks if the spooled file viewer is available.

Syntax

```
unsigned int CWB_ENTRY  cwbOBJ_IsViewerAvailable(
                             cwbSV_ErrHandle   errorHandle);
```

Parameters

cwbSV_ErrHandle errorHandle - output
Optional, may be 0. Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle() API. The messages may be retrieved through the cwbSV_GetErrText() API. If the parameter is set to zero, no messages will be retrievable.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion (viewer is installed).

CWB_NO_VIEWER
Viewer not installed.

Usage

Use this function to test for the presence of the viewer on the workstation. If the viewer is installed this function will return CWB_OK. If the viewer is not available, the function will return CWB_NO_VIEWER and the errorHandle parameter (if provided) will contain an appropriate error message. Using this function, applications can check for viewer support without calling the cwbOBJ_DisplaySplF() API.

cwbOBJ_MoveSplF:

Purpose

Moves an iSeries spooled file to another output queue or to another position on the same output queue.

Syntax

```
unsigned int CWB_ENTRY  cwbOBJ_MoveSplF(
                              cwbOBJ_ObjHandle   splFHandle,
                              cwbOBJ_ObjHandle  *targetSplFHandle,
                              cwbOBJ_ObjHandle  *outputQueueHandle,
                              cwbSV_ErrHandle    errorHandle);
```

Parameters

cwbOBJ_ObjHandle splFHandle - input
Handle of the spooled file to be moved.

cwbOBJ_ObjHandle *targetSplFHandle - input
Optional. The handle of another spooled file on the same system, that specifies the spooled file to move this spooled file after. If this is specified, *outputQueueHandle is not used.

cwbOBJ_ObjHandle *outputQueueHandle - input
Optional. The handle of an output queue on the same system that specifies which output queue to move the spooled file to. The spooled file will be moved to the first position on this queue. This parameter is ignored if targetSplFHandle is specified.

cwbSV_ErrHandle errorHandle - output
Optional, may be 0. Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle() API. The messages may be retrieved through the cwbSV_GetErrText() API. If the parameter is set to zero, no messages will be retrievable.

Return Codes

The following list shows common return values.

CWB_NO_ERROR
Successful completion.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory.

CWB_INVALID_HANDLE
Handle is not valid.

CWBOBJ_RC_HOST_ERROR
Host error occurred. Text may be in errorHandle.

CWBOBJ_RC_INVALID_TYPE
Handle is not a spooled file handle.

Usage

If both targetSplFHandle and outputQueueHandle are NULL, the spooled file will be moved to the first position on the current output queue.

cwbOBJ_ReleaseSplF:

Purpose

Releases a spooled file.

Syntax

```
unsigned int CWB_ENTRY  cwbOBJ_ReleaseSplF(
                              cwbOBJ_ObjHandle  splFHandle,
                              cwbSV_ErrHandle   errorHandle);
```

Parameters

cwbOBJ_ObjHandle splFHandle - input
Handle of the spooled file to be released.

cwbSV_ErrHandle errorHandle - output
Optional, may be 0. Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle() API. The messages may be retrieved through the cwbSV_GetErrText() API. If the parameter is set to zero, no messages will be retrievable.

Return Codes

The following list shows common return values.

CWB_NO_ERROR
Successful completion.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory.

CWB_INVALID_HANDLE
Handle is not valid.

CWBOBJ_RC_HOST_ERROR
Host error occurred. Text may be in errorHandle.

CWBOBJ_RC_INVALID_TYPE
Handle is not a spooled file handle.

Usage

None

cwbOBJ_SendNetSplF:

Purpose

Sends a spooled file to another user on the same system or to a remote system on the network.

Syntax

```
unsigned int CWB_ENTRY  cwbOBJ_SendNetSplF(
                             cwbOBJ_ObjHandle   splFHandle,
                             cwbOBJ_ParmHandle  parmListHandle,
                             cwbSV_ErrHandle    errorHandle);
```

Parameters

cwbOBJ_ObjHandle splFHandle - input
Handle of the spooled file to be sent.

cwbOBJ_ParmHandle parmListHandle - input
Required. A handle of a parameter list object that contains the parameters for sending the spooled file.

cwbSV_ErrHandle errorHandle - output
Optional, may be 0. Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle() API. The messages may be retrieved through the cwbSV_GetErrText() API. If the parameter is set to zero, no messages will be retrievable.

Return Codes

The following list shows common return values.

CWB_NO_ERROR
Successful completion.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory.

CWB_INVALID_HANDLE
Handle is not valid.

CWB_INVALID_PARAMETER
invalid parameter specified.

CWBOBJ_RC_HOST_ERROR
Host error occurred. Text may be in errorHandle.

CWBOBJ_RC_INVALID_TYPE
Handle is not a spooled file handle.

Usage

The equivalent of a send net spooled file (SNDNETSPLF) command will be issued against the spooled file. The following parameter key's MUST be set in the parmListHandl object:

- CWBOBJ_KEY_TOUSERID

  Specifies user ID to send the spooled file to.
- CWBOBJ_KEY_TOADDRESS

  Specifies the remote system to send the spooled file to. ″*NORMAL″ is the default.

The following parameter key's may be set in the parmListHandle object:

- CWBOBJ_KEY_DATAFORMAT

  Specifies the data format in which to transmit the spooled file. May be ″*RCDDATA″ or ″*ALLDATA″. ″*RCDDATA″ is the default.
- CWBOBJ_KEY_VMMVSCLASS

  Specifies the VM/MVS SYSOUT class for distributions sent to a VM host system or to an MVS™ host system. May be ″A″ to ″Z″ or ″0″ to ″9″. ″A″ is the default.
- CWBOBJ_KEY_SENDPTY

  Specifies the queueing priority used for this spooled file when it is being routed through a snad network. May be ″*NORMAL″ or ″*HIGH″. ″*NORMAL″ is the default.

cwbOBJ_SendTCPSplF:

Purpose

Sends a spooled file to be printed on a remote system. This is the iSeries server version of the TCP/IP LPR command.

Syntax

```
unsigned int CWB_ENTRY  cwbOBJ_SendTCPSplF(
                              cwbOBJ_ObjHandle   splFHandle,
                              cwbOBJ_ParmHandle  parmListHandle,
                              cwbSV_ErrHandle    errorHandle);
```

Parameters

cwbOBJ_ObjHandle splFHandle - input
Handle of the spooled file to be sent.

cwbOBJ_ParmHandle parmListHandle - input
Required. A handle of a parameter list object that contains the parameters for sending the spooled file.

cwbSV_ErrHandle errorHandle - output
Optional, may be 0. Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle() API. The messages may be retrieved through the cwbSV_GetErrText() API. If the parameter is set to zero, no messages will be retrievable.

Return Codes

The following list shows common return values.

CWB_NO_ERROR
Successful completion.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory.

CWB_INVALID_HANDLE
Handle is not valid.

CWB_INVALID_PARAMETER
Invalid parameter specified.

CWBOBJ_RC_HOST_ERROR
Host error occurred. Text may be in errorHandle.

CWBOBJ_RC_INVALID_TYPE
Handle is not a spooled file handle.

CWBOBJ_KEY_SEPPAGE
Specifies wether or not to print the separator page.

CWBOBJ_KEY_USRDTATFMLIB
Specifies the name of the user data transform library.

CWBOBJ_KEY_USRDTATFM
Specifies the name of the user data transform.

Usage

The equivalent of an iSeries server send TCP/IP spooled file (SNDTCPSPLF) command will be issued against the spooled file. The following parameter key's MUST be set in the parmListHandl object:

- CWBOBJ_KEY_RMTSYSTEM

  Specifies the remote system to which the print request is sent. May be a remote system name or ″*INTNETADR″.
- CWBOBJ_KEY_RMTPRTQ

  Specifies the name of the destination print queue.

The following parameter key's may be set in the parmListHandle object:

- CWBOBJ_KEY_DELETESPLF

  Specifies whether to delete the spooled file after it has been successfully sent. May be ″*NO″ or ″*YES″. ″*NO″ is the default.
- CWBOBJ_KEY_DESTOPTION

  Specifies a destination-dependant option. These options will be sent to the remote system with the spooled file.
- CWBOBJ_KEY_DESTINATION

Specifies the type of system to which the spooled file is being sent. When sending to other iSeries systems, this value should be ″*AS/400″. May also be ″*OTHER″, ″*PSF/2″. ″*OTHER″ is the default.

- CWBOBJ_KEY_INTERNETADDR

  Specifies the internet address of the receiving system.
- CWBOBJ_KEY_MFGTYPE

  Specifies the manufacturer, type and model when transforming print data for SCS to ASCII.
- CWBOBJ_KEY_SCS2ASCII

  Specifies wether the print data is to be transformed for SCS to ASCII. May be ″*NO″ or ″*YES″. ″*NO″ is the default.
- CWBOBJ_KEY_WSCUSTMOBJ

  Specifies the name of the workstation customizing object.
- CWBOBJ_KEY_WSCUSTMOBJL

  Specifies the name of the workstation customizing object library.

APIs for handling spooled file messages for iSeries Access for Windows

The following iSeries Access for Windows APIs pertain to handling spooled file messages. The APIs are listed alphabetically.

Note: When working with handles in the following APIs, 0 never will be returned as a valid handle.

cwbOBJ_AnswerSplFMsg:

Purpose

Answer the message that the spooled file is waiting on.

Syntax

```
unsigned int CWB_ENTRY  cwbOBJ_AnswerSplFMsg(
                             cwbOBJ_ObjHandle   splFHandle,
                             char              *msgAnswer,
                             cwbSV_ErrHandle    errorHandle);
```

Parameters

cwbOBJ_ObjHandle splFHandle - input
Handle of the spooled file to answer the message for.

const char *msgAnswer - input
Pointer to a ASCIIZ string that contains the answer for the message.

cwbSV_ErrHandle errorHandle - output
Optional, may be 0. Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle() API. The messages may be retrieved through the cwbSV_GetErrText() API. If the parameter is set to zero, no messages will be retrievable.

Return Codes

The following list shows common return values.

CWB_NO_ERROR
Successful completion.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory.

CWB_INVALID_HANDLE
Handle is not valid spooled file handle.

CWBOBJ_RC_HOST_ERROR
Host error occurred. Text may be in errorHandle

CWBOBJ_RC_INVALID_TYPE
Handle is not a spooled file handle.

CWBOBJ_RC_SPLFNOMESSAGE
The spooled file isn't waiting on a message.

Usage

None

cwbOBJ_GetSplFMsgAttr:

Purpose

Retrieves an attribute of a message that's associated with a spooled file.

Syntax

```
unsigned int CWB_ENTRY  cwbOBJ_GetSplFMsgAttr(
                              cwbOBJ_ObjHandle  splFHandle,
                              cwbOBJ_KeyID       key,
                              void              *buffer,
                              unsigned long      bufLen,
                              unsigned long     *bytesNeeded,
                              cwbOBJ_DataType   *keyType,
                              cwbSV_ErrHandle    errorHandle);
```

Parameters

cwbOBJ_ObjHandle splFHandle - input
Handle of the spooled file.

cwbOBJ_KeyID key - input
Identifying key of the attribute to retrieve. The CWBOBJ_KEY_XXX constants define the key ids.

void *buffer - output
The buffer that will hold the attribute value, if this call returns successfully. The value of the key determines what type of data will be put into pBuffer. The type is also returned to the *keyType parameter, if provided.

unsigned long bufLen - input
The length of the buffer pointed to by pBuffer.

unsigned long *bytesNeeded - output
On output, this will be the number of bytes needed to hold result.

cwbOBJ_DataType *keyType - output
Optional, may be NULL. On output this will contain the type of data used to represent this attribute and what is stored at *buffer.

cwbSV_ErrHandle errorHandle - output
Optional, may be 0. Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle() API. The messages may be retrieved through the cwbSV_GetErrText() API. If the parameter is set to zero, no messages will be retrievable.

Return Codes

The following list shows common return values.

CWB_NO_ERROR
Successful completion.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory.

CWB_INVALID_HANDLE
Handle is not an allocated object handle.

CWB_BUFFER_OVERFLOW
Buffer too small.

CWBOBJ_RC_HOST_ERROR
Host error occurred. Text may be in errorHandle.

CWBOBJ_RC_INVALID_KEY
Key isn't valid.

CWBOBJ_RC_SPLFNOMESSAGE
The spooled file isn't waiting on a message.

CWB_API_ERROR
General API failure.

Usage

The following keys are valid:

```
CWBOBJ_KEY_MSGTEXT       -   Message text
CWBOBJ_KEY_MSGHELP       -   Message help text
CWBOBJ_KEY_MSGREPLY      -   Message reply
CWBOBJ_KEY_MSGTYPE       -   Message type
CWBOBJ_KEY_MSGID         -   Message ID
CWBOBJ_KEY_MSGSEV        -   Message severity
CWBOBJ_KEY_DATE          -   Message date
CWBOBJ_KEY_TIME          -   Message time
```

Message formatting characters will appear in the message text and should be used as follows:

&N Force the text to a new line indented to column 2. If the text is longer than 1 line, the next lines should be indented to column 4 until the end of text or another format control character is found.

&P Force the text to a new line indented to column 6. If the text is longer than 1 line, the next lines should be indented to column 4 until the end of text or another format control character is found.

&B Force the text to a new line indented to column 4. If the text is longer than 1 line, the next lines should be indented to column 6 until the end of text or another format control character is found.

APIs for analyzing spooled file data for iSeries Access for Windows

The following iSeries Access for Windows APIs pertain to analyzing spooled file data. The APIs are listed alphabetically.

Note: When working with handles in the following APIs, 0 never will be returned as a valid handle.

cwbOBJ_AnalyzeSplFData:

Purpose

Analyze data for a spooled file and give a best guess as to what the data type is.

Syntax

```
unsigned int CWB_ENTRY cwbOBJ_AnalyzeSplFData(
                              const char          *data,
                              unsigned long         bufLen,
                              cwbOBJ_SplFDataType  *dataType,
                              cwbSV_ErrHandle       errorHandle);
```

Parameters

const char *data - input
pointer to data to be analyzed.

unsigned long bufLen - input
The length of the buffer pointed to by data.

cwbOBJ_SplFDataType *dataType - output
On output this will contain the data type. If the data type can not be determined, it defaults to CWBOBJ_DT_USERASCII.

cwbSV_ErrHandle errorHandle - output
Optional, may be 0. Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle() API. The messages may be retrieved through the cwbSV_GetErrText() API. If the parameter is set to zero, no messages will be retrievable.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_PARAMETER
Invalid parameter specified.

Usage

This uses the same routine that is used during the creation of spooled files that don't have a data type specified or have a data type of *AUTO specified. The result defaults to *USERASCII if it can not be determined.

Server program APIs for iSeries Access for Windows

The following iSeries Access for Windows APIs pertain to server programs. The APIs are listed alphabetically.

Note: When working with handles in the following APIs, 0 never will be returned as a valid handle.

cwbOBJ_DropConnections:

Purpose

Drops all unused conversations to all systems for the network print server for this process.

Syntax

```
unsigned int CWB_ENTRY  cwbOBJ_DropConnections(
                              cwbSV_ErrHandle   errorHandle);
```

Parameters

cwbSV_ErrHandle errorHandle - output
Optional, may be 0. Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle() API. The messages may be retrieved through the cwbSV_GetErrText() API. If the parameter is set to zero, no messages will be retrievable.

Return Codes

The following list shows common return values.

CWB_NO_ERROR
Successful completion.

CWBOBJ_RC_HOST_ERROR
Host error occurred. Text may be in errorHandle.

Usage

The CWBOBJ.DLL maintains a pool of available conversations to the network print server for use on the APIs. These conversations normally time out after not having been used for 10 to 20 minutes and are then dropped. This API allows the application to clean up the pool of conversations immediately without waiting for the timeout. It can also be used at the end of the process to make sure that any conversations are terminated. This API will drop all connections to all servers for this process that are not ″in use.″ In use connections include those with open spooled files on them (for creating or reading from).

cwbOBJ_GetNPServerAttr:

Purpose

Get an attribute of the QNPSERVR program on a specified system.

Syntax

```
unsigned int CWB_ENTRY cwbOBJ_GetNPServerAttr(
                              const char      *systemName,
                              cwbOBJ_KeyID     key,
                              void            *buffer,
                              unsigned long    bufLen,
                              unsigned long   *bytesNeeded,
                              cwbOBJ_DataType *keyType,
                              cwbSV_ErrHandle  errorHandle);
```

Parameters

const char *systemName - input
Pointer to the system name contained in an ASCIIZ string.

cwbOBJ_KeyID key - input
Identifying key of the attribute to retrieve.

void *buffer - output
The buffer that will hold the attribute value. If this call returns successfully. The value of the key determines what type of data will be put into pBuffer. The type is also returned to the *keyType parameter, if provided.

unsigned long bufLen - input
The length of the buffer pointed to by pBuffer.

unsigned long *bytesNeeded - output
On output, this will be the number of bytes needed to hold result.

cwbOBJ_DataType *keyType - output
Optional, may be NULL. On output this will contain the type of data used to represent this attribute and what is stored at *buffer.

cwbSV_ErrHandle errorHandle - output
Optional, may be 0. Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle() API. The messages may be retrieved through the cwbSV_GetErrText() API. If the parameter is set to zero, no messages will be retrievable.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory.

CWB_BUFFER_OVERFLOW
Buffer too small.

CWB_INVALID_PARAMETER
Invalid parameter specified.

CWBOBJ_RC_HOST_ERROR
Host error occurred. Text may be in errorHandle.

CWBOBJ_RC_INVALID_KEY
Key isn't valid.

CWB_NON_REPRESENTABLE_UNICODE_CHAR
One or more input Unicode characters have no representation in the codepage being used.

CWB_API_ERROR
General API failure.

Usage

The following attributes may be retrieved from the QNPSERVR program:
- CWBOBJ_KEY_NPSCCSID - Server CCSID
- CWBOBJ_KEY_NPSLEVEL - Server code level

cwbOBJ_SetConnectionsToKeep:

Purpose

Set the number of connections that should be left active for a particular system. Normally, the cwbobj.dll will time out and drop connections after they have not been used for a while. With this API you can force it to leave open a certain number of connections for this system.

Syntax

```
unsigned int CWB_ENTRY cwbOBJ_SetConnectionsToKeep(
                              const char *systemName
                              unsigned int connections
                              cwbSV_ErrHandle  errorHandle);
```

Parameters

const char *systemName - input
Pointer to the system name contained in ASCIIZ string.

unsigned int connections - input
The number to of connections to keep open.

cwbSV_ErrHandle errorHandle - output
Optional, may be 0. Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle() API. The messages may be retrieved through the cwbSV_GetErrText() API. If the parameter is set to zero, no messages will be retrievable.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_PARAMETER
Invalid parameter specified.

Usage

The default number of connections left open per system is 0. The connections are made per process, so this API only affects connections under the process it is called under. Setting the number of connections to be left open does not open any new connections.

Example: Using iSeries Objects APIs for iSeries Access for Windows

The following example shows a typical calling sequence for retrieving a list of spooled files.

```
/********************************************************/
/* List all spooled files for the current user and      */
/*  display them to the user.                           */
/********************************************************/

 #ifdef UNICODE
    #define _UNICODE
 #endif
 #include <windows.h>

 #include <stdio.h>
 #include "CWBOBJ.H"
main(int argc, char *argv[ ], char *envp[ ])
{
 cwbOBJ_ListHandle listHandle;
 cwbOBJ_ObjHandle  splFHandle;
 unsigned int ulRC;
 unsigned long ulListSize, ulObjPosition, ulBytesNeeded;
 cwbOBJ_KeyID keysWanted[] = { CWBOBJ_KEY_SPOOLFILE,
                                                 CWBOBJ_KEY_USER };
 unsigned long ulNumKeysWanted = sizeof(keysWanted)/sizeof(*keysWanted);
 char szSplFName[11];
 char szUser[11];

 ulRC = cwbOBJ_CreateListHandle(_TEXT("ANYAS400"),
                                CWBOBJ_LIST_SPLF,
                                &listHandle,
                                0);
 if (ulRC == CWB_OK)
 {

     /* Set up the filter for the list to be opened with   */
     /* NOTE: this is just for example, the user defaults  */
     /*       to *CURRENT, so this isn't really needed.    */

     cwbOBJ_SetListFilter(listHandle, CWBOBJ_KEY_USER,
                          _TEXT("*CURRENT"), 0);

     /* Optionally call to cwbOBJ_SetListAttrsToRetrieve to*/
     /*  make walking the list faster                      */
     ulRC = cwbOBJ_SetListAttrsToRetrieve(listHandle,
                                          ulNumKeysWanted,
                                          keysWanted,
                                          0);

     /* open the list - this will build the list of spooled*/
     /* files.                                             */
```

```
ulRC = cwbOBJ_OpenList(listHandle,
                       CWBOBJ_LIST_OPEN_SYNCH,
                       0);
if (ulRC == CWB_OK)
{
    /* Get the number of items that are in the list   */
    ulRC = cwbOBJ_GetListSize(listHandle,
                              &ulListSize,
                              (cwbOBJ_List_Status *)0,
                              0);
    if (ulRC == CWB_OK)
    {

        /* walk through the list of items, displaying */
        /* each item to the user                      */

        ulObjPosition = 0;
        while (ulObjPosition < ulListSize)
        {
           /*******************************************/
           /* Get a handle to the next spooled file in*/
           /* the list.  This handle is valid while   */
           /* the list is open.  If you want to       */
           /* maintain a handle to the spooled file   */
           /* after the list is closed, you could call*/
           /* cwbOBJ_CopyObjHandle() after this call. */
           /*******************************************/
           ulRC = cwbOBJ_GetObjHandle(listHandle,
                                      ulObjPosition,
                                      &splFHandle,
                                      0);
           if (ulRC == CWB_OK)
           {

              /****************************************/
              /* call cwbOBJ_GetObjAttr() to get info */
              /* about this spooled file.  May also   */
              /* call spooled file specific APIs      */
              /* with this handle, such as            */
              /* cwbOBJ_HoldSplF().                   */
              /****************************************/

              ulRC = cwbOBJ_GetObjAttr(splFHandle,
                                       CWBOBJ_KEY_SPOOLFILE,
                                       (void *)szSplFName,
                                       sizeof(szSplFName),
                                       &ulBytesNeeded,
                                       NULL,
                                       0);
              if (ulRC == CWB_OK)
              {
                 ulRC = cwbOBJ_GetObjAttr(splFHandle,
                                          CWBOBJ_KEY_USER,
                                          (void *)szUser,
                                          sizeof(szUser),
                                          &ulBytesNeeded,
                                          NULL,
                                          0);
                 if (ulRC == CWB_OK)
                 {
                    printf("%3u: %11s %s\n",
                           ulObjPosition, szSplFName, szUser);
                 } else {
                    /* ERROR on GetObjAttr! */
                 }
              } else {
                 /* ERROR on GetObjAttr! */
```

```
                }
                /* free this object handle              */
                cwbOBJ_DeleteObjHandle(splFHandle, 0);
             } else {
               /* ERROR on GetObjHandle! */
             }
             ulObjPosition++;
          }
        } else {
          /* ERROR on GetListSize! */
        }
        cwbOBJ_CloseList(listHandle, 0);
    } else {
       /* ERROR on OpenList! */
    }

    cwbOBJ_DeleteListHandle(listHandle, 0);
}
```

iSeries Access for Windows Remote Command/Distributed Program Call APIs

The iSeries Access for Windows Remote Command/Distributed Program Call APIs allow the PC application programmer to access functions on the iSeries system. User program and system commands can be called without requiring an emulation session. A single iSeries program serves commands and programs, so only one iSeries job is started for both.

iSeries Access for Windows Remote Command APIs:

The iSeries Access for Windows Remote Command application programming interfaces (APIs) enable your PC application to start non-interactive commands on the iSeries system and to receive completion messages from these commands. The iSeries server command can send up to ten reply messages.

iSeries Access for Windows Distributed Program Call API:

The iSeries Access for Windows Distributed Program Call API allows your PC application to call any iSeries program or command. Input, output and in/out parameters are handled through this function. If the program runs correctly, the output and the in/out parameters will contain the data returned by the iSeries program that was called. If the program fails to run correctly on the iSeries server, the program can send up to ten reply messages.

iSeries Access for Windows Remote Command/Distributed Program Call APIs required files:

Header file	Import library	Dynamic Link Library
cwbrc.h	cwbapi.lib	cwbrc.dll

Programmer’s Toolkit:

The Programmer’s Toolkit provides Remote Command and Distributed Program Call documentation, access to the cwbrc.h header file, and links to sample programs. To access this information, open the Programmer’s Toolkit and select either **Remote Command** or **Distributed Program Call → C/C++ APIs**.

Note: By using the code examples, you agree to the terms of the “Code license and disclaimer information” on page 552.

Related reference

“Remote Command/Distributed Program Call APIs return codes” on page 27

“iSeries system name formats for connection APIs” on page 5
APIs that take an iSeries system name as a parameter accept names in the following formats.

“OEM, ANSI, and Unicode considerations” on page 6
Most of the iSeries Access for Windows C/C++ APIs that accept string parameters exist in three forms: OEM, ANSI, or Unicode.

Typical use of iSeries Access for Windows Remote Command/Distributed Program Call APIs

An application that uses the iSeries Access for Windows Remote Command/Distributed Program Call function uses objects.

Each of these objects are identified to the application through a handle:

System object
This represents an iSeries system. The handle to the system object is provided to the StartSysEx function to identify the system on which the commands or APIs will be run.

Command request object
This represents the request to the iSeries system. Commands can be run and programs can be called on this object.

Note: The Command Request object previously was known as the ″system object″ in iSeries Access for Windows.

Program object
This represents the iSeries program. Parameters can be added, and the program can be sent to the system to run the program.

There is not a separate object for commands. The command string is sent directly to the command request.

An application that uses the Remote Command/Distributed Program Call APIs first creates a system object by calling the “cwbCO_CreateSystem” on page 46 function. This function returns a handle to the system object. This handle then is used with the “cwbRC_StartSysEx” on page 327 function to start a conversation with the iSeries system. The cwbRC_StartSysEx function returns a handle to the command request. Use the command request handle to call programs or to run commands. The APIs that are associated with the command request object are:

- “cwbRC_StartSysEx” on page 327
- “cwbRC_CallPgm” on page 331
- “cwbRC_RunCmd” on page 329
- “cwbRC_StopSys” on page 328

A command is a character string that is to be run on the iSeries system. Because it is a simple object (a character string) no additional object will need to be created in order to run a command. The command string simply is a parameter on the cwbRC_RunCmd API.

A program is a complex object that is created with the cwbRC_CreatePgm API, which requires the program name and the library name as parameters. The handle that is returned by this function can have 0 to 35 parameters associated with it. Parameters are added with the cwbRC_AddParm function. Parameters types can be input, output, or input/output. These parameters need to be in a format with which the iSeries program can work (that is, one for which no data transform or data conversion will occur). When all of the parameters have been added, the program handle is used with the cwbRC_CallPgm API on the command request object. The APIs that are associated with the program object are:

- “cwbRC_CreatePgm” on page 332
- “cwbRC_AddParm” on page 330

- “cwbRC_GetParmCount” on page 335
- “cwbRC_GetParm” on page 334
- “cwbRC_GetPgmName” on page 336
- “cwbRC_GetLibName” on page 334
- “cwbRC_SetParm” on page 337
- “cwbRC_SetPgmName” on page 339
- “cwbRC_SetLibName” on page 337
- “cwbRC_DeletePgm” on page 333

Remote Command/Distributed Program Call: Access remote command APIs list for iSeries Access for Windows

Access the remote command server program on the iSeries system. The request handle is used to run commands and to call programs. The APIs are listed alphabetically.

cwbRC_GetClientCCSID:

Purpose

Get the coded character set identifier (CCSID) associated with the current process. This CCSID along with the host CCSID can be used to convert EBCDIC data returned by some iSeries program to ASCII data that can be used in client applications.

Syntax

```
unsigned int CWB_ENTRY cwbRC_GetClientCCSID(
                             cwbRC_SysHandle     system,
                             unsigned long      *clientCCSID);
```

Parameters

cwbRC_SysHandle system - input
Handle that was returned by a previous call to the cwbRC_StartSysEx function. It identifies the iSeries server system.

unsigned long * clientCCSID - output
Pointer to an unsigned long where the client CCSID will be written.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_POINTER
Bad or NULL pointer.

CWBRC_INVALID_SYSTEM_HANDLE
Invalid system handle.

Usage

See related APIs in the CWBNLCNV.H file.

cwbRC_GetHostCCSID:

Purpose

Get the coded character set identifier (CCSID) associated with the iSeries server job. This CCSID along with the client CCSID can be used to convert EBCDIC data returned by some iSeries programs to ASCII data that can be used in client applications.

Syntax

```
unsigned int CWB_ENTRY cwbRC_GetHostCCSID(
                             cwbRC_SysHandle     system,
                             unsigned long      *hostCCSID);
```

Parameters

cwbRC_SysHandle system - input
Handle that was returned by a previous call to the cwbRC_StartSysEx function. It identifies the iSeries system.

unsigned long * hostCCSID - output
Pointer to an unsigned long where the host CCSID will be written.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_POINTER
Bad or NULL pointer.

CWBRC_INVALID_SYSTEM_HANDLE
Invalid system handle.

Usage

See related APIs in the CWBNLCNV.H file.

cwbRC_StartSysEx:

Purpose

This function starts a conversation with the specified system. If the conversation is successfully started, a handle is returned. Use this handle with all subsequent calls to issue commands or call programs. When the conversation no longer is needed, use the handle with the cwbRC_StopSys API to end the conversation. The cwbRC_StartSysEx API may be called multiple times within an application. If the same system object handle is used on StartSysEx calls, only one conversation with the iSeries server will be started. If you want multiple conversations to be active, you must call StartSysEx multiple times, specifying different system object handles.

Syntax

```
unsigned int CWB_ENTRY cwbRC_StartSysEx(
                             const cwbCO_SysHandle systemObj,
                             cwbRC_SysHandle    *request);
```

Parameters

const cwbCO_SysHandle systemObj - input
Handle to an existing system object of the system on which you want programs and commands to be run.

cwbRC_SysHandle *request - output
Pointer to a cwbRC_SysHandle where the handle of the command request will be returned.

Return Codes

The following list shows common return values:

CWB_OK
Successful completion.

CWB_COMMUNICATIONS_ERROR
A communications error occurred.

CWB_SERVER_PROGRAM_NOT_FOUND
iSeries application not found.

CWB_HOST_NOT_FOUND
iSeries system inactive or does not exist.

CWB_SECURITY_ERROR
A security error has occurred.

CWB_LICENSE_ERROR
A license error has occurred.

CWB_CONFIG_ERROR
A configuration error has occurred.

CWBRC_SYSTEM_NAME
System name is too long.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory; may have failed to allocate temporary buffer.

CWB_NON_REPRESENTABLE_UNICODE_CHAR
One or more input Unicode characters have no representation in the codepage being used.

CWB_API_ERROR
General API failure.

Usage

None.

cwbRC_StopSys:

Purpose

This function stops a conversation with the system specified by the handle. This handle can no longer be used to issue program calls or commands.

Syntax

```
unsigned int CWB_ENTRY cwbRC_StopSys(
                             cwbRC_SysHandle     system);
```

Parameters

cwbRC_SysHandle system - input
Handle that was returned by a previous call to the cwbRC_StartSysEx function. It identifies the iSeries system.

Return Codes

The following list shows common return values:

CWB_OK
Successful completion.

CWBRC_INVALID_SYSTEM_HANDLE
Invalid system handle.

Usage

None

Remote Command/Distributed Program Call: Run APIs list for iSeries Access for Windows

Use these APIs to run an iSeries command. The APIs are listed alphabetically.

cwbRC_RunCmd:

Purpose

Issues the command on the system identified by the handle. The return code will indicate success or failure of the command. Additional messages can be returned by using the message handle that is returned.

Syntax

```
unsigned int CWB_ENTRY cwbRC_RunCmd(
                             cwbRC_SysHandle     system,
                             const char         *commandString,
                             cwbSV_ErrHandle     msgHandle);
```

Parameters

cwbRC_SysHandle system - input
Handle that was returned by a previous call to the cwbRC_StartSysEx function. It identifies the iSeries system.

const char *commandString - input
Pointer to a string that contains the command to be issued on the iSeries system. This is an ASCIIZ string.

cwbSV_ErrHandle msgHandle - output
Any messages returned from the iSeries server will be written to this object. It is created with the cwbSV_CreateErrHandle API. The messages may be retrieved through the cwbSV_GetErrTextIndexed API. If the parameter is set to zero, no messages will be retrieved.

Return Codes

The following list shows common return values:

CWB_OK
Successful completion.

CWB_INVALID_POINTER
Bad or NULL pointer.

CWBRC_INVALID_SYSTEM_HANDLE
Invalid system handle.

CWBRC_REJECTED_USER_EXIT
Command rejected by user exit program.

CWBRC_USR_EXIT_ERROR
Error in user exit program.

CWBRC_COMMAND_FAILED
Command failed.

CWBRC_COMMAND_TOO_LONG
Command string is too long.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory; may have failed to allocate temporary buffer.

CWB_NON_REPRESENTABLE_UNICODE_CHAR
One or more input Unicode characters have no representation in the codepage being used.

CWB_API_ERROR
General API failure.

Usage

None

Remote Command/Distributed Program Call: Access programs APIs list for iSeries Access for Windows

Use these APIs to access programs and their parameters.

cwbRC_AddParm:

Purpose

Add a parameter to the program that is identified by the handle. This function should be called once for each parameter that is to be added to the program. When the program is called the parameters will be in the same order that they are added using this function.

Syntax

```
unsigned int CWB_ENTRY cwbRC_AddParm(
                            cwbRC_PgmHandle      program,
                            unsigned short       type,
                            unsigned long        length,
                            const unsigned char  *parameter);
```

Parameters

cwbRC_PgmHandle program - input
Handle that was returned by a previous call to the cwbRC_CreatePgm API. It identifies the program object.

unsigned short type - input
The type of parameter this is. Use one of the defined parameter types: CWBRC_INPUT, CWBRC_OUTPUT, CWBRC_INOUT. If you want to automatically convert between local CCSID and host CCSID, add the appropriate convert flag to this field with a bitwise, or use one of the defined parameter types:

- CWBRC_TEXT_CONVERT
- CWBRC_TEXT_CONVERT_INPUT
- CWBRC_TEXT_CONVERT_OUTPUT

The last two types are intended for use with CWBRC_INOUT when conversion is only needed in one direction.

unsigned long length - input
The length of the parameter. If this is an CWBRC_OUTPUT parameter, the length should be the length of the buffer where the returned parameter will be written.

const unsigned char * parameter - input
Pointer to a buffer that will contain: the value if the type is CWBRC_INPUT or CWBRC_INOUT, or the place where the returned parameter is to be written if the type is CWBRC_OUTPUT or CWBRC_INOUT.

Return Codes

The following list shows common return values:

CWB_OK
Successful completion.

CWBRC_INVALID_PROGRAM
Invalid program handle.

CWBRC_INVALID_TYPE
Invalid type specified.

CWBRC_INVALID_PARM_LENGTH
Invalid parameter length.

CWBRC_INVALID_PARM
Invalid parameter.

Usage

Parameter data is assumed to be binary. No conversion will be performed on the parameter data unless one of the conversion flags is set. For example:

```
cwbRC_AddParm( hPgm,
CWBRC_INOUT | CWBRC_TEXT_CONVERT_OUTPUT,
bufferSize,
buffer );
```

will use the buffer as is to send to the host, and will convert the output (eg to ASCII) before putting the result into the buffer.

cwbRC_CallPgm:

Purpose

Calls the program identified by the handle. The return code will indicate the success or failure of the program. Additional messages can be returned by using the message handle that is returned.

Syntax

```
unsigned int CWB_ENTRY cwbRC_CallPgm(
                            cwbRC_SysHandle     system,
                            cwbRC_PgmHandle     program,
                            cwbSV_ErrHandle     msgHandle);
```

Parameters

cwbRC_SysHandle system - input
Handle that was returned by a previous call to the cwbRC_StartSysEx function. It identifies the iSeries system.

cwbRC_PgmHandle program - input
Handle that was returned by a previous call to the cwbRC_CreatePgm API. It identifies the program object. object.

cwbSV_ErrHandle msgHandle - output
Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle API. The messages may be retrieved through the cwbSV_GetErrTextIndexed API. If the parameter is set to zero, no messages will be retrieved.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_COMMUNICATIONS_ERROR
A communications error occurred.

CWBRC_INVALID_SYSTEM_HANDLE
Invalid system handle.

CWBRC_INVALID_PROGRAM
Invalid program handle.

CWBRC_REJECTED_USER_EXIT
Command rejected by user exit program.

CWBRC_USER_EXIT_ERROR
Error in user exit program.

CWBRC_PROGRAM_NOT_FOUND
Program not found.

CWBRC_PROGRAM_ERROR
Error when calling program.

Usage

None

cwbRC_CreatePgm:

Purpose

This function creates a program object given a program and library name. The handle that is returned can be used to add parameters to the program and then call the program.

Syntax

```
unsigned int CWB_ENTRY cwbRC_CreatePgm(
                            const char         *programName,
                            const char         *libraryName,
                            cwbRC_PgmHandle    *program);
```

Parameters

const char *programName - input
Pointer to an ASCIIZ string that contains the name of the program that you want to call. The name is uppercased unless enclosed in double quotes.

const char *libraryName - input
Pointer to an ASCIIZ string that contains the name of the library where the program resides. The name is uppercased unless enclosed in double quotes.

cwbRC_PgmHandle * program - output
Pointer to a cwbRC_PgmHandle where the handle of the program will be returned.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_POINTER
Bad or NULL pointer.

CWBRC_PROGRAM_NAME
Program name is too long.

CWBRC_LIBRARY_NAME
Library name is too long.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory; may have failed to allocate temporary buffer.

CWB_NON_REPRESENTABLE_UNICODE_CHAR
One or more input Unicode characters have no representation in the codepage being used.

CWB_API_ERROR
General API failure.

Usage

You should create a separate program object for each program you want to call on the iSeries server. You can use the functions described in this file to change the values of the parameters being sent to the program, but cannot change the number of parameters being sent.

cwbRC_DeletePgm:

Purpose

This function deletes the program object that is identified by the handle provided.

Syntax

```
unsigned int CWB_ENTRY cwbRC_DeletePgm(
                            cwbRC_PgmHandle     program);
```

Parameters

cwbRC_PgmHandle program - input
Handle that was returned by a previous call to the cwbRC_CreatePgm API. It identifies the program object.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWBRC_INVALID_PROGRAM
Invalid program handle.

Usage

None.

cwbRC_GetLibName:
Purpose

Get the name of the library that was used when creating this program object.

Syntax

```
unsigned int CWB_ENTRY cwbRC_GetLibName(
                             cwbRC_PgmHandle     program,
                             char               *libraryName);
```

Parameters

cwbRC_PgmHandle program - input
Handle that was returned by a previous call to the cwbRC_CreatePgm API. It identifies the program object.

char * libraryName - output
Pointer to a ten character buffer where the name of the library will be written.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_POINTER
Bad or NULL pointer.

CWBRC_INVALID_PROGRAM
Invalid program handle.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory; may have failed to allocate the temporary buffer.

CWB_API_ERROR
General API failure.

Usage

None

cwbRC_GetParm:
Purpose

Retrieve the parameter identified by the index. The index will range from 0 to the total number of parameters - 1. This number can be obtained by calling the cwbRC_GetParmCount API.

Syntax

```
unsigned int CWB_ENTRY cwbRC_GetParm(
                             cwbRC_PgmHandle     program,
                             unsigned short      index,
                             unsigned short     *type,
                             unsigned long      *length,
                             unsigned char     **parameter);
```

Parameters

cwbRC_PgmHandle handle - input
Handle that was returned by a previous call to the cwbRC_CreatePgm API. It identifies the program object.

unsigned short index - input
The number of the specific parameter in this program that should be retrieved. This index is zero-based.

unsigned short * type - output
Pointer to the type of parameter this is. The value will be one of the defined parameter types:

- CWBRC_INPUT
- CWBRC_OUTPUT
- CWBRC_INOUT

unsigned long * length - input
Pointer to the length of the parameter.

unsigned char * * parameter - output
Pointer to a buffer that will contain the address of the actual parameter.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_POINTER
Bad or NULL pointer.

CWBRC_INVALID_PROGRAM
Invalid program handle.

CWBRC_INDEX_RANGE_ERROR
Index is out of range.

Usage

None

cwbRC_GetParmCount:

Purpose

Get the number of parameters for this program object.

Syntax

```
unsigned int CWB_ENTRY cwbRC_GetParmCount(
                              cwbRC_PgmHandle     program,
                              unsigned short     *count);
```

Parameters

cwbRC_PgmHandle handle - input
Handle that was returned by a previous call to the cwbRC_CreatePgm API. It identifies the program object.

unsigned short * count - output
Pointer to an unsigned short where the parameter count will be written.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_POINTER
Bad or NULL pointer.

CWBRC_INVALID_PROGRAM
Invalid program handle.

Usage

None

cwbRC_GetPgmName:

Purpose

Get the name of the program that was used when creating this program.

Syntax

```
unsigned int CWB_ENTRY cwbRC_GetPgmName(
                             cwbRC_PgmHandle     program,
                             char               *programName);
```

Parameters

cwbRC_PgmHandle program - input
Handle that was returned by a previous call to the cwbRC_CreatePgm API. It identifies the program object.

char * programName - output
Pointer to a ten character buffer where the name of the program will be written.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_POINTER
Bad or NULL pointer.

CWBRC_INVALID_PROGRAM
Invalid program handle.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory; may have failed to allocate the temporary buffer.

CWB_API_ERROR
General API failure.

Usage

None

cwbRC_SetLibName:
Purpose

Set the name of the library for this program object.

Syntax

```
unsigned int CWB_ENTRY cwbRC_SetLibName(
                             cwbRC_PgmHandle     program,
                             const char         *libraryName);
```

Parameters

cwbRC_PgmHandle program - input
Handle that was returned by a previous call to the cwbRC_CreatePgm API. It identifies the program object.

const char *libraryName - input
Pointer to an ASCIIZ string that contains the name of the library where the program resides.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWBRC_INVALID_PROGRAM
Invalid program handle.

CWBRC_LIBRARY_NAME
Library name is too long.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory; may have failed to allocate temporary buffer.

CWB_NON_REPRESENTABLE_UNICODE_CHAR
One or more input Unicode characters have no representation in the codepage being used.

CWB_API_ERROR
General API failure.

Usage

Use this function to change the name of the name of the library that contains the program you want to call. This function should not be used to call a different program with different parameters.

cwbRC_SetParm:
Purpose

Set the parameter value identified by the index. The index will range from 0 to the total number of parameters - 1. This number can be obtained by calling the cwbRC_GetParmCount API. Note that this function is to be used to change a parameter. Use cwbRC_AddParm to create the parameter.

Syntax

```
unsigned int CWB_ENTRY cwbRC_SetParm(
                              cwbRC_PgmHandle       program,
                              unsigned short        index,
                              unsigned short        type,
                              unsigned long         length,
                              const unsigned char  *parameter);
```

Parameters

cwbRC_PgmHandle handle - input
Handle that was returned by a previous call to the cwbRC_CreatePgm API. It identifies the program object.

unsigned short index - input
The number of the specific parameter in this program that should be changed. This index is zero-based.

unsigned short type - input
The type of parameter this is. Use one of the defined parameter types:

- CWBRC_INPUT
- CWBRC_OUTPUT
- CWBRC_INOUT

If you want to automatically convert between local CCSID and host CCSID, add the appropriate convert flag to this field with a bitwise-OR. Use one of the defined parameter types:

- CWBRC_TEXT_CONVERT
- CWBRC_TEXT_CONVERT_INPUT
- CWBRC_TEXT_CONVERT_OUTPUT

The latter two are intended for use with CWBRC_INOUT when conversion is only needed in one direction.

unsigned long length - input
The length of the parameter. If this is an CWBRC_OUT parameter, the length should be the length of the buffer where the returned parameter will be written.

const unsigned char * parameter - input
Pointer to a buffer that will contain the value if the type is CWBRC_INPUT or CWBRC_INOUT, or the place where the return parameter is to be written if the type is CWBRC_OUTPUT or CWBRC_INOUT.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWBRC_INVALID_PROGRAM
Invalid program handle.

CWBRC_INVALID_TYPE
Invalid type specified.

CWBRC_INVALID_PARM_LENGTH
Invalid parameter length.

CWBRC_INVALID_PARM
Invalid parameter.

Usage

Parameter data is assumed to be binary. No conversion will be performed on the parameter data unless one of the conversion flags is set. For example:

```
   cwbRC_SetParm( hPgm,
                  CWBRC_INOUT | CWBRC_TEXT_CONVERT_OUTPUT,
                  bufferSize,
                  buffer );
```

will use the buffer as is to send to the host, and will convert the output (for example, to ASCII) before putting the result into the buffer.

cwbRC_SetPgmName:

Purpose

Set the name of the program for this program object.

Syntax

```
unsigned int CWB_ENTRY cwbRC_SetPgmName(
                             cwbRC_PgmHandle     program,
                             const char         *programName);
```

Parameters

cwbRC_PgmHandle program - input
Handle that was returned by a previous call to the cwbRC_CreatePgm API. It identifies the program object.

const char *programName - input
Pointer to an ASCIIZ string that contains the name of the program that you want to call.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWBRC_INVALID_PROGRAM
Invalid program handle.

CWBRC_PROGRAM_NAME
Program name is too long.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory; may have failed to allocate temporary buffer.

CWB_NON_REPRESENTABLE_UNICODE_CHAR
One or more input Unicode characters have no representation in the codepage being used.

CWB_API_ERROR
General API failure.

Usage

Use this function to change the name of the program that you want to call. This function should not be used to change the program object to call a different program with different parameters.

Example: Using Remote iSeries Access for Windows Command/Distributed Program Call APIs

This example illustrates using remote iSeries Access for Windows Command/Distributed Program Call APIs.

```
#ifdef UNICODE
   #define _UNICODE
#endif
#include <windows.h>

// Include the necessary RC/DPC Classes
#include <stdlib.h>
#include <iostream.h>
#include <TCHAR.H>
#include "cwbrc.h"
#include "cwbcosys.h"
/**********************************************************************/

void main()
{
   cwbCO_SysHandle system;
   cwbRC_SysHandle request;
   cwbRC_PgmHandle program;

   // Create the system object
   if ( (cwbCO_CreateSystem("AS/400SystemName",&system)) != CWB_OK )
      return;

   // Start the system
   if ( (cwbRC_StartSysEx(system,&request)) != CWB_OK )
      return;

   // Call the command to create a library
   char* cmd1 = "CRTLIB LIB(RCTESTLIB) TEXT('RC TEST LIBRARY')";
   if ( (cwbRC_RunCmd(request, cmd1, 0)) != CWB_OK )
      return;

   cout << "Created Library" << endl;

   // Call the command to delete a library
   char* cmd2 = "DLTLIB LIB(RCTESTLIB)";
   if ( (cwbRC_RunCmd(request, cmd2, 0)) != CWB_OK )
      return;

   cout << "Deleted Library" << endl;

   // Create a program object to create a user space
   if ( cwbRC_CreatePgm(_TEXT("QUSCRTUS"),
                        _TEXT("QSYS"),
                        &program) != CWB_OK )
      return;

   // Add the parameters
      // name is DPCTESTSPC/QGPL
   unsigned char name[20] = {0xC4,0xD7,0xC3,0xE3,0xC5,0xE2,0xE3,0xE2,0xD7,0xC3,
                             0xD8,0xC7,0xD7,0xD3,0x40,0x40,0x40,0x40,0x40,0x40};

      // extended attribute is not needed
   unsigned char attr[10] = {0x40,0x40,0x40,0x40,0x40,0x40,0x40,0x40,0x40,0x40};

      // initial size is 100 bytes
   unsigned long size = 0x64000000;

      // initial value is blank
   unsigned char init = 0x40;

      // public authority is CHANGE
```

```
unsigned char auth[10] = {0x5C,0xC3,0xC8,0xC1,0xD5,0xC7,0xC5,0x40,0x40,0x40};

   // description is DPC TEMP SPACE
unsigned char desc[50] = {0xC4,0xD7,0xC3,0x40,0xE3,0xC5,0xD4,0xD7,0x40,0xE2,
                          0xD7,0xC1,0xC3,0xC5,0x40,0x40,0x40,0x40,0x40,0x40,
                          0x40,0x40,0x40,0x40,0x40,0x40,0x40,0x40,0x40,0x40,
                          0x40,0x40,0x40,0x40,0x40,0x40,0x40,0x40,0x40,0x40,
                          0x40,0x40,0x40,0x40,0x40,0x40,0x40,0x40,0x40,0x40};

if ( cwbRC_AddParm(program, CWBRC_INPUT, 20, name) != CWB_OK)
   return;

if ( cwbRC_AddParm(program, CWBRC_INPUT, 10, attr) != CWB_OK)
   return;

if ( cwbRC_AddParm(program, CWBRC_INPUT, 4, (unsigned char*)&size) != CWB_OK)
   return;

if ( cwbRC_AddParm(program, CWBRC_INPUT, 1, &init) != CWB_OK)
   return;

if ( cwbRC_AddParm(program, CWBRC_INPUT, 10, auth) != CWB_OK)
   return;

if ( cwbRC_AddParm(program, CWBRC_INPUT, 50, desc) != CWB_OK)
   return;


// Call the program
if ( cwbRC_CallPgm(request, program, 0) != CWB_OK )
   return;

cout << "Created User Space" << endl;

// Delete the program
if ( cwbRC_DeletePgm(program) != CWB_OK )
   return;

// Create a program object to delete a user space
if ( cwbRC_CreatePgm(_TEXT("QUSDLTUS"),
                     _TEXT("QSYS"),
                     &program) != CWB_OK )
   return;

// Add the parameters
   // error code structure will not be used
   unsigned long err = 0x00000000;

if ( cwbRC_AddParm(program, CWBRC_INPUT, 20, name) != CWB_OK)
   return;

if ( cwbRC_AddParm(program, CWBRC_INOUT, 4, (unsigned char*)&err) != CWB_OK)
   return;

// Call the program
if ( cwbRC_CallPgm(request, program, 0) != CWB_OK )
   return;

// Delete the program
if ( cwbRC_DeletePgm(program) != CWB_OK )
   return;

cout << "Deleted User Space" << endl;

// Stop the system
if ( cwbRC_StopSys(request) != CWB_OK )
   return;
   // Delete the system object
   if ( cwbCO_DeleteSystem(system) != CWB_OK )
     return;

}
```

iSeries Access for Windows Serviceability APIs

The iSeries Access for Windows Serviceability application programming interfaces (APIs) allow you to log service file messages and events within your program.

A set of APIs allows you to read the records from the service files that are created. These APIs allow you to write a customized service-file browser.

The following general categories of iSeries Access for Windows Serviceability API functions are provided:

- Writing message text to the History log
- Writing Trace entries to the Trace file
- Reading service files
- Retrieving message text that is associated with error handles

Why you should use iSeries Access for Windows Serviceability APIs:

The iSeries Access for Windows Serviceability APIs provide an efficient means of adding message logging and trace points to your code. Incorporate these functions into programs that are shipped as part of your product, and use them to help debug programs that are under development. The file structure supports multiple programs (that are identified by unique product and component strings) logging to the same files simultaneously. This provides a complete picture of logging activity on the client workstation.

iSeries Access for Windows Serviceability APIs required files:

Header file	Import library	Dynamic Link Library
cwbsv.h	cwbapi.lib	cwbsv.dll

Programmer’s Toolkit:

The Programmer’s Toolkit provides Serviceability documentation, access to the cwbsv.h header file, and links to sample programs. To access this information, open the Programmer’s Toolkit and select **Error Handling** → **C/C++ APIs**.

Note: By using the code examples, you agree to the terms of the “Code license and disclaimer information” on page 552.

Related reference

“Serviceability APIs return codes” on page 29

History log and trace files

History logs and trace files allow you to log information about your programs.

History log:

The log functions allow you to write message text to the iSeries Access for Windows History Log. The message text needs to be displayable ASCII character data.

iSeries Access for Windows has instrumented all of its programs to log messages to the iSeries Access for Windows History Log. Messages also are logged by the DLLs that are supplied with the product.

The History Log is a file where message text strings are logged through the cwbSV_LogMessageText API. The log provides a history of activity that has taken place on the client workstation.

Trace files:

The trace functions allow you to log low-level events that occur as your program runs. For example, you can track various return codes that were received from calling other functions. If your program is sending and receiving data, you may want to log the significant fields of the data (for example, function byte or bytes, and data length) to aid in debugging if something goes wrong. Use the **Detailed data trace** function (cwbSV_LogTraceData) to accomplish this.

Another form of trace, the **Entry Point trace** function, allows you to track entry into and exit from your routines. iSeries Access for Windows defines two different types of entry point trace points:

API trace point:
Use the API (application programming interface) trace point to track entry and exit from routines that you externalize to other programs.

SPI trace point:
Use the SPI (system programming interface) trace point to track entry and exit from key internal routines of the program that you want to trace.

The key piece of information that is provided on the APIs is a one-byte eventID. It allows you to identify which API or SPI is being entered or exited. Data such as input values can be traced on entry, as well as tracing output values on exit from a routine. These trace functions are intended to be used in pairs (for example, cwbSV_LogAPIEntry and cwbSV_LogAPIExit) in the routines that utilize them. These types of trace points provide a record of flow of control through the code.

iSeries Access for Windows has instrumented the procedural APIs described in this topic with Entry/Exit API trace points. When one of these procedural APIs is called, entry and exit trace points are logged to the Entry Point trace file if tracing is active. The Entry/Exit SPI trace logs internal calling sequences. The Detailed data trace function logs data which is useful in debugging problems.

iSeries Access for Windows supports the following types of traces:

Detailed (Data):
Allows you to trace a buffer of information at a point in your code via the cwbSV_LogTraceData API. This buffer can be a mixture of ASCII and/or binary values (for example, C-struct). The data is logged in binary form.

Entry/Exit (API):
A specialized form of trace which allows you to trace entry into and exit from your externalized routines via the cwbSV_LogAPIEntry and cwbSV_LogAPIExit APIs.

Entry/Exit (SPI):
A specialized form of trace that allows you to trace entry into and exit from your key internal routines by using the cwbSV_LogSPIEntry and cwbSV_LogSPIExit APIs.

Error handles

The error handle functions allow you to create an error handle (cwbSV_CreateErrHandle) to use on iSeries Access for Windows APIs that support it.

If an error occurs (a non-zero return code) on the iSeries Access for Windows API call, you can call other error handle functions to retrieve information such as:

- The number of error messages (cwbSV_GetErrCount) that are associated with the return code
- The message text (cwbSV_GetErrTextIndexed) for each of the error messages

Typical use of Serviceability APIs

Typical uses of serviceability APIs include history logs and error handles.

History log:

Serviceability APIs provide a tracking mechanism for activity that is taking place on the client workstation. As a result, you can use the message-logging APIs to log messages to the iSeries Access for Windows History Log. Examples of messages to log include an indication that your application was started, and other significant events. For example, a log message may indicate that a file successfully was transferred to the iSeries server, a database query failed for some reason, or that a job was submitted for printing.

The product and component strings that you provide when you are using the Serviceability APIs allow your messages and events to be distinguished from other entries in the service files. The recommended hierarchy is to define a product ID, with one or many component IDs defined under it.

Error handles:

Use the error-handle parameter on iSeries Access for Windows C/C++ APIs to retrieve message text that is associated with a failure return code. This enables your application to display the message text, instead of providing your own text for the set of iSeries Access return codes.

Serviceability APIs list: Writing to history log

Use these APIs to write message text to a history log

cwbSV_CreateMessageTextHandle:

Purpose

This function creates a message text object and returns a handle to it. This message handle can be used in your program to write message text to the currently active history log. The message text is supplied in a buffer passed on the cwbSV_LogMessageText() call.

Syntax

```
unsigned int CWB_ENTRY cwbSV_CreateMessageTextHandle(
                            char                   *productID,
                            char                   *componentID,
                            cwbSV_MessageTextHandle *messageTextHandle);
```

Parameters

char * productID - input
Points to a null-terminated string that contains a product identifier to be used on this message entry. Parameter is optional, if null, no productID is set. NOTE: A maximum of CWBSV_MAX_PRODUCT_ID characters will be logged for the product ID. Larger strings will be truncated.

char * componentID - input
Points to a null-terminated string that contains a component identifier to be used on this message entry. Parameter is optional, if null, no componentID is set. NOTE: A maximum of CWBSV_MAX_COMP_ID characters will be logged for the component ID. Larger strings will be truncated.

cwbSV_MessageTextHandle * messageTextHandle - input/output
Pointer to a cwbSV_MessageTextHandle where the handle will be returned. This handle should be used in subsequent calls to the message text functions.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_POINTER
NULL passed on output parameter.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory to create handle.

Usage

It is recommended that you set a unique product ID and component ID in the message handle before using it to log message text. These ID's will distinguish your messages from other messages in the history log.

cwbSV_DeleteMessageTextHandle:

Purpose

This function deletes the message text object that is identified by the handle that is provided.

Syntax

```
unsigned int CWB_ENTRY cwbSV_DeleteMessageTextHandle(
                             cwbSV_MessageTextHandle messageTextHandle);
```

Parameters

cwbSV_MessageTextHandle messageTextHandle - input
Handle that was returned by a previous call to the cwbSV_CreateMessageTextHandle() function.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_HANDLE
Unusable handle passed in on request.

Usage

This call should be made when the handle is no longer needed.

cwbSV_LogMessageText:

Purpose

This function will log the supplied message text to the currently active history log. The product and component ID's set in the entry will be written along with the date and time of the when the text was logged.

Syntax

```
unsigned int CWB_ENTRY cwbSV_LogMessageText(
                             cwbSV_MessageTextHandle  messageTextHandle,
                             char                    *messageText,
                             unsigned long            messageTextLength);
```

Parameters

cwbSV_MessageTextHandle messageTextHandle - input
Handle that was returned by a previous call to cwbSV_CreateMessageTextHandle().

char * messageText - input
Points to a buffer that contains the message text you want to log.

unsigned long messageTextLength - input
Specifies the number of bytes in the message text buffer to log for this message entry.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_HANDLE
Unusable handle passed in on request.

Usage

None

cwbSV_SetMessageClass:

Purpose

This function allows setting of the message class (severity) to associate with the message being written to the history log.

Syntax

```
unsigned int CWB_ENTRY cwbSV_SetMessageClass(
                             cwbSV_MessageTextHandle  messageTextHandle,
                             cwbSV_MessageClass       messageClass);
```

Parameters

cwbSV_MessageTextHandle messageTextHandle - input
Handle that was returned by a previous call to cwbSV_CreateMessageTextHandle().

cwbSV_MessageClass messageClass - input
One of the following:

- CWBSV_CLASS_INFORMATIONAL
- CWBSV_CLASS_WARNING
- CWBSV_CLASS_ERROR

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_HANDLE
Unusable handle passed in on request.

CWBSV_INVALID_MSG_CLASS
Invalid message class passed in.

Usage

This value should be set before calling the corresponding log function, ″cwbSV_LogMessageText()″.

cwbSV_SetMessageComponent:

Purpose

This function allows setting of a unique component identifier in the message handle that is provided. Along with setting the product ID (see cwbSV_SetMessageProduct), this call should be used to distinguish your message entries from other product's entries in the history log.

Syntax

```
unsigned int CWB_ENTRY cwbSV_SetMessageComponent(
                             cwbSV_MessageTextHandle  messageTextHandle,
                             char                    *componentID);
```

Parameters

cwbSV_MessageTextHandle messageTextHandle - input
Handle that was returned by a previous call to cwbSV_CreateMessageTextHandle().

char * componentID - input
Points to a null-terminated string that contains a component identifier to be used on this message entry. NOTE: A maximum of CWBSV_MAX_COMP_ID characters will be logged for the component ID. Larger strings will be truncated.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_HANDLE
Unusable handle passed in on request.

Usage

This value should be set before calling the corresponding log function, ″cwbSV_LogMessageData()″. The suggested hierarchy is that you would define a product ID with one or many components that are defined under it.

cwbSV_SetMessageProduct:

Purpose

This function allows setting of a unique product identifier in the message handle that is provided. Along with setting the component ID (see cwbSV_SetMessageComponent), this call should be used to distinguish your message entries from other product's entries in the history log.

Syntax

```
unsigned int CWB_ENTRY cwbSV_SetMessageProduct(
                             cwbSV_MessageTextHandle  messageTextHandle,
                             char                    *productID);
```

Parameters

cwbSV_MessageTextHandle messageTextHandle - input
Handle that was returned by a previous call to cwbSV_CreateMessageTextHandle().

char * productID - input
Points to a null-terminated string that contains a product identifier to be used on this message entry. NOTE: A maximum of CWBSV_MAX_PRODUCT_ID characters will be logged for the product ID. Larger strings will be truncated.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_HANDLE
Unusable handle passed in on request.

Usage

This value should be set before calling the corresponding log function, ″cwbSV_LogMessageData()″. The suggested hierarchy is that you would define a product ID with one or many components that are defined under it.

Serviceability APIs list: Writing trace data

Use these APIs to write trace data to a detail trace file

cwbSV_CreateTraceDataHandle:

Purpose

This function creates a trace data object and returns a handle to it. This trace handle can be used in your program to log trace information to trace files. The trace information is supplied in a buffer passed on cwbSV_LogTraceData() calls.

Syntax

```
unsigned int CWB_ENTRY cwbSV_CreateTraceDataHandle(
                             char                 *productID,
                             char                 *componentID,
                             cwbSV_TraceDataHandle *traceDataHandle);
```

Parameters

char * productID - input
Points to a null-terminated string that contains a product identifier to be used on this message entry. Parameter is optional, if null, no productID is set. NOTE: A maximum of CWBSV_MAX_PRODUCT_ID characters will be logged for the product ID. Larger strings will be truncated.

char * componentID - input
Points to a null-terminated string that contains a component identifier to be used on this message

entry. Parameter is optional, if null, no componentID is set. NOTE: A maximum of CWBSV_MAX_COMP_ID characters will be logged for the component ID. Larger strings will be truncated.

cwbSV_TraceDataHandle * traceDataHandle - input/output
Pointer to a cwbSV_TraceDataHandle where the handle will be returned. This handle should be used in subsequent calls to the trace data functions.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_POINTER
NULL passed on output parameter.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory to create handle.

Usage

It is recommended that you set a unique product ID and component ID in the trace data handle before using it to log trace entries. These ID's will distinguish your trace entries from other entries in the trace file.

cwbSV_DeleteTraceDataHandle:

Purpose

This function deletes the trace data object that is identified by the trace handle that is provided.

Syntax

```
unsigned int CWB_ENTRY cwbSV_DeleteTraceDataHandle(
                             cwbSV_TraceDataHandle traceDataHandle);
```

Parameters

cwbSV_TraceDataHandle traceDataHandle - input
Handle that was returned by a previous call to the cwbSV_CreateTraceDataHandle() function.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_HANDLE
Handle is not valid.

Usage

This call should be made when the handle is no longer needed.

cwbSV_LogTraceData:

Purpose

This function will log the supplied trace data to the currently active trace file. The product and component ID's set in the entry will be written along with the date and time of the when the data was logged.

Syntax

```
unsigned int CWB_ENTRY cwbSV_LogTraceData(
                             cwbSV_TraceDataHandle  traceDataHandle,
                             char                  *traceData,
                             unsigned long          traceDataLength);
```

Parameters

cwbSV_TraceDataHandle traceDataHandle - input
Handle that was returned by a previous call to cwbSV_CreateTraceDataHandle().

char * traceData - input
Points to a buffer that contains the trace data you want to log. The buffer can contain binary data because the length parameter is used in determining the amount to trace.

unsigned long traceDataLength - input
Specifies the number of bytes in the trace data buffer to log for this trace entry.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_HANDLE
Handle is not valid.

Usage

None

cwbSV_SetTraceComponent:

Purpose

This function allows setting of a unique component identifier in service entry that is provided. Along with setting the product ID (see cwbSV_SetTraceProduct), this call should be used to distinguish your trace entries from other product's entries in the trace file.

Syntax

```
unsigned int CWB_ENTRY cwbSV_SetTraceComponent(
                             cwbSV_TraceDataHandle  traceDataHandle,
                             char                  *componentID);
```

Parameters

cwbSV_TraceDataHandle traceDataHandle - input
Handle that was returned by a previous call to cwbSV_CreateTraceDataHandle().

char * componentID - input
Points to a null-terminated string that contains a component identifier to be used on this trace entry. NOTE: A maximum of CWBSV_MAX_COMP_ID characters will be logged for the component ID. Larger strings will be truncated.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_HANDLE
Handle is not valid.

Usage

This value should be set before calling the corresponding log function, ″cwbSV_LogTraceData()″. The suggested hierarchy is that you would define a product ID with one or many components that are defined under it.

cwbSV_SetTraceProduct:

Purpose

This function allows setting of a unique product identifier in the trace handle that is provided. Along with setting the component ID (see cwbSV_SetTraceComponent), this call should be used to distinguish your trace entries from other product's entries in the trace file.

Syntax

```
unsigned int CWB_ENTRY cwbSV_SetTraceProduct(
                             cwbSV_TraceDataHandle  traceDataHandle,
                             char                  *productID);
```

Parameters

cwbSV_TraceDataHandle traceDataHandle - input
Handle that was returned by a previous call to cwbSV_CreateTraceDataHandle().

char * productID - input
Points to a null-terminated string that contains a product identifier to be used on this trace entry. NOTE: A maximum of CWBSV_MAX_PRODUCT_ID characters will be logged for the product ID. Larger strings will be truncated.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_HANDLE
Handle is not valid.

Usage

This value should be set before calling the corresponding log function, cwbSV_LogTraceData. The suggested hierarchy is that you would define a product ID with one or many components that are defined under it.

Serviceability API list: Writing trace points

Use these APIs to write trace points to an entry/exit trace file

cwbSV_CreateTraceAPIHandle:

Purpose

This function creates a trace API object and returns a handle to it. This trace API handle can be used in your program to log entry to and exit from your API entry points.

Syntax

```
unsigned int CWB_ENTRY cwbSV_CreateTraceAPIHandle(
                             char                 *productID,
                             char                 *componentID,
                             cwbSV_TraceAPIHandle *traceAPIHandle);
```

Parameters

char * productID - input
Points to a null-terminated string that contains a product identifier to be used on this message entry. Parameter is optional, if null, no productID is set. NOTE: A maximum of CWBSV_MAX_PRODUCT_ID characters will be logged for the product ID. Larger strings will be truncated.

char * componentID - input
Points to a null-terminated string that contains a component identifier to be used on this message entry. Parameter is optional, if null, no componentID is set. NOTE: A maximum of CWBSV_MAX_COMP_ID characters will be logged for the component ID. Larger strings will be truncated.

cwbSV_TraceAPIHandle * traceAPIHandle - input/output
Pointer to a cwbSV_TraceAPIHandle where the handle will be returned. This handle should be used in subsequent calls to the trace API functions.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_POINTER
NULL passed on output parameter.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory to create handle.

Usage

It is recommended that you set a unique product ID and component ID in the trace data handle before using it to log trace entries. These ID's will distinguish your trace entries from other entries in the trace file.

cwbSV_CreateTraceSPIHandle:

Purpose

This function creates a trace SPI object and returns a handle to it. This trace SPI handle can be used in your program to log entry to and exit from your SPI entry points.

Syntax

```
unsigned int CWB_ENTRY cwbSV_CreateTraceSPIHandle(
                             char                 *productID,
                             char                 *componentID,
                             cwbSV_TraceSPIHandle *traceSPIHandle);
```

Parameters

char * productID - input
Points to a null-terminated string that contains a product identifier to be used on this message entry. Parameter is optional, if null, no productID is set. NOTE: A maximum of CWBSV_MAX_PRODUCT_ID characters will be logged for the product ID. Larger strings will be truncated.

char * componentID - input
Points to a null-terminated string that contains a component identifier to be used on this message entry. Parameter is optional, if null, no componentID is set. NOTE: A maximum of CWBSV_MAX_COMP_ID characters will be logged for the component ID. Larger strings will be truncated.

cwbSV_TraceSPIHandle * traceSPIHandle - input/output
Pointer to a cwbSV_TraceSPIHandle where the handle will be returned. This handle should be used in subsequent calls to the trace SPI functions.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_POINTER
NULL passed on output parameter.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory to create handle.

Usage

It is recommended that you set a unique product ID and component ID in the trace data handle before using it to log trace entries. These ID's will distinguish your trace entries from other entries in the trace file.

cwbSV_DeleteTraceAPIHandle:

Purpose

This function deletes the trace API object that is identified by the handle that is provided.

Syntax

```
unsigned int CWB_ENTRY cwbSV_DeleteTraceAPIHandle(
                             cwbSV_TraceAPIHandle traceAPIHandle);
```

Parameters

cwbSV_TraceAPIHandle traceAPIHandle - input
Handle that was returned by a previous call to the cwbSV_CreateTraceAPIHandle() function.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_HANDLE
Handle is not valid.

Usage

This call should be made when the handle is no longer needed.

cwbSV_DeleteTraceSPIHandle:
Purpose

This function deletes the trace SPI object that is identified by the handle that is provided.

Syntax

```
unsigned int CWB_ENTRY cwbSV_DeleteTraceSPIHandle(
                             cwbSV_TraceSPIHandle traceSPIHandle);
```

Parameters

cwbSV_TraceSPIHandle traceSPIHandle - input
Handle that was returned by a previous call to the cwbSV_CreateTraceSPIHandle() function.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_HANDLE
Handle is not valid.

Usage

This call should be made when the handle is no longer needed.

cwbSV_LogAPIEntry:
Purpose

This function will log an API entry point to the currently active entry/exit trace file. The product and component ID's set in the entry will be written along with the date and time of the when the data was logged. The apiID, along with any optional data that is passed on the request, will also be logged.

Syntax

```
unsigned int CWB_ENTRY cwbSV_LogAPIEntry(
                             cwbSV_TraceAPIHandle  traceAPIHandle,
                             unsigned char         apiID,
                             char                 *apiData,
                             unsigned long         apiDataLength);
```

Parameters

cwbSV_TraceAPIHandle traceAPIHandle - input
Handle that was returned by a previous call to cwbSV_CreateTraceAPIHandle().

unsigned char apiID - input
A unique one-byte code that will distinguish this API trace point from others that are logged by your program. Definition of these codes are left up to the caller of this API. The recommended approach is to use the defined range (0x00 - 0xFF) for each unique component in your product (that is, start at 0x00 for each component)

char * apiData - input
Points to a buffer that contains additional data (for example, input parameter values from your caller) that you want to log along with this entry point. Parameter is optional, it is ignored if the address is NULL or the data length is zero. This buffer can contain binary data because the length parameter is used in determining the amount to trace.

unsigned long apiDataLength - input
Specifies the number of bytes in the API data buffer to log for this trace entry.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_HANDLE
Handle is not valid.

Usage

This call should allows be used in conjunction with a corresponding ″cwbSV_LogAPIExit()″. It is recommended that these calls would be put at the beginning and end of an API routine that you write. The other method would be to use these log functions around calls to external routines that are not written by you.

cwbSV_LogAPIExit:

Purpose

This function will log an API exit point to the currently active entry/exit trace file. The product and component ID’s set in the entry will be written along with the date and time of the when the data was logged. The API ID, along with any optional data that is passed on the request, will also be logged.

Syntax

```
unsigned int CWB_ENTRY cwbSV_LogAPIExit(
                             cwbSV_TraceAPIHandle  traceAPIHandle,
                             unsigned char         apiID,
                             char                 *apiData,
                             unsigned long         apiDataLength);
```

Parameters

cwbSV_TraceAPIHandle traceAPIHandle - input
Handle that was returned by a previous call to cwbSV_CreateTraceAPIHandle().

unsigned char apiID - input
A unique one-byte code that will distinguish this API trace point from others that are logged by your

program. Definition of these codes are left up to the caller of this API. The recommended approach is to use the defined range (0x00 - 0xFF) for each unique component in your product (that is, start at 0x00 for each component)

char * apiData - input
Points to a buffer that contains additional data (for example, output parameter values passed back to your caller) that you want to log along with this exit point. Parameter is optional, it is ignored if the address is NULL or the data length is zero. This buffer can contain binary data because the length parameter is used in determining the amount to trace.

unsigned long apiDataLength - input
Specifies the number of bytes in the API data buffer to log for this trace entry.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_HANDLE
Handle is not valid.

Usage

This call should allows be used in conjunction with a corresponding ″cwbSV_LogAPIEntry()″. It is recommended that these calls would be put at the beginning and end of an API routine that you write. The other method would be to use these log functions around calls to external routines that are not written by you.

cwbSV_LogSPIEntry:

Purpose

This function will log an SPI entry point to the currently active entry/exit trace file. The product and component ID’s set in the entry will be written along with the date and time of the when the data was logged. The spiID, along with any optional data that is passed on the request, will also be logged.

Syntax

```
unsigned int CWB_ENTRY cwbSV_LogSPIEntry(
                             cwbSV_TraceSPIHandle  traceSPIHandle,
                             unsigned char         spiID,
                             char                 *spiData,
                             unsigned long         spiDataLength);
```

Parameters

cwbSV_TraceSPIHandle traceSPIHandle - input
Handle that was returned by a previous call to cwbSV_CreateTraceSPIHandle().

unsigned char spiID - input
A unique one-byte code that will distinguish this SPI trace point from others that are logged by your program. Definition of these codes are left up to the caller of this API. The recommended approach is to use the defined range (0x00 - 0xFF) for each unique component in your product (that is, start at 0x00 for each component)

char * spiData - input
Points to a buffer that contains additional data (for example, input parameter values from your caller)

that you want to log along with this entry point. Parameter is optional, it is ignored if the address is NULL or the data length is zero. This buffer can contain binary data because the length parameter is used in determining the amount to trace.

unsigned long spiDataLength - input
Specifies the number of bytes in the SPI data buffer to log for this trace entry.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_HANDLE
IHandle is not valid.

Usage

This call should allows be used in conjunction with a corresponding ″cwbSV_LogSPIExit()″. It is recommended that these calls would be put at the beginning and end of an API routine that you write. The other method would be to use these log functions around calls to external routines that are not written by you.

cwbSV_LogSPIExit:

Purpose

This function will log an SPI exit point to the currently active entry/exit trace file. The product and component ID's set in the entry will be written along with the date and time of the when the data was logged. The spiID, along with any optional data that is passed on the request, will also be logged.

Syntax

```
unsigned int CWB_ENTRY cwbSV_LogSPIExit(
                    cwbSV_TraceSPIHandle  traceSPIHandle,
                    unsigned char         spiID,
                    char                 *spiData,
                    unsigned long         spiDataLength);
```

Parameters

cwbSV_TraceSPIHandle traceSPIHandle - input
Handle that was returned by a previous call to cwbSV_CreateTraceSPIHandle().

unsigned char spiID - input
A unique one-byte code that will distinguish this SPI trace point from others that are logged by your program. Definition of these codes are left up to the caller of this API. The recommended approach is to use the defined range (0x00 - 0xFF) for each unique component in your product (that is, start at 0x00 for each component)

char * spiData - input
Points to a buffer that contains additional data (for example, output parameter values passed back to your caller) that you want to log along with this exit point. Parameter is optional, it is ignored if the address is NULL or the data length is zero. This buffer can contain binary data because the length parameter is used in determining the amount to trace.

unsigned long spiDataLength - input
Specifies the number of bytes in the SPI data buffer to log for this trace entry.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_HANDLE
Handle is not valid.

Usage

This call should allows be used in conjunction with a corresponding ″cwbSV_LogSPIEntry()″. It is recommended that these calls would be put at the beginning and end of an API routine that you write. The other method would be to use these log functions around calls to external routines that are not written by you.

cwbSV_SetAPIComponent:

Purpose

This function allows setting of a unique component identifier in trace entry that is provided. Along with setting the product ID (see cwbSV_SetAPIProduct), this call should be used to distinguish your trace entries from other product's entries in the trace file.

Syntax

```
unsigned int CWB_ENTRY cwbSV_SetAPIComponent(
                             cwbSV_TraceAPIHandle  traceAPIHandle,
                             char                 *componentID);
```

Parameters

cwbSV_TraceAPIHandle traceAPIHandle - input
Handle that was returned by a previous call to cwbSV_CreateTraceAPIHandle().

char * componentID - input
Points to a null-terminated string that contains a component identifier to be used on this trace entry. NOTE: A maximum of CWBSV_MAX_COMP_ID characters will be logged for the component ID. Larger strings will be truncated.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_HANDLE
Handle is not valid.

Usage

This value should be set before calling the corresponding log functions, ″cwbSV_LogAPIEntry()″ and ″cwbSV_LogAPIExit(). The suggested hierarchy is that you would define a product ID with one or many components that are defined under it.

cwbSV_SetAPIProduct:

Purpose

This function allows setting of a unique product identifier in the trace handle that is provided. Along with setting the component ID (see cwbSV_SetAPIComponent), this call should be used to distinguish your trace entries from other product's entries in the trace file.

Syntax

```
unsigned int CWB_ENTRY cwbSV_SetAPIProduct(
                             cwbSV_TraceAPIHandle  traceAPIHandle,
                             char                 *productID);
```

Parameters

cwbSV_TraceAPIHandle traceAPIHandle - input
Handle that was returned by a previous call to cwbSV_CreateTraceAPIHandle().

char * productID - input
Points to a null-terminated string that contains a product identifier to be used on this trace entry. NOTE: A maximum of CWBSV_MAX_PRODUCT_ID characters will be logged for the product ID. Larger strings will be truncated.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_HANDLE
Handle is not valid.

Usage

This value should be set before calling the corresponding log functions, ″cwbSV_LogAPIEntry()″ and ″cwbSV_LogAPIExit(). The suggested hierarchy is that you would define a product ID with one or many components that are defined under it.

cwbSV_SetSPIComponent:

Purpose

This function allows setting of a unique component identifier in trace entry that is provided. Along with setting the product ID (see cwbSV_SetSPIProduct), this call should be used to distinguish your trace entries from other product's entries in the trace file.

Syntax

```
unsigned int CWB_ENTRY cwbSV_SetSPIComponent(
                             cwbSV_TraceSPIHandle  traceSPIHandle,
                             char                 *componentID);
```

Parameters

cwbSV_TraceSPIHandle traceSPIHandle - input
Handle that was returned by a previous call to cwbSV_CreateTraceSPIHandle().

char * componentID - input
Points to a null-terminated string that contains a component identifier to be used on this trace entry. NOTE: A maximum of CWBSV_MAX_COMP_ID characters will be logged for the component ID. Larger strings will be truncated.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_HANDLE
Handle is not valid.

Usage

This value should be set before calling the corresponding log functions, ″cwbSV_LogAPIEntry()″ and ″cwbSV_LogAPIExit(). The suggested hierarchy is that you would define a product ID with one or many components that are defined under it.

cwbSV_SetSPIProduct:

Purpose

This function allows setting of a unique product identifier in the trace handle that is provided. Along with setting the component ID (see cwbSV_SetSPIComponent), this call should be used to distinguish your trace entries from other product's entries in the trace file.

Syntax

```
unsigned int CWB_ENTRY cwbSV_SetSPIProduct(
                             cwbSV_TraceSPIHandle  traceSPIHandle,
                             char                 *productID);
```

Parameters

cwbSV_TraceSPIHandle traceSPIHandle - input
Handle that was returned by a previous call to cwbSV_CreateTraceSPIHandle().

char * productID - input
Points to a null-terminated string that contains a product identifier to be used on this trace entry. NOTE: A maximum of CWBSV_MAX_PRODUCT_ID characters will be logged for the product ID. Larger strings will be truncated.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_HANDLE
Handle is not valid.

Usage

This value should be set before calling the corresponding log functions, ″cwbSV_LogAPIEntry()″ and ″cwbSV_LogAPIExit(). The suggested hierarchy is that you would define a product ID with one or many components that are defined under it.

Serviceability API list: Reading service files

Use these APIs to read service files, service file records, and service file header information. Additionally, you can read history log service records, detail trace file service records, and entry/exit trace file service records.

cwbSV_ClearServiceFile:

Purpose

Clears the service file that is identified by the handle that is provided.

Syntax

```
unsigned int CWB_ENTRY cwbSV_ClearServiceFile(
                             cwbSV_ServiceFileHandle serviceFile,
                             cwbSV_ErrHandle         errorHandle);
```

Parameters

cwbSV_ServiceFileHandle serviceFileHandle - input
Handle that was returned by a previous call to the cwbSV_OpenServiceFile() function.

cwbSV_ErrHandle errorHandle - output
Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle API. The messages may be retrieved through the cwbSV_GetErrText API. If the parameter is set to zero, no messages will be retrieved.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_FILE_IO_ERROR
File could not be cleared.

CWB_INVALID_HANDLE
Handle is not valid.

Usage

None

cwbSV_CloseServiceFile:

Purpose

Closes the service file identified by the handle provided.

Syntax

```
unsigned int CWB_ENTRY cwbSV_CloseServiceFile(
                             cwbSV_ServiceFileHandle serviceFile,
                             cwbSV_ErrHandle         errorHandle);
```

Parameters

cwbSV_ServiceFileHandle serviceFileHandle - input
Handle that was returned by a previous call to the cwbSV_OpenServiceFile() function.

cwbSV_ErrHandle errorHandle - output
Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle API. The messages may be retrieved through the cwbSV_GetErrText API. If the parameter is set to zero, no messages will be retrieved.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_FILE_IO_ERROR
File could not be closed.

CWB_INVALID_HANDLE
Handle is not valid.

Usage

None

cwbSV_CreateServiceRecHandle:

Purpose

This function creates a service record object and returns a handle to it.

Syntax

```
unsigned int CWB_ENTRY cwbSV_CreateServiceRecHandle(
                             cwbSV_ServiceRecHandle *serviceRecHandle);
```

Parameters

cwbSV_ServiceRecHandle * serviceRecHandle - input/output
Pointer to a cwbSV_ServiceRecordHandle where the handle will be returned. This handle should be used in subsequent calls to the service record functions.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_POINTER
NULL passed as handle address.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory to create handle.

Usage

This handle can be used in your program to read records from an open service file and extract information from the record.

cwbSV_DeleteServiceRecHandle:

Purpose

This function deletes the service record object that is identified by the handle that is provided.

Syntax

```
unsigned int CWB_ENTRY cwbSV_DeleteServiceRecHandle(
                             cwbSV_ServiceRecHandle serviceRecHandle);
```

Parameters

cwbSV_ServiceRecHandle serviceRecHandle - input
Handle that was returned by a previous call to the cwbSV_CreateServiceRecHandle() function.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_HANDLE
Handle is not valid.

Usage

This call should be made when the handle is no longer needed.

cwbSV_GetComponent:

Purpose

Returns the component ID value for the service record object that is identified by the handle provided.

Syntax

```
unsigned int CWB_ENTRY cwbSV_GetComponent(
                             cwbSV_ServiceRecHandle  serviceRecHandle,
                             char                   *componentID,
                             unsigned long           componentIDLength,
                             unsigned long          *returnLength);
```

Parameters

cwbSV_ServiceRecHandle serviceRecHandle - input
Handle that was returned by a previous call to the cwbSV_CreateServiceRecHandle function.

char * componentID - input/output
Pointer to a buffer that will receive the component ID that is stored in the record that is identified by the handle.

unsigned long componentIDLength - input
Length of the receive buffer passed in. It should include space for the ending null character. If the buffer is too small, the value will be truncated, and CWB_BUFFER_OVERFLOW and returnLength will be set. NOTE: The recommended size is CWBSV_MAX_COMP_ID.

unsigned long * returnLength - input/output
Optional, may be NULL. A return address to store the number of bytes needed to hold the output string if the receive buffer is too small.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_BUFFER_OVERFLOW
Output buffer too small, data truncated.

CWB_INVALID_POINTER
NULL passed on output parameter.

CWB_INVALID_HANDLE
Handle is not valid.

Usage

The service record handle needs to be filled in by a call to a ″read″ function before calling this routine, otherwise a NULL string will be returned. This function is valid for all service record types.

cwbSV_GetDateStamp:

Purpose

Returns the date stamp (in localized format) for the service record that is identified by the handle that is provided.

Syntax

```
unsigned int CWB_ENTRY cwbSV_GetDateStamp(
                             cwbSV_ServiceRecHandle  serviceRecHandle,
                             char                   *dateStamp,
                             unsigned long           dateStampLength,
                             unsigned long          *returnLength);
```

Parameters

cwbSV_ServiceRecHandle serviceRecHandle - input
Handle that was returned by a previous call to the cwbSV_CreateServiceRecHandle function.

char * dateStamp - input/output
Pointer to a buffer that will receive the datestamp that is stored in the record that is identified by the handle.

unsigned long dateStampLength - input
Length of the receive buffer passed in. It should include space for the ending null character. If the buffer is too small, the value will be truncated, and CWB_BUFFER_OVERFLOW and returnLength will be set. NOTE: The recommended size is CWBSV_MAX_DATE_VALUE.

unsigned long * returnLength - input/output
Optional, may be NULL. A return address to store the number of bytes needed to hold the output string if the receive buffer is too small.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_BUFFER_OVERFLOW
Output buffer too small, data truncated.

CWB_INVALID_POINTER
NULL passed on output parameter.

CWB_INVALID_HANDLE
Handle is not valid.

Usage

The service record handle needs to be filled in by a call to a ″read″ function before calling this routine, otherwise a NULL string will be returned. This function is valid for all service record types.

cwbSV_GetMaxRecordSize:

Purpose

Returns the size (in bytes) of the largest record in the service file that is identified by the file handle that is provided.

Syntax

```
unsigned int CWB_ENTRY cwbSV_GetMaxRecordSize(
                             cwbSV_ServiceFileHandle  serviceFile,
                             unsigned long           *maxRecordSize);
```

Parameters

cwbSV_ServiceFileHandle serviceFileHandle - input
Handle that was returned by a previous call to the cwbSV_OpenServiceFile function.

unsigned long * recordCount - input/output
Pointer to variable that receives the size of the largest record in the file.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_POINTER
NULL passed on output parameter.

CWB_INVALID_HANDLE
Handle is not valid.

Usage

None

cwbSV_GetMessageText:

Purpose

Returns the message text portion of the service record object that is identified by the handle that is provided.

Syntax

```
unsigned int CWB_ENTRY cwbSV_GetMessageText(
                             cwbSV_ServiceRecHandle  serviceRecHandle,
                             char                   *messageText,
                             unsigned long           messageTextLength,
                             unsigned long          *returnLength);
```

Parameters

cwbSV_ServiceRecHandle serviceRecHandle - input
Handle that was returned by a previous call to the cwbSV_CreateServiceRecHandle function.

char * messageText - input/output
Pointer to a buffer that will receive the message text that is stored in the record that is identified by the handle.

unsigned long messageTextLength - input
Length of the receive buffer passed in. If the buffer is too small, the value will be truncated, and CWB_BUFFER_OVERFLOW and returnLength will be set.

unsigned long * returnLength - input/output
Optional, may be NULL. A return address to store the number of bytes needed to hold the output data if the receive buffer is too small.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_BUFFER_OVERFLOW
Output buffer too small, data truncated.

CWB_INVALID_POINTER
NULL passed on output parameter.

CWB_INVALID_HANDLE
Handle is not valid.

CWBSV_INVALID_RECORD_TYPE
Type is not CWBSV_MESSAGE_REC.

Usage

If the record type is not CWBSV_MESSAGE_REC, a return code of CWBSV_INVALID_RECORD_TYPE will be returned. (note: cwbSV_GetServiceType() returns the current record type)

cwbSV_GetProduct:

Purpose

Returns the product ID value for the service record object that is identified by the handle that is provided.

Syntax

```
unsigned int CWB_ENTRY cwbSV_GetProduct(
                                cwbSV_ServiceRecHandle  serviceRecHandle,
                                char                   *productID,
                                unsigned long           productIDLength,
                                unsigned long          *returnLength);
```

Parameters

cwbSV_ServiceRecHandle serviceRecHandle - input
Handle that was returned by a previous call to the cwbSV_CreateServiceRecHandle function.

char * productID - input/output
Pointer to a buffer that will receive the product ID that is stored in the record that is identified by the handle.

unsigned long productIDLength - input
Length of the receive buffer passed in. It should include space for the ending null character. If the buffer is too small, the value will be truncated, and CWB_BUFFER_OVERFLOW and returnLength will be set. NOTE: The recommended size is CWBSV_MAX_PRODUCT_ID.

unsigned long * returnLength - input/output
Optional, may be NULL. A return address to store the number of bytes needed to hold the output string if the receive buffer is too small.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_BUFFER_OVERFLOW
Output buffer too small, data truncated.

CWB_INVALID_POINTER
NULL passed on output parameter.

CWB_INVALID_HANDLE
Handle is not valid.

Usage

The service record handle needs to be filled in by a call to a ″read″ function before calling this routine, otherwise a NULL string will be returned. This function is valid for all service record types.

cwbSV_GetRecordCount:

Purpose

Returns the total numbers of records in the service file that is identified by the file handle that is provided.

Syntax

```
unsigned int CWB_ENTRY cwbSV_GetRecordCount(
                             cwbSV_ServiceFileHandle  serviceFile,
                             unsigned long           *recordCount);
```

Parameters

cwbSV_ServiceFileHandle serviceFileHandle - input
Handle that was returned by a previous call to the cwbSV_OpenServiceFile function.

unsigned long * recordCount - input/output
Pointer to variable that receives the total number of records in the file.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_POINTER
NULL passed on output parameter.

CWB_INVALID_HANDLE
Handle is not valid.

Usage

None

cwbSV_GetServiceFileName:

Purpose

Returns the fully-qualified path and file name of where the service records are being logged to for a particular file type.

Syntax

```
unsigned int CWB_ENTRY cwbSV_GetServiceFileName(
                             cwbSV_ServiceFileType  serviceFileType,
                             char                  *fileName,
                             unsigned long          fileNameLength,
                             unsigned long         *returnLength);
```

Parameters

cwbSV_ServiceFileType serviceFileType - input
Value indicating which service file name you want returned. - CWBSV_HISTORY_LOG - CWBSV_PROBLEM_LOG - CWBSV_DETAIL_TRACE_FILE - CWBSV_ENTRY_EXIT_TRACE_FILE

char * fileName - input/output
Pointer to a buffer that will receive the service file name associated with the one that was requested.

unsigned long fileNameLength - input
Length of the receive buffer passed in. It should include space for the ending null character. If the buffer is too small, the value will be truncated, and CWB_BUFFER_OVERFLOW and returnLength will be set. NOTE: The recommended size is CWBSV_MAX_FILE_PATH.

unsigned long * returnLength - input/output
Optional, may be NULL. A return address to store the number of bytes needed to hold the output string if the receive buffer is too small.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_BUFFER_OVERFLOW
Output buffer too small, data truncated.

CWB_INVALID_POINTER
NULL passed on output parameter.

CWBSV_INVALID_FILE_TYPE
Unusable file type passed-in.

Usage

The filename string returned could be used as input to the cwbSV_OpenServiceFile() routine.

cwbSV_GetServiceType:

Purpose

Returns the type of record (trace, message, entry/exit, and so forth) for the service record that is identified by the handle that is provided. Note: The service record needs to be filled in by a call to a ″read″ function before calling this function.

Syntax

```
unsigned int CWB_ENTRY cwbSV_GetServiceType(
                             cwbSV_ServiceRecHandle  serviceRecHandle,
                             cwbSV_ServiceRecType   *serviceType,
                             cwbSV_ErrHandle         errorHandle);
```

Parameters

cwbSV_ServiceRecHandle serviceRecHandle - input
Handle that was returned by a previous call to the cwbSV_CreateServiceRecHandle function.

cwbSV_ServiceRecType * serviceType - output
Pointer to a cwbSV_ServiceRecType where the serviceType will be returned. - CWBSV_MESSAGE_REC - CWBSV_PROBLEM_REC - CWBSV_DATA_TRACE_REC - CWBSV_API_TRACE_REC - CWBSV_SPI_TRACE_REC

cwbSV_ErrHandle errorHandle - output
Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle API. The messages may be retrieved through the cwbSV_GetErrText API. If the parameter is set to zero, no messages will be retrieved.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_POINTER
NULL passed on output parameter.

CWB_INVALID_HANDLE
Handle is not valid.

CWBSV_INVALID_RECORD_TYPE
Unusable record type detected.

Usage

The service record handle needs to be filled in by a call to a ″read″ function before calling this routine, otherwise CWBSV_INVALID_RECORD_TYPE will be returned.

cwbSV_GetTimeStamp:

Purpose

Returns the timestamp (in localized format) for the service record that is identified by the handle that is provided.

Syntax

```
unsigned int CWB_ENTRY cwbSV_GetTimeStamp(
                             cwbSV_ServiceRecHandle  serviceRecHandle,
                             char                 *timeStamp,
                             unsigned long         timeStampLength,
                             unsigned long        *returnLength);
```

Parameters

cwbSV_ServiceRecHandle serviceRecHandle - input
Handle that was returned by a previous call to the cwbSV_CreateServiceRecHandle function.

char * timeStamp - input/output
Pointer to a buffer that will receive the timestamp that is stored in the record that is identified by the handle.

unsigned long timeStampLength - input
Length of the receive buffer passed in. It should include space for the ending null character. If the buffer is too small, the value will be truncated, and CWB_BUFFER_OVERFLOW and returnLength will be set. NOTE: The recommended size is CWBSV_MAX_TIME_VALUE.

unsigned long * returnLength - input/output
Optional, may be NULL. A return address to store the number of bytes needed to hold the output string if the receive buffer is too small.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_BUFFER_OVERFLOW
Output buffer too small, data truncated.

CWB_INVALID_POINTER
NULL passed on output parameter.

CWB_INVALID_HANDLE
Handle is not valid.

Usage

The service record handle needs to be filled in by a call to a "read" function before calling this routine, otherwise a NULL string will be returned. This function is valid for all service record types.

cwbSV_GetTraceData:

Purpose

Returns the trace data portion of the service record object that is identified by the handle that is provided.

Syntax

```
unsigned int CWB_ENTRY cwbSV_GetTraceData(
                              cwbSV_ServiceRecHandle  serviceRecHandle,
                              char                   *traceData,
                              unsigned long           traceDataLength,
                              unsigned long          *returnLength);
```

Parameters

cwbSV_ServiceRecHandle serviceRecHandle - input
Handle that was returned by a previous call to the cwbSV_CreateServiceRecHandle() function.

char * traceData - input/output
Pointer to a buffer that will receive the trace data that is stored in the record that is identified by the handle. Note: The data that is returned is binary. Hence, it is NOT returned as an ASCIIZ string.

unsigned long traceDataLength - input
Length of the receive buffer passed in. If the buffer is too small, the value will be truncated, and CWB_BUFFER_OVERFLOW and returnLength will be set.

unsigned long * returnLength - input/output
Optional, may be NULL. A return address to store the number of bytes needed to hold the output data if the receive buffer is too small.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_BUFFER_OVERFLOW
Output buffer too small, data truncated.

CWB_INVALID_POINTER
NULL passed on output parameter.

CWB_INVALID_HANDLE
Handle is not valid.

CWBSV_INVALID_RECORD_TYPE
Type is not CWBSV_DATA_TRACE_REC.

Usage

If the record type is not CWBSV_TRACE_DATA_REC, a return code of CWBSV_INVALID_RECORD_TYPE will be returned. (note: cwbSV_GetServiceType() returns the current record type)

cwbSV_GetTraceAPIData:

Purpose

Returns the API trace data portion of the service record that is identified by the handle that is provided.

Syntax

```
unsigned int CWB_ENTRY cwbSV_GetTraceAPIData(
                             cwbSV_ServiceRecHandle  serviceRecHandle,
                             char                   *apiData,
                             unsigned long           apiDataLength,
                             unsigned long          *returnLength);
```

Parameters

cwbSV_ServiceRecHandle serviceRecHandle - input
Handle that was returned by a previous call to the cwbSV_CreateServiceRecHandle() function.

char * apiData - input/output
Pointer to a buffer that will receive the API trace data that is stored in the record that is identified by the handle. Note: The data that is returned is binary. Hence, it is NOT returned as an ASCIIZ string.

unsigned long apiDataLength - input
Length of the receive buffer passed in. If the buffer is too small, the value will be truncated, and CWB_BUFFER_OVERFLOW and returnLength will be set.

unsigned long * returnLength - input/output
Optional, may be NULL. A return address to store the number of bytes needed to hold the output data if the receive buffer is too small.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_BUFFER_OVERFLOW
Output buffer too small, data truncated.

CWB_INVALID_POINTER
NULL passed on output parameter.

CWB_INVALID_HANDLE
Handle is not valid.

CWBSV_INVALID_RECORD_TYPE
Type is not CWBSV_API_TRACE_REC.

Usage

If the record type is not CWBSV_API_TRACE_REC, a return code of CWBSV_INVALID_RECORD_TYPE will be returned. (note: cwbSV_GetServiceType() returns the current record type)

cwbSV_GetTraceAPIID:

Purpose

Returns the API event ID of the service record object that is identified by the handle that is provided.

Syntax

```
unsigned int CWB_ENTRY cwbSV_GetTraceAPIID(
                             cwbSV_ServiceRecHandle  serviceRecHandle,
                             char                   *apiID);
```

Parameters

cwbSV_ServiceRecHandle serviceRecHandle - input
Handle that was returned by a previous call to the cwbSV_CreateServiceRecHandle() function.

char * apiID - input/output
Pointer to one-byte field that receives the API event ID.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_POINTER
NULL passed on output parameter.

CWB_INVALID_HANDLE
Handle is not valid.

CWBSV_INVALID_RECORD_TYPE
Type is not CWBSV_API_TRACE_REC.

Usage

If the record type is not CWBSV_API_TRACE_REC, a return code of CWBSV_INVALID_RECORD_TYPE will be returned. (note: cwbSV_GetServiceType() returns the current record type)

cwbSV_GetTraceAPIType:

Purpose

Returns the API event type of the service record object that is identified by the handle that is provided.

Syntax

```
unsigned int CWB_ENTRY cwbSV_GetTraceAPIType(
                             cwbSV_ServiceRecHandle  serviceRecHandle,
                             cwbSV_EventType        *eventType,
                             cwbSV_ErrHandle         errorHandle);
```

Parameters

cwbSV_ServiceRecHandle serviceRecHandle - input
Handle that was returned by a previous call to the cwbSV_CreateServiceRecHandle() function.

cwbSV_EventType * eventType - output
Pointer to a cwbSV_EventType where the eventType will be returned. - CWBSV_ENTRY_POINT - CWBSV_EXIT_POINT

cwbSV_ErrHandle errorHandle - output
Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle API. The messages may be retrieved through the cwbSV_GetErrText API. If the parameter is set to zero, no messages will be retrieved.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_POINTER
NULL passed on output parameter.

CWB_INVALID_HANDLE
Handle is not valid.

CWBSV_INVALID_RECORD_TYPE
Type is not CWBSV_API_TRACE_REC.

CWBSV_INVALID_EVENT_TYPE
Unusable event type detected.

Usage

If the record type is not CWBSV_API_TRACE_REC, a return code of CWBSV_INVALID_RECORD_TYPE will be returned. (note: cwbSV_GetServiceType() returns the current record type)

cwbSV_GetTraceSPIData:

Purpose

Returns the SPI trace data portion of the service record that is identified by the handle that is provided.

Syntax

```
unsigned int CWB_ENTRY cwbSV_GetTraceSPIData(
                             cwbSV_ServiceRecHandle  serviceRecHandle,
                             char                   *spiData,
                             unsigned long           spiDataLength,
                             unsigned long          *returnLength);
```

Parameters

cwbSV_ServiceRecHandle serviceRecHandle - input
Handle that was returned by a previous call to the cwbSV_CreateServiceRecHandle() function.

char * spiData - input/output
Pointer to a buffer that will receive the SPI trace data that is stored in the record that is identified by the handle. Note: The data that is returned is binary. Hence, it is NOT returned as an ASCIIZ string.

unsigned long spiDataLength - input
Length of the receive buffer passed in. If the buffer is too small, the value will be truncated, and CWB_BUFFER_OVERFLOW and returnLength will be set.

unsigned long * returnLength - input/output
Optional, may be NULL. A return address to store the number of bytes needed to hold the output data if the receive buffer is too small.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_BUFFER_OVERFLOW
Output buffer too small, data truncated.

CWB_INVALID_POINTER
NULL passed on output parameter.

CWB_INVALID_HANDLE
Handle is not valid.

CWBSV_INVALID_RECORD_TYPE
Type is not CWBSV_SPI_TRACE_REC.

Usage

If the record type is not CWBSV_SPI_TRACE_REC, a return code of CWBSV_INVALID_RECORD_TYPE will be returned. (note: cwbSV_GetServiceType() returns the current record type)

cwbSV_GetTraceSPIID:

Purpose

Returns the SPI event ID of the service record object that is identified by the handle that is provided.

Syntax

```
unsigned int CWB_ENTRY cwbSV_GetTraceSPIID(
                             cwbSV_ServiceRecHandle  serviceRecHandle,
                             char                   *spiID);
```

Parameters

cwbSV_ServiceRecHandle serviceRecHandle - input
Handle that was returned by a previous call to the cwbSV_CreateServiceRecHandle() function.

char * spiID - input/output
Pointer to one-byte field that receives the SPI event ID.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_POINTER
NULL passed on output parameter.

CWB_INVALID_HANDLE
Handle is not valid.

CWBSV_INVALID_RECORD_TYPE
Type is not CWBSV_SPI_TRACE_REC.

Usage

If the record type is not CWBSV_SPI_TRACE_REC, a return code of CWBSV_INVALID_RECORD_TYPE will be returned. (note: cwbSV_GetServiceType() returns the current record type)

cwbSV_GetTraceSPIType:

Purpose

Returns the SPI event type of the service record object that is identified by the handle that is provided.

Syntax

```
unsigned int CWB_ENTRY cwbSV_GetTraceSPIType(
                             cwbSV_ServiceRecHandle  serviceRecHandle,
                             cwbSV_EventType        *eventType,
                             cwbSV_ErrHandle         errorHandle);
```

Parameters

cwbSV_ServiceRecHandle serviceRecHandle - input
Handle that was returned by a previous call to the cwbSV_CreateServiceRecHandle() function.

cwbSV_EventType * eventType - output
Pointer to a cwbSV_EventType where the eventType will be returned. - CWBSV_ENTRY_POINT - CWBSV_EXIT_POINT

cwbSV_ErrHandle errorHandle - output
Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle API. The messages may be retrieved through the cwbSV_GetErrText API. If the parameter is set to zero, no messages will be retrieved.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_POINTER
NULL passed on output parameter.

CWB_INVALID_HANDLE
Handle is not valid.

CWBSV_INVALID_RECORD_TYPE
Type is not CWBSV_SPI_TRACE_REC.

CWBSV_INVALID_EVENT_TYPE
Unusable event type detected.

Usage

If the record type is not CWBSV_SPI_TRACE_REC, a return code of CWBSV_INVALID_RECORD_TYPE will be returned. (note: cwbSV_GetServiceType() returns the current record type)

cwbSV_OpenServiceFile:

Purpose

Opens the specified service file for READ access (history log, trace file, and so forth) and returns a handle to it.

Syntax

```
unsigned int CWB_ENTRY cwbSV_OpenServiceFile(
                             char                    *serviceFileName,
                             cwbSV_ServiceFileHandle *serviceFileHandle,
                             cwbSV_ErrHandle          errorHandle);
```

Parameters

char * serviceFileName - input
Points to a buffer that contains the fully-qualified name (for example, c:\path\filename.ext) of the service file to open.

cwbSV_ServiceFileHandle * serviceFileHandle - input/output
Pointer to a cwbSV_ServiceFileHandle where the handle will be returned. This handle should be used in subsequent calls to the service file functions.

cwbSV_ErrHandle errorHandle - output
Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle API. The messages may be retrieved through the cwbSV_GetErrText API. If the parameter is set to zero, no messages will be retrieved.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_POINTER
NULL passed as handle address.

CWB_FILE_IO_ERROR
File could not be opened.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory to create handle.

Usage

None

cwbSV_ReadNewestRecord:

Purpose

Reads the newest record in the service file into the record handle that is provided. Subsequent calls can be made to retrieve the information that is stored in this record (for example, GetProduct(), GetDateStamp(), and so forth). Note: This record is the one with the newest time and date stamp in the file.

Syntax

```
unsigned int CWB_ENTRY cwbSV_ReadNewestRecord(
                             cwbSV_ServiceFileHandle serviceFileHandle,
                             cwbSV_ServiceRecHandle  serviceRecHandle,
                             cwbSV_ErrHandle         errorHandle);
```

Parameters

cwbSV_ServiceFileHandle serviceFileHandle - input
Handle that was returned by a previous call to the cwbSV_OpenServiceFile function.

cwbSV_ServiceRecHandle serviceRecHandle - input
Handle that was returned by a previous call to the cwbSV_CreateServiceRecHandle function.

cwbSV_ErrHandle errorHandle - output
Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle API. The messages may be retrieved through the cwbSV_GetErrText API. If the parameter is set to zero, no messages will be retrieved.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_END_OF_FILE
End of file has been reached.

CWB_FILE_IO_ERROR
Record could not be read.

CWB_INVALID_HANDLE
Handle is not valid.

Usage

This read would be used as a ″priming-type″ read before issuing a series of cwbSV_ReadPrevRecord() calls until the end-of-file indicator is returned.

cwbSV_ReadNextRecord:

Purpose

Reads the next record in the service file into the record handle that is provided. Subsequent calls can be made to retrieve the information that is stored in this record (for example, GetProduct(), GetDateStamp(), and so forth).

Syntax

```
unsigned int CWB_ENTRY cwbSV_ReadNextRecord(
                             cwbSV_ServiceFileHandle serviceFileHandle,
                             cwbSV_ServiceRecHandle  serviceRecHandle,
                             cwbSV_ErrHandle         errorHandle);
```

Parameters

cwbSV_ServiceFileHandle serviceFileHandle - input
Handle that was returned by a previous call to the cwbSV_OpenServiceFile function.

cwbSV_ServiceRecHandle serviceRecHandle - input
Handle that was returned by a previous call to the cwbSV_CreateServiceRecHandle function.

cwbSV_ErrHandle errorHandle - output
Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle API. The messages may be retrieved through the cwbSV_GetErrText API. If the parameter is set to zero, no messages will be retrieved.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_END_OF_FILE
End of file has been reached.

CWB_FILE_IO_ERROR
Record could not be read.

CWB_INVALID_HANDLE
Handle is not valid.

Usage

This read would normally be used once the priming read, ″ReadOldestRecord()″ is performed.

cwbSV_ReadOldestRecord:

Purpose

Reads the oldest record in the service file into the record handle that is provided. Subsequent calls can be made to retrieve the information that is stored in this record (for example, GetProduct(), GetDateStamp(), and so forth). Note: This record is the one with the oldest time and date stamp in the file.

Syntax

```
unsigned int CWB_ENTRY cwbSV_ReadOldestRecord(
                             cwbSV_ServiceFileHandle serviceFileHandle,
                             cwbSV_ServiceRecHandle  serviceRecHandle,
                             cwbSV_ErrHandle         errorHandle);
```

Parameters

cwbSV_ServiceFileHandle serviceFileHandle - input
Handle that was returned by a previous call to the cwbSV_OpenServiceFile function.

cwbSV_ServiceRecHandle serviceRecHandle - input
Handle that was returned by a previous call to the cwbSV_CreateServiceRecHandle function.

cwbSV_ErrHandle errorHandle - output
Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle API. The messages may be retrieved through the cwbSV_GetErrText API. If the parameter is set to zero, no messages will be retrieved.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_END_OF_FILE
End of file has been reached.

CWB_FILE_IO_ERROR
Record could not be read.

CWB_INVALID_HANDLE
Handle is not valid.

Usage

This read would be used as a ″priming-type″ read before issuing a series of cwbSV_ReadNextRecord() calls until the end-of-file indicator is returned.

cwbSV_ReadPrevRecord:

Purpose

Reads the previous record in the service file into the record handle that is provided. Subsequent calls can be made to retrieve the information that is stored in this record (for example, GetProduct(), GetDateStamp(), and so forth).

Syntax

```
unsigned int CWB_ENTRY cwbSV_ReadPrevRecord(
                            cwbSV_ServiceFileHandle serviceFileHandle,
                            cwbSV_ServiceRecHandle  serviceRecHandle,
                            cwbSV_ErrHandle         errorHandle);
```

Parameters

cwbSV_ServiceFileHandle serviceFileHandle - input
Handle that was returned by a previous call to the cwbSV_OpenServiceFile function. V_ServiceRecHandle serviceRecHandle -input Handle that was returned by a previous call to the cwbSV_CreateServiceRecHandle function.

cwbSV_ErrHandle errorHandle - output
Any returned messages will be written to this object. It is created with the cwbSV_CreateErrHandle API. The messages may be retrieved through the cwbSV_GetErrText API. If the parameter is set to zero, no messages will be retrieved.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_END_OF_FILE
End of file has been reached.

CWB_FILE_IO_ERROR
Record could not be read.

CWB_INVALID_HANDLE
Handle is not valid.

Usage

This read would normally be used once the priming read, ″ReadNewestRecord()″ is performed.

Serviceability API list: Retrieving message text

Use these APIs to retrieve message text associated with error handles

cwbSV_CreateErrHandle:

Purpose

This function creates an error message object and returns a handle to it. This error handle can be passed to @@xe1s@@ APIs that support it. If an error occurs on one of these APIs, the error handle can be used to retrieve the error messages text that is associated with the API error.

Syntax

```
unsigned int CWB_ENTRY cwbSV_CreateErrHandle(
                             cwbSV_ErrHandle *errorHandle);
```

Parameters

cwbSV_ErrHandle *errorHandle - input/output
Pointer to a cwbSV_ErrHandle where the handle will be returned.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_POINTER
NULL passed as handle address.

CWB_NOT_ENOUGH_MEMORY
Insufficient memory to create handle.

Usage

None

cwbSV_DeleteErrHandle:

Purpose

This function deletes the error message object that is identified by the handle that is provided.

Syntax

```
unsigned int CWB_ENTRY cwbSV_DeleteErrHandle(
                             cwbSV_ErrHandle errorHandle);
```

Parameters

cwbSV_ErrHandle errorHandle - output
Handle that was returned by a previous call to the cwbSV_CreateErrHandle() function.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_HANDLE
Handle is not valid.

Usage

This call should be made when the handle is no longer needed.

cwbSV_GetErrClass:

Purpose

Returns the message class associated with the top-level (most recent) error that is identified by the error handle that is provided.

Syntax

```
unsigned int CWB_ENTRY cwbSV_GetErrClass(
                             cwbSV_ErrHandle  errorHandle,
                             unsigned long   *errorClass);
```

Parameters

cwbSV_ErrHandle errorHandle - input
Handle that was returned by a previous call to the cwbSV_CreateErrHandle() function.

unsigned long * errorClass - output
Pointer to a variable that will receive the error class that is stored in the error that is identified by the handle.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_POINTER
NULL passed on output parameter.

CWB_INVALID_HANDLE
Handle is not valid.

CWBSV_NO_ERROR_MESSAGES
No error messages associated with error handle.

Usage

None

cwbSV_GetErrClassIndexed:

Purpose

Returns the message class associated with the error index provided. An index value of 1 will retrieve the lowest-level (for example, the oldest) message that is associated with the error handle. An index value of ″cwbSV_GetErrCount()′s returned errorCount″ will retrieve the top-level (for example, the most recent) message associated with the error handle.

Syntax

```
unsigned int CWB_ENTRY cwbSV_GetErrClassIndexed(
                             cwbSV_ErrHandle  errorHandle,
                             unsigned long    errorIndex,
                             unsigned long   *errorClass);
```

Parameters

cwbSV_ErrHandle errorHandle - input
Handle that was returned by a previous call to the cwbSV_CreateErrHandle() function.

unsigned long errorIndex - input
Index value that indicates which error text to return if multiple errors are associated with the error handle.

unsigned long * errorClass - output
Pointer to a variable that will receive the error class that is stored in the error that is identified by the index.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_POINTER
NULL passed on output parameter.

CWB_INVALID_HANDLE
Handle is not valid.

CWBSV_NO_ERROR_MESSAGES
No error messages associated with error handle.

Usage

Valid index values are from 1 to cwbSV_GetErrCount()′s return value. Index values less than 1 act as if 1 was passed. Index values greater than cwbSV_GetErrCount() act as if errorCount was passed.

cwbSV_GetErrCount:

Purpose

Returns the number of messages associated with the error handle provided.

Syntax

```
unsigned int CWB_ENTRY cwbSV_GetErrCount(
                             cwbSV_ErrHandle  errorHandle,
                             unsigned long   *errorCount);
```

Parameters

cwbSV_ErrHandle errorHandle - input
Handle that was returned by a previous call to the cwbSV_CreateErrHandle() function.

unsigned long * errorCount - input/output
Pointer to variable that receives the number of messages associated with this error handle. If zero is returned, no errors are associated with the error handle.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_INVALID_POINTER
NULL passed on output parameter.

CWB_INVALID_HANDLE
Handle is not valid.

Usage

None

cwbSV_GetErrFileName:

Purpose

Returns the message file name for the top-level (the. most recent) message added to the error handle provided. This message attribute only pertains to messages returned from the iSeries server. The file name is the name of the iSeries server message file that contains the message.

Syntax

```
unsigned int CWB_ENTRY cwbSV_GetErrFileName(
                             cwbSV_ErrHandle  errorHandle,
                             char            *fileName,
                             unsigned long    fileNameLength,
                             unsigned long   *returnLength);
```

Parameters

cwbSV_ErrHandle errorHandle - input
Handle that was returned by a previous call to the cwbSV_CreateErrHandle() API.

char * fileName - input/output
Pointer to a buffer that will receive the message file name stored in the error identified by the handle. The value returned is an ASCIIZ string.

unsigned long fileNameLength - input
Length of the receive buffer passed in. It should include space for the terminating null character. If the buffer is too small, the value will be truncated and CWB_BUFFER_OVERFLOW and returnLength will be set. NOTE: The recommended size is CWBSV_MAX_MSGFILE_NAME.

unsigned long * returnLength - input/output
Optional, may be NULL. A return address to store the number of bytes needed to hold the output string if the receive buffer is too small.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_BUFFER_OVERFLOW
Output buffer too small, data truncated.

CWB_INVALID_POINTER
NULL passed on output parameter.

CWB_INVALID_HANDLE
Invalid handle.

CWBSV_NO_ERROR_MESSAGES
No messages are in the error handle.

CWBSV_ATTRIBUTE_NOT_SET
Attribute not set in current message.

Usage

iSeries server messages may be added to the error handle when using the cwbRC_CallPgm() and cwbRC_RunCmd() API's. In these cases, you can use this API to retrieve the message file name for the iSeries server messages contained in the error handle. If there is no message file name attribute for the message, return code CWBSV_ATTRIBUTE_NOT_SET will be returned.

cwbSV_GetErrFileNameIndexed:

Purpose

Returns the message file name for the message identified by the index provided. This message attribute only pertains to messages returned from the iSeries server. The file name is the name of the iSeries server message file containing the message.

Syntax

```
unsigned int CWB_ENTRY cwbSV_GetErrFileNameIndexed(
                             cwbSV_ErrHandle  errorHandle,
                             unsigned long    index,
                             char            *fileName,
                             unsigned long    fileNameLength,
                             unsigned long   *returnLength);
```

Parameters

cwbSV_ErrHandle errorHandle - input
Handle that was returned by a previous call to the cwbSV_CreateErrHandle() API.

unsigned long index - input
Index value indicating which message file name to return if multiple errors are associated with the error handle. The valid index range is from 1 to the number of messages contained in the error handle. The number of messages can be obtained by calling the cwbSV_GetErrCount() API.

char * fileName - input/output
Pointer to a buffer that will receive the message file name stored in the error identified by the index. The value returned is an ASCIIZ string.

unsigned long fileNameLength - input
Length of the receive buffer passed in. It should include space for the terminating null character. If

the buffer is too small, the value will be truncated and CWB_BUFFER_OVERFLOW and returnLength will be set. NOTE: The recommended size is CWBSV_MAX_MSGFILE_NAME.

unsigned long * returnLength - input/output
Optional, may be NULL. A return address to store the number of bytes needed to hold the output string if the receive buffer is too small.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_BUFFER_OVERFLOW
Output buffer too small, data truncated.

CWB_INVALID_POINTER
NULL passed on output parameter.

CWB_INVALID_HANDLE
Invalid handle.

CWBSV_NO_ERROR_MESSAGES
No messages are in the error handle.

CWBSV_ATTRIBUTE_NOT_SET
Attribute not set in current message.

Usage

iSeries server messages may be added to the error handle when using the cwbRC_CallPgm() and cwbRC_RunCmd() API's. In these cases, you can use this API to retrieve the message file name for the iSeries server messages contained in the error handle. If there is no message file name attribute for the message, return code CWBSV_ATTRIBUTE_NOT_SET will be returned. An index value of 1 works with the lowest-level (i.e. oldest) message in the error handle. An index value equal to the count returned by the cwbSV_GetErrCount() API works with the top-level (i.e. most recent) message in the error handle. Index values less than 1 act as if 1 was passed in. Index values greater than the number of messages contained in the error handle act as if the returned count value from the cwbSV_GetErrCount() API was passed in.

cwbSV_GetErrLibName:

Purpose

Returns the message file library name for the top-level (i.e. most recent) message added to the error handle provided. This message attribute only pertains to messages returned from the iSeries server. The library name is the name of the iSeries library containing the message file for the message.

Syntax

```
unsigned int CWB_ENTRY cwbSV_GetErrLibName(
                             cwbSV_ErrHandle  errorHandle,
                             char            *libraryName,
                             unsigned long    libraryNameLength,
                             unsigned long   *returnLength);
```

Parameters

cwbSV_ErrHandle errorHandle - input
Handle that was returned by a previous call to the cwbSV_CreateErrHandle() API.

char * libraryName - input/output
Pointer to a buffer that will receive the message file library name stored in the error identified by the handle. The value returned is an ASCIIZ string.

unsigned long libraryNameLength - input
Length of the receive buffer passed in. It should include space for the terminating null character. If the buffer is too small, the value will be truncated and CWB_BUFFER_OVERFLOW and returnLength will be set. NOTE: The recommended size is CWBSV_MAX_MSGFILE_LIBR.

unsigned long * returnLength - input/output
Optional, may be NULL. A return address to store the number of bytes needed to hold the output string if the receive buffer is too small.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_BUFFER_OVERFLOW
Output buffer too small, data truncated.

CWB_INVALID_POINTER
NULL passed on output parameter.

CWB_INVALID_HANDLE
Invalid handle.

CWBSV_NO_ERROR_MESSAGES
No messages are in the error handle.

CWBSV_ATTRIBUTE_NOT_SET
Attribute not set in current message.

Usage

iSeries messages may be added to the error handle when using the cwbRC_CallPgm() and cwbRC_RunCmd() API's. In these cases, you can use this API to retrieve the message file library name for the iSeries messages contained in the error handle. If there is no message file library name attribute for the message, return code CWBSV_ATTRIBUTE_NOT_SET will be returned.

cwbSV_GetErrLibNameIndexed:

Purpose

Returns the message file library name for the message identified by the index provided. This message attribute only pertains to messages returned from the iSeries server. The library name is the name of the iSeries library containing the message file for the message.

Syntax

```
unsigned int CWB_ENTRY cwbSV_GetErrLibNameIndexed(
                             cwbSV_ErrHandle  errorHandle,
                             unsigned long     index,
                             char             *libraryName,
                             unsigned long     libraryNameLength,
                             unsigned long    *returnLength);
```

Parameters

cwbSV_ErrHandle errorHandle - input
Handle that was returned by a previous call to the cwbSV_CreateErrHandle() API.

unsigned long index - input
Index value indicating which message file library name to return if multiple errors are associated with the error handle. The valid index range is from 1 to the number of messages contained in the error handle. The number of messages can be obtained by calling the cwbSV_GetErrCount() API.

char * libraryName - input/output
Pointer to a buffer that will receive the message file library name stored in the error identified by the index. The value returned is an ASCIIZ string.

unsigned long libraryNameLength - input
Length of the receive buffer passed in. It should include space for the terminating null character. If the buffer is too small, the value will be truncated and CWB_BUFFER_OVERFLOW and returnLength will be set. NOTE: The recommended size is CWBSV_MAX_MSGFILE_LIBR.

unsigned long * returnLength - input/output
Optional, may be NULL. A return address to store the number of bytes needed to hold the output string if the receive buffer is too small.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_BUFFER_OVERFLOW
Output buffer too small, data truncated.

CWB_INVALID_POINTER
NULL passed on output parameter.

CWB_INVALID_HANDLE
Invalid handle.

CWBSV_NO_ERROR_MESSAGES
No messages are in the error handle.

CWBSV_ATTRIBUTE_NOT_SET
Attribute not set in current message.

Usage

iSeries messages may be added to the error handle when using the cwbRC_CallPgm() and cwbRC_RunCmd() API's. In these cases, you can use this API to retrieve the message file library name for the iSeries messages contained in the error handle. If there is no message file library name attribute for the message, return code CWBSV_ATTRIBUTE_NOT_SET will be returned. An index value of 1 works with the lowest-level (i.e. oldest) message in the error handle. An index value equal to the count returned by the cwbSV_GetErrCount() API works with the top-level (i.e. most recent) message in the error handle. Index values less than 1 act as if 1 was passed in. Index values greater than the number of messages contained in the error handle act as if the returned count value from the cwbSV_GetErrCount() API was passed in.

cwbSV_GetErrSubstText:

Purpose

Returns the message substitution data for the top-level (the most recent) message identified by the error handle provided. This message attribute only pertains to messages returned from the iSeries server. The substitution data are inserted into the substitution variable fields defined for the message.

Syntax

```
unsigned int CWB_ENTRY cwbSV_GetErrSubstText(
                             cwbSV_ErrHandle  errorHandle,
                             char            *substitutionData,
                             unsigned long    substitutionDataLength,
                             unsigned long   *returnLength);
```

Parameters

cwbSV_ErrHandle errorHandle - input
Handle that was returned by a previous call to the cwbSV_CreateErrHandle() API.

char * substitutionData - input/output
Pointer to a buffer that will receive the substitution data for the message identified by the handle. NOTE: The data returned is binary, hence it is NOT returned as an ASCIIZ string. Any character strings contained in the substitution data are returned as EBCDIC values.

unsigned long substitutionDataLength - input
Length of the receive buffer passed in. If the buffer is too small, the value will be truncated and CWB_BUFFER_OVERFLOW and returnLength will be set.

unsigned long * returnLength - input/output
Optional, may be NULL. A return address to store the number of bytes needed to hold the output data if the receive buffer is too small. It will also be set to the actual number of bytes of output data returned upon successful completion.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_BUFFER_OVERFLOW
Output buffer too small, data truncated.

CWB_INVALID_POINTER
NULL passed on output parameter.

CWB_INVALID_HANDLE
Invalid handle.

CWBSV_NO_ERROR_MESSAGES
No messages are in the error handle.

CWBSV_ATTRIBUTE_NOT_SET
Attribute not set in current message.

Usage

iSeries server messages may be added to the error handle when using the cwbRC_CallPgm() and cwbRC_RunCmd() API's. In these cases, you can use this API to retrieve the substitution data for the iSeries server messages contained in the error handle. If there is no substitution data for the message, return code CWBSV_ATTRIBUTE_NOT_SET will be returned. Use the returnLength parameter to determine the actual number of bytes returned in the substitution data when the return code is CWB_OK. The substitution data returned on this API could be used on a subsequent host retrieve message API call (QSYS/QMHRTVM) to retrieve the format of the substitution data or to return secondary help text with the substitution data added in. Host API's are called using the cwbRC_CallPgm() API.

cwbSV_GetErrSubstTextIndexed:

Purpose

Returns the message substitution data for the message identified by the index provided. This message attribute only pertains to messages returned from the iSeries server. The substitution data is the data inserted into the substitution variable fields defined for the message.

Syntax

```
unsigned int CWB_ENTRY cwbSV_GetErrSubstTextIndexed(
                             cwbSV_ErrHandle  errorHandle,
                             unsigned long    index,
                             char            *substitutionData,
                             unsigned long    substitutionDataLength,
                             unsigned long   *returnLength);
```

Parameters

cwbSV_ErrHandle errorHandle - input
Handle that was returned by a previous call to the cwbSV_CreateErrHandle() API.

unsigned long index - input
Index value indicating which substitution data to return if multiple errors are associated with the error handle. The valid index range is from 1 to the number of messages contained in the error handle. The number of messages can be obtained by calling the cwbSV_GetErrCount() API.

char * substitutionData - input/output
Pointer to a buffer that will receive the substitution data stored in the error identified by the index. Note: The data returned is binary, hence it is NOT returned as an ASCIIZ string. Any character strings contained in the substitution data are returned as EBCDIC values.

unsigned long substitutionDataLength - input
Length of the receive buffer passed in. If the buffer is too small, the value will be truncated and CWB_BUFFER_OVERFLOW and returnLength will be set.

unsigned long * returnLength - input/output
Optional, may be NULL. A return address to store the number of bytes needed to hold the output data if the receive buffer is too small. It will also be set to the actual number of bytes of output data returned upon successful completion.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_BUFFER_OVERFLOW
Output buffer too small, data truncated.

CWB_INVALID_POINTER
NULL passed on output parameter.

CWB_INVALID_HANDLE
Invalid handle.

CWBSV_NO_ERROR_MESSAGES
No messages are in the error handle.

CWBSV_ATTRIBUTE_NOT_SET
Attribute not set in current message.

Usage

iSeries server messages may be added to the error handle when using the cwbRC_CallPgm() and cwbRC_RunCmd() API's. In these cases, you can use this API to retrieve the substitution data for the iSeries server messages contained in the error handle. If there is no substitution data for the message, return code CWBSV_ATTRIBUTE_NOT_SET will be returned. An index value of 1 works with the lowest-level (i.e. oldest) message in the error handle. An index value equal to the count returned by the cwbSV_GetErrCount() API works with the top-level (i.e. most recent) message in the error handle. Index values less than 1 act as if 1 was passed in. Index values greater than the number of messages contained in the error handle act as if the returned count value from the cwbSV_GetErrCount() API was passed in. Use the returnLength parameter to determine the actual number of bytes returned in the substitution data when the return code is CWB_OK. The substitution data returned on this API could be used on a subsequent host retrieve message API call (QSYS/QMHRTVM) to retrieve the format of the substitution data or to return secondary help text with the substitution data added in. Host API's are called using the cwbRC_CallPgm() API.

cwbSV_GetErrText:

Purpose

Returns the message text associated with the top-level (for example, the most recent) error that is identified by the error handle that is provided.

Syntax

```
unsigned int CWB_ENTRY cwbSV_GetErrText(
                             cwbSV_ErrHandle  errorHandle,
                             char            *errorText,
                             unsigned long    errorTextLength,
                             unsigned long   *returnLength);
```

Parameters

cwbSV_ErrHandle errorHandle - input
Handle that was returned by a previous call to the cwbSV_CreateErrHandle() function.

char * errorText - input/output
Pointer to a buffer that will receive the error message text that is stored in the error that is identified by the handle.

unsigned long errorTextLength - input
Length of the receive buffer passed in. It should include space for the ending null character. If the buffer is too small, the value will be truncated, and CWB_BUFFER_OVERFLOW and returnLength will be set.

unsigned long * returnLength - input/output
Optional, may be NULL. A return address to store the number of bytes needed to hold the output string if the receive buffer is too small.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_BUFFER_OVERFLOW
Output buffer too small, data truncated.

CWB_INVALID_POINTER
NULL passed on output parameter.

CWB_INVALID_HANDLE
Handle is not valid.

CWBSV_NO_ERROR_MESSAGES
No error messages associated with error handle.

Usage

None

cwbSV_GetErrTextIndexed:

Purpose

Returns the message text associated with the error index provided. An index value of 1 will retrieve the lowest-level (for example, the oldest) message that is associated with the error handle. An index value of ″cwbSV_GetErrCount()'s returned errorCount″ will retrieve the top-level (for example, the most recent) message associated with the error handle.

Syntax

```
unsigned int CWB_ENTRY cwbSV_GetErrTextIndexed(
                            cwbSV_ErrHandle  errorHandle,
                            unsigned long    errorIndex,
                            char            *errorText,
                            unsigned long    errorTextLength,
                            unsigned long   *returnLength);
```

Parameters

cwbSV_ErrHandle errorHandle - input
Handle that was returned by a previous call to the cwbSV_CreateErrHandle() function.

unsigned long errorIndex - input
Index value that indicates which error text to return if multiple errors are associated with the error handle.

char * errorText - input/output
Pointer to a buffer that will receive the error message text that is stored in the error that is identified by the index.

unsigned long errorTextLength - input
Length of the receive buffer passed in. It should include space for the ending null character. If the buffer is too small, the value will be truncated, and CWB_BUFFER_OVERFLOW and returnLength will be set.

unsigned long * returnLength - input/output
Optional, may be NULL. A return address to store the number of bytes needed to hold the output string if the receive buffer is too small.

Return Codes

The following list shows common return values.

CWB_OK
Successful completion.

CWB_BUFFER_OVERFLOW
Output buffer too small, data truncated.

CWB_INVALID_POINTER
NULL passed on output parameter.

CWB_INVALID_HANDLE
Handle is not valid.

CWBSV_NO_ERROR_MESSAGES
No error messages associated with error handle.

Usage

Valid index values are from 1 to cwbSV_GetErrCount()'s return value. Index values less than 1 act as if 1 was passed. Index values greater than cwbSV_GetErrCount() act as if errorCount was passed.

Example: Using iSeries Access for Windows Serviceability APIs

The following example uses the iSeries Access for Windows Serviceability APIs to log a message string to theiSeries Access for Windows History Log.

```
#include <stdio.h>
#include "CWBSV.H"

unsigned int logMessageText(char *msgtxt)
/* Write a message to the active message log. */
{
    cwbSV_MessageTextHandle messageTextHandle;
    unsigned int    rc;

    /* Create a handle to a message text object, so that we may write  */
    /* message text to the active message log.                         */
    if ((rc = cwbSV_CreateMessageTextHandle("ProductID", "ComponentID",
            &messageTextHandle)) != CWB_OK)
        return(rc);

    /* Log the supplied message text to the active message log.        */
    rc = cwbSV_LogMessageText(messageTextHandle, msgtxt, strlen(msgtxt));

    /* Delete the message text object identified by the handle provided.*/
    cwbSV_DeleteMessageTextHandle(messageTextHandle);

    return(rc);
}

unsigned int readMessageText(char **bufptr, cwbSV_ErrHandle errorHandle)
/* Read a message from the active message log. */
{
    cwbSV_ServiceFileHandle serviceFileHandle;
    cwbSV_ServiceRecHandle  serviceRecHandle;
    static char buffer[BUFSIZ];
    unsigned int    rc;

    /* Retrieve the fully-qualified path and file name of the active  */
    /* message log.                                                   */
    if ((rc = cwbSV_GetServiceFileName(CWBSV_HISTORY_LOG, buffer, BUFSIZ,
            NULL)) != CWB_OK)
        return(rc);

    /* Open the active message log for READ access and return a handle */
    /*  to it.                                                         */
    if ((rc = cwbSV_OpenServiceFile(buffer, &serviceFileHandle, errorHandle))
            != CWB_OK)
        return(rc);

    /* Create a service record object and return a handle to it.     */
    if ((rc = cwbSV_CreateServiceRecHandle(&serviceRecHandle)) != CWB_OK) {
        cwbSV_CloseServiceFile(serviceFileHandle, 0);
        return(rc);
    }

    /* Read the newest record in the active message log into the      */
    /* record handle provided.                                        */
    if ((rc = cwbSV_ReadNewestRecord(serviceFileHandle, serviceRecHandle,
            errorHandle)) != CWB_OK) {
        cwbSV_DeleteServiceRecHandle(serviceRecHandle);
        cwbSV_CloseServiceFile(serviceFileHandle, 0);
        return(rc);
    }

    /* Retrieve the message text portion of the service record object */
    /* identified by the handle provided.                             */
    if ((rc = cwbSV_GetMessageText(serviceRecHandle, buffer, BUFSIZ, NULL))
            == CWB_OK || rc == CWB_BUFFER_OVERFLOW) {
        *bufptr = buffer;
        rc = CWB_OK;
    }

    /* Delete the service record object identified by the            */
    /* handle provided.                                               */
    cwbSV_DeleteServiceRecHandle(serviceRecHandle);

    /* Close the active message log identified by the handle provided.*/
    cwbSV_CloseServiceFile(serviceFileHandle, errorHandle);

    return(rc);
}

void main(int argc, char *argv[ [)
{
    cwbSV_ErrHandle errorHandle;
    char   *msgtxt = NULL, errbuf[BUFSIZ];
    unsigned int    rc;

    /* Write a message to the active message log.                     */
    if (logMessageText("Sample message text") != CWB_OK)
        return;

    /* Create an error message object and return a handle to it.     */
    cwbSV_CreateErrHandle(&errorHandle);

    /* Read a message from the active message log.                    */
    if (readMessageText(&msgtxt, errorHandle) != CWB_OK) {
        if ((rc = cwbSV_GetErrText(errorHandle, errbuf, BUFSIZ, NULL)) ==
                CWB_OK || rc == CWB_BUFFER_OVERFLOW)
            fprintf(stdout, "%s\n", errbuf);
    }
    else if (msgtxt)
        fprintf(stdout, "Message text: \"%s\"\n", msgtxt);

    /* Delete the error message object identified by the              */
    /* handle provided.                                               */
    cwbSV_DeleteErrHandle(errorHandle);
}
```

iSeries Access for Windows System Object Access (SOA) APIs

System Object Access enables you to view and manipulate iSeries objects through a graphical user interface.

System Object Access application programming interfaces (APIs) for iSeries Access for Windows provide direct access to object attributes. For example, to obtain the number of copies for a given spool file, you can call a series of SOA APIs, and change the value as needed.

System Object Access APIs for iSeries Access for Windows required files:

Interface definition file	Import library	Dynamic Link Library
cwbsoapi.h	cwbapi.lib	cwbsoapi.dll

Programmer's Toolkit:

The Programmer's Toolkit provides System Object Access documentation, access to the cwbsoapi.h header file, and links to sample programs. To access this information, open the Programmer's Toolkit and select **iSeries Operations** → **C/C++ APIs**.

Note: By using the code examples, you agree to the terms of the "Code license and disclaimer information" on page 552.

Related reference

"System Object Access APIs return codes" on page 29

"iSeries system name formats for connection APIs" on page 5
APIs that take an iSeries system name as a parameter accept names in the following formats.

SOA objects

Use System Object Access to view and to manipulate the following iSeries objects.

You can view and manipulate these objects:

- Jobs
- Printers
- Printed output
- Messages
- Spooled files

You only can manipulate these objects:

- Users and groups
- TCP/IP interfaces
- TCP/IP routes
- Ethernet lines
- Token-ring lines
- Hardware resources
- Software resources
- Libraries in QSYS

iSeries object views

Two types of **iSeries object views** are provided with iSeries Access for Windows.

List view:
Displays a customizable graphical list view of the selected iSeries objects. The user can perform a variety of actions on one or more objects.

Properties view:
Displays a detailed graphical view of the attributes of a specific iSeries object. The user can view all attributes if desired, and make changes to those attributes that are changeable.

Typical use of System Object Access APIs for iSeries Access for Windows

Three summaries for and examples of System Object Access API usage are provided below.

Each example is presented twice; a typical sequence of API calls is shown in summary form, and then an actual C-language sample program is presented. The summary indicates which APIs are required (R) and which are optional (O). Normally, additional code would be required to check for and handle errors on each function call; this has been omitted for illustration purposes.

Displaying a customized list of iSeries objects:

In this example, a list object for a list of iSeries spool files is created. After setting the desired sort and filter criteria, the list is displayed to the user, with the user interface customized so that certain user actions are disabled.

When the user is finished viewing the list, the filter criteria are saved in the application profile and the program exits.

Displaying a customized list of iSeries objects (summary)

(O)	cwbRC_StartSys	Start an iSeries conversation
(R)	CWBSO_CreateListHandle	Create a list of iSeries objects
(O)	CWBSO_SetListProfile	Set name of application
(O)	CWBSO_ReadListProfile	Load application preferences
(O)	CWBSO_SetListFilter	Set list filter criteria
(O)	CWBSO_SetListSortFields	Set list sort criteria
(O)	CWBSO_DisallowListFilter	Do not allow user to change filter criteria
(O)	CWBSO_DisallowListActions	Disallow selected list actions
(O)	CWBSO_SetListTitle	Set title of list
(R)	CWBSO_CreateErrorHandle	Create an error object
(R)	CWBSO_DisplayList	Display the customized list
(O)	CWBSO_DisplayErrMsg	Display error message if error occurred
(O)	CWBSO_WriteListProfile	Save list filter criteria
(R)	CWBSO_DeleteErrorHandle	Delete error object
(R)	CWBSO_DeleteListHandle	Delete list
(O)	cwbRC_StopSys	End iSeries conversation

Note: By using the code examples, you agree to the terms of the “Code license and disclaimer information” on page 552.

Sample program: Displaying a customized list of iSeries objects:

```
#ifdef UNICODE
   #define _UNICODE
#endif
#include  <windows.h>              // Windows APIs and datatypes
#include  "cwbsoapi.h"            // System Object Access APIs
#include  "cwbrc.h"               // iSeries DPC APIs
#include  "cwbun.h"               // iSeries Navigator APIs

#define  APP_PROFILE  "APPPROF"     // Application profile name
```

```
int PASCAL WinMain(HINSTANCE hInstance, HINSTANCE hPrevInstance,
                       LPSTR lpszCmdLine, int nCmdShow)
{
MSG               msg;                            // Message structure
HWND              hWnd;                           // Window handle
cwbRC_SysHandle   hSystem;                        // System handle
CWBSO_LIST_HANDLE hList  = CWBSO_NULL_HANDLE;   // List handle
CWBSO_ERR_HANDLE  hError = CWBSO_NULL_HANDLE;   // Error handle
cwbCO_SysHandle   hSystemHandle;                  // System object handle
unsigned int      rc;                             // System Object Access return codes

unsigned short    sortIDs[] = { CWBSO_SFL_SORT_UserData,
                                CWBSO_SFL_SORT_Priority };
                                                  // Array of sort IDs
unsigned short    actionIDs[] = { CWBSO_ACTN_PROPERTIES };
                                                  // Array of action IDs

//******************************************************************
// Start a conversation with iSeries server SYSNAME.  Specify
// application name APPNAME.
//******************************************************************
cwbUN_GetSystemHandle((char *)"SYSNAME", (char *)"APPNAME", &hSystemHandle);

cwbRC_StartSysEx(hSystemHandle, &hSystem);

//*******************************************************************
// Create a list of spooled files.  Set desired sort/filter criteria.

// Create a list of spooled files on system SYSNAME
CWBSO_CreateListHandleEx(hSystemHandle,
                         CWBSO_LIST_SFL,
                         &hList);

// Identify the name of the application profile
CWBSO_SetListProfile(hList, APP_PROFILE);

// Create an error handle
CWBSO_CreateErrorHandle(&hError);

// Load previous filter criteria
CWBSO_ReadListProfile(hList, hError);

// Only show spooled files on printer P3812 for user TLK
CWBSO_SetListFilter(hList, CWBSO_SFLF_DeviceFilter, "P3812");
CWBSO_SetListFilter(hList, CWBSO_SFLF_UserFilter, "TLK");

// Sort by 'user specified data', then by 'output priority'
CWBSO_SetListSortFields(hList, sortIDs, sizeof(sortIDs) / sizeof(short));

//*******************************************************************
// Customize the UI by disabling selected UI functions.  Set the list title.
//*******************************************************************

// Do not allow users to change list filter
CWBSO_DisallowListFilter(hList);

// Do not allow the 'properties' action to be selected
CWBSO_DisallowListActions(hList, actionIDs, sizeof(actionIDs) / sizeof(short));

// Set the string that will appear in the list title bar
CWBSO_SetListTitle(hList, "Application Title");

//*******************************************************************
// Display the list.
//*******************************************************************

// Display the customized list of spooled files
rc = CWBSO_DisplayList(hList, hInstance, nCmdShow, &hWnd, hError);

// If an error occurred, display a message box
if (rc == CWBSO_ERROR_OCCURRED)
  CWBSO_DisplayErrMsg(hError);
else
{
  // Dispatch messages for the list window
  while(GetMessage(&msg, NULL, 0, 0))
  {
    TranslateMessage(&msg);
    DispatchMessage(&msg);
  }

  // List window has been closed - save filter criteria in application profile
  CWBSO_WriteListProfile(hList, hError);
}

//********************************************************************
// Processing complete - clean up and exit.
//********************************************************************

// Clean up handles
CWBSO_DeleteErrorHandle(hError);
CWBSO_DeleteListHandle(hList);

// End the conversation started by EHNDP_StartSys
cwbRC_StopSys(hSystem);

//*********************************************************************
// Return from WinMain.
//*********************************************************************

return rc;
}
```

Displaying the Properties view for an iSeries Object:

A list object for a list of iSeries spool files is created. After setting the desired filter criteria, the list is opened, and a handle to the first object in the list is obtained. A properties view that shows the attributes for this object is displayed to the user.

Displaying the properties view for an object (Summary)

(O)	cwbRC_StartSys	Start a conversation with an iSeries server
(R)	CWBSO_CreateListHandle	Create a list of iSeries objects
(O)	CWBSO_SetListFilter	Set list filter criteria
(R)	CWBSO_CreateErrorHandle	Create an error object
(R)	CWBSO_OpenList	Open the list (builds a list on the iSeries server)
(O)	CWBSO_DisplayErrMsg	Display error message if error occurred
(O)	CWBSO_GetListSize	Get number of objects in the list
(R)	CWBSO_GetObjHandle	Get an object from the list
(R)	CWBSO_DisplayObjAttr	Display the properties view for the object
(R)	CWBSO_DeleteObjHandle	Delete the object
(O)	CWBSO_CloseList	Close the list

```
(R)  CWBSO_DeleteErrorHandle     Delete error object

(R)  CWBSO_DeleteListHandle      Delete list

(O)  cwbRC_StopSys               End iSeries conversation
```

Note: By using the code examples, you agree to the terms of the "Code license and disclaimer information" on page 552.

Sample program: Displaying the Properties view of an object:

```
#ifdef UNICODE
   #define _UNICODE
#endif
#include  <windows.h>                    // Windows APIs and datatypes
#include  "cwbsoapi.h"                   // System Object Access APIs
#include  "cwbrc.h"                      // iSeries DPC APIs
#include  "cwbun.h"                      // iSeries Navigator APIs

int PASCAL WinMain(HINSTANCE hInstance, HINSTANCE hPrevInstance,
                          LPSTR lpszCmdLine, int nCmdShow)
{
MSG               msg;                          // Message structure
HWND              hWnd;                         // Window handle
cwbRC_SysHandle   hSystem;                      // System handle
CWBSO_LIST_HANDLE hList  = CWBSO_NULL_HANDLE;   // List handle
CWBSO_ERR_HANDLE  hError = CWBSO_NULL_HANDLE;   // Error handle
CWBSO_OBJ_HANDLE  hObject = CWBSO_NULL_HANDLE;  // Object handle
cwbCO_SysHandle   hSystemHandle;                // System object handle
unsigned long     listSize = 0;                 // List size
unsigned short    listStatus = 0;               // List status
unsigned int      rc;                           // System Object Access return codes

//*********************************************************************
// Start a conversation with iSeries server SYSNAME.  Specify
// application name APPNAME.
//********************************************************************

cwbUN_GetSystemHandle((char *)"SYSNAME", (char *)"APPNAME", &hSystemHandle);

cwbRC_StartSysEx(hSystemHandle, &hSystem);

//*********************************************************************
// Create a list of spooled files.  Set desired filter criteria.
//*********************************************************************

// Create a list of spooled files on system SYSNAME
CWBSO_CreateListHandleEx(hSystemHandle,
                         CWBSO_LIST_SFL,
                         &hList);

// Only include spooled files on printer P3812 for user TLK
CWBSO_SetListFilter(hList, CWBSO_SFLF_DeviceFilter, "P3812");
CWBSO_SetListFilter(hList, CWBSO_SFLF_UserFilter, "TLK");

//*********************************************************************
// Open the list.
//*********************************************************************

// Create an error handle
CWBSO_CreateErrorHandle(&hError);

// Open the list of spooled files
rc = CWBSO_OpenList(hList, hError);
// If an error occurred, display a message box
if (rc == CWBSO_ERROR_OCCURRED)
```

```
  CWBSO_DisplayErrMsg(hError);
else
{
  //*****************************************************************
  // Display the properties of the first object in the list
  //*****************************************************************

  // Get the number of objects in the list
  CWBSO_GetListSize(hList, &listSize, &listStatus, hError);

  if (listSize > 0)
  {
    // Get the first object in the list
    CWBSO_GetObjHandle(hList, 0, &hObject, hError);

    // Display the properties window for this object
    CWBSO_DisplayObjAttr(hObject, hInstance, nCmdShow, &hWnd, hError);

    // Dispatch messages for the properties window
    while(GetMessage(&msg, NULL, 0, 0))
    {
      TranslateMessage(&msg);
      DispatchMessage(&msg);
 }

    // Properties window has been closed - delete object handle
    CWBSO_DeleteObjHandle(hObject);
  }
}

//*******************************************************************
// Processing complete - clean up and exit.
//*******************************************************************

// Close the list
CWBSO_CloseList(hList, hError);

// Clean up handles
CWBSO_DeleteErrorHandle(hError);
CWBSO_DeleteListHandle(hList);

// End the conversation started by EHNDP_StartSys
cwbRC_StopSys(hSystem);

//********************************************************************
// Return from WinMain.
//********************************************************************

return rc;
}
```

Accessing and updating data for iSeries Objects:

A list object for a list of iSeries spool files is created. After setting the desired filter criteria, the list is opened. A parameter object is created which will be used to change the output priority for each spooled file in the list.

After storing the desired output priority value of ″9″ in the parameter object, a loop is entered. Each object in the list is examined in turn, and if a spooled file is found to have more than 10 pages then its output priority is changed.

In this example, all spooled files for device P3812 that have 10 or more pages have their output priority changed to 9 so that they will not print before smaller files.

Accessing and updating data for iSeries objects (Summary)

```
(R)  CWBSO_CreateListHandle      Create a list of iSeries objects

(O)  CWBSO_SetListFilter         Set list filter criteria

(R)  CWBSO_CreateErrorHandle     Create an error object

(R)  CWBSO_OpenList              Open the list (automatically starts
                                 a conversation with the iSeries server)

(O)  CWBSO_DisplayErrMsg         Display error message if error occurred

(R)  CWBSO_CreateParmObjHandle   Create a parameter object

(R)  CWBSO_SetParameter          Set new value for object attribute
                                 or attributes

(R)  CWBSO_WaitForObj            Wait until first object is available

. . . Loop through all objects
.
. (R)  CWBSO_GetObjHandle         Get an object from the list
.
. (R)  CWBSO_GetObjAttr           Read data for a particular attribute
.
. (R)  CWBSO_SetObjAttr           Update an attribute on the iSeries server
.
. (R)  CWBSO_DeleteObjHandle      Clean up object handle
.
. (R)  CWBSO_WaitForObj           Wait for next object in list
.
..............


(R)  CWBSO_DeleteParmObjHandle   Delete the parameter object

(O)  CWBSO_CloseList             Close the list

(R)  CWBSO_DeleteErrorHandle     Delete error object

(R)  CWBSO_DeleteListHandle      Delete list (automatically ends the
                                 iSeries conversation)
```

Note: By using the code examples, you agree to the terms of the “Code license and disclaimer information” on page 552.

Sample program: Accessing and updating data for iSeries objects:

```
#include  <windows.h>                   // Windows APIs and datatypes
#include  <stdlib.h>                    // For atoi
#include  "cwbsoapi.h"                  // System Object Access APIs

int PASCAL WinMain(HINSTANCE hInstance, HINSTANCE hPrevInstance,
                       LPSTR lpszCmdLine, int nCmdShow)
{
CWBSO_LIST_HANDLE hList  = CWBSO_NULL_HANDLE;   // List handle
CWBSO_ERR_HANDLE  hError = CWBSO_NULL_HANDLE;   // Error handle
CWBSO_PARMOBJ_HANDLE  hParmObject = CWBSO_NULL_HANDLE; // Parm object
CWBSO_OBJ_HANDLE  hObject = CWBSO_NULL_HANDLE;  // Object handle
unsigned int      rc, setRC;                    // System Object Access return codes
unsigned long     bytesNeeded = 0;              // Bytes needed
unsigned short    errorIndex = 0;          // Error index (SetObjAttr)
char              szString[100]; // Buffer for formatting
int               totalPages = 0;          // Total pages
int               i = 0;                   // Loop counter
int               nNbrChanged = 0;         // Count of changed objects
```

```
MessageBox(GetFocus(), "Start of Processing", "PRIORITY", MB_OK);

//********************************************************************
// Create a list of spooled files.  Set desired filter criteria.
//********************************************************************

// Create a list of spooled files on system SYSNAME
CWBSO_CreateListHandle("SYSNAME",
                       "APPNAME",
                       CWBSO_LIST_SFL,
                       &hList);

// Only include spooled files for device P3812
CWBSO_SetListFilter(hList, CWBSO_SFLF_DeviceFilter, "P3812");

//*******************************************************************
// Open the list.
//*******************************************************************

// Create an error handle
CWBSO_CreateErrorHandle(&hError);

// Open the list of spooled files
rc = CWBSO_OpenList(hList, hError);


// If an error occurred, display a message box
if (rc == CWBSO_ERROR_OCCURRED)
  CWBSO_DisplayErrMsg(hError);
else
{
  //*****************************************************************
  // Set up to change output priority for all objects in the list.
  //*****************************************************************

  // Create a parameter object to hold the attribute changes
  CWBSO_CreateParmObjHandle(&hParmObject);

  // Set the parameter to change the output priority to '9'
  CWBSO_SetParameter(hParmObject,
                     CWBSO_SFL_OutputPriority,
                     "9",
                     hError);

  //******************************************************************
  // Loop through the list, changing the output priority for any
  // files that have more than 10 total pages.  Loop will
  // terminate when CWBSO_WaitForObj
  // returns CWBSO_BAD_LIST_POSITION, indicating that there
  // are no more objects in the list.
  //******************************************************************

  // Wait for first object in the list
  rc = CWBSO_WaitForObj(hList, i, hError);

  // Loop through entire list
  while (rc == CWBSO_NO_ERROR)
  {
    // Get the list object at index i
    CWBSO_GetObjHandle(hList, i, &hObject, hError);

    // Get the total pages attribute for this spooled file
    CWBSO_GetObjAttr(hObject,
                     CWBSO_SFL_TotalPages,
                     szString,
                     sizeof(szString),
                     &bytesNeeded,;
                     hError);

    totalPages = atoi(szString);

    // Update the output priority if necessary
    if (totalPages > 10)
    {
      // Change the spool file's output priority to '9'
      setRC = CWBSO_SetObjAttr(hObject, hParmObject, &errorIndex, hError);
      if (setRC == CWBSO_NO_ERROR)
        nNbrChanged++;
    }


    // Delete the object handle
    CWBSO_DeleteObjHandle(hObject);

    // Increment list item counter
    i++;

    // Wait for next list object
    rc = CWBSO_WaitForObj(hList, i, hError);

  } /* end while */

  // Parameter object no longer needed
  CWBSO_DeleteParmObjHandle(hParmObject);

  } /* end if */


// Display the number of spooled files that had priority changed
wsprintf (szString, "Number of spool files changed:  %d", nNbrChanged);
MessageBox(GetFocus(), szString, "PRIORITY", MB_OK);

//*******************************************************************
// Processing complete - clean up and exit.
//*******************************************************************

// Close the list
CWBSO_CloseList(hList,hError);

// Clean up handles
CWBSO_DeleteErrorHandle(hError);
CWBSO_DeleteListHandle(hList);

//*******************************************************************
// Return from WinMain.
//*******************************************************************

return 0;
}
```

iSeries Access for Windows System Object Access programming considerations

See the following topics for important SOA programming considerations.

About System Object Access errors:

All System Object Access APIs use return codes to report error conditions.

Check for errors on each function call. In addition, certain APIs incorporate a handle to an “error object” in their interface. The error object is used to provide additional information for errors which occurred during the processing of a request. Often these errors are encountered while interacting with the iSeries server, in which case the error object will contain the error message text.

If a function call returns CWBSO_ERROR_OCCURRED then the error object will have been filled in with information that describe the error. CWBSO_GetErrMsgText may be used to retrieve the error message text. The message will have been translated into the language that is specified for the user's execution environment. Alternatively, the error message may be displayed to the user directly by calling CWBSO_DisplayErrMsg.

For internal processing errors, error objects automatically log an entry in the System Object Access log file `soa.log`, in the iSeries Access for Windows install directory. This file is English only and is intended for use by IBM personnel for problem analysis.

Related reference

"System Object Access APIs return codes" on page 29

System Object Access application profiles:

By default, user-specified list filter criteria are not saved to disk. System Object Access provides APIs for.

- Requesting the use of an application-specific registry key for loading the filter data from the registry into a given list object
- Saving the data for a particular list object in the registry

The data is saved by iSeries system name, and within system name by object type. To read or write profile data, a system name must be specified on the CWBSO_CreateListHandle call for the list object.

Managing iSeries communications sessions for application programs:

System Object Access APIs for iSeries Access for Windows communicate with the iSeries server through the use of one or more client/server conversations.

Because it often takes several seconds to establish a conversation, your application may experience delays when a list first is opened. This topic explains how to control and manage the initiation of conversations so that the performance impact on application programs is minimized.

The default behavior of System Object Access may be summarized as follows:

- If no conversation has been established with the iSeries system object that is identified on the CWBSO_CreateListHandleEx API, a conversation automatically will be started when the list is opened or displayed. If iSeries Access for Windows has not yet established a connection to the specified system, a dialog box will appear prompting the user for the appropriate UserID and password.
- If another instance of the application program starts, the above process repeats itself. No conversation sharing occurs between application programs that run in different processes (that is, with different instance handles).
- When the application program deletes the last System Object Access list, the conversation with the iSeries server is automatically ended (Note that CWBSO_CloseList does not end the conversation with the iSeries server).

A System Object Access conversation may be started using the cwbRC_StartSysEx API. This API accepts an iSeries system object as a parameter, and returns a system handle. Save this handle for later use on the cwbRC_StopSys API, when the application is terminating and it is time to end the conversation with the iSeries server.

When the cwbRC_StartSysEx API is called, the application is blocked until the conversation is established. Therefore, it is good practice to inform the user that a connection is about to be attempted immediately before the call. On return, the conversation will have been initiated, and System Object Access list processing will use this conversation instead of starting a new one.

When cwbRC_StartSysEx is used in this way, the last list to be deleted will not end the conversation. You must call cwbRC_StopSys explicitly before you exit the application.

System Object Access APIs for iSeries Access for Windows List

The following System Object Access APIs for iSeries Access for Windows are listed alphabetically.

SOA enablers:

System Object Access also includes enablers (APIs), which applications can use to access data in iSeries objects or to request graphical lists and attribute views of the object data. The APIs for manipulating lists of objects must be called in the correct order. The basic flow is as follows:

```
CreateErrorHandle -- Creates a handle to an "error" object
                     to be passed to other APIs
CreateListHandle -- Instantiates a list object on the client
OpenList -- Builds list on iSeries server associated with client
            list
(Manipulate the list and its objects using various generic
 and subclass APIs)
CloseList -- Closes list and release resource on iSeries server
DeleteListHandle -- Destroys list object on the client
```

The CWBSO_CreateListHandle API must be called to create a list before any other list APIs are called. The CWBSO_CreateListHandle API returns a list handle to the caller. The list handle must be passed as input to all other list APIs.

After the list is allocated, the CWBSO_SetListFilter API can be called to change the filter criteria for the list. CWBSO_SetListFilter is optional; if it is not called, the list will be built with the default filter criteria. Similarly, the CWBSO_SetListSortFields API can be called to define the attributes on which the list will be sorted. If it is not called the list will not be sorted.

The CWBSO_OpenList API must be called to build the list of objects. This will result in a request to be sent to the iSeries server. The list will be built on the iSeries server, and some or all of the objects (records) in the list will be buffered down to the list on the client. Although all objects in the list are not necessarily cached on the client, the APIs will behave as if they are. Once the CWBSO_OpenList API is called successfully, the following APIs can be called:

CWBSO_GetObjHandle
Retrieves a handle to a specific object in the list. The object handle can then be used to manipulate the specific object.

CWBSO_DeleteObjHandle
Releases the handle returned by CWBSO_GetObjHandle.

CWBSO_DisplayList
Displays the spreadsheet view of the list.

CWBSO_GetListSize
Retrieves the number of objects in the list.

CWBSO_CloseList
Closes the list on the iSeries server and destroy all client objects in the list. All object handles returned by CWBSO_GetListObject no longer are valid after the list is closed. After the list is closed, the APIs in this list cannot be called until the CWBSO_OpenList API is called again. The CWBSO_DeleteListHandle API should be called to destroy the list object.

CWBSO_CloseList:

Purpose

Closes the list of objects and frees up resources allocated on the iSeries server.

Syntax

```
unsigned int CWB_ENTRY CWBSO_CloseList(
                 CWBSO_LIST_HANDLE listHandle,
                 CWBSO_ERR_HANDLE errorHandle);
```

Parameters

CWBSO_LIST_HANDLE listHandle - input
A handle to a list that was returned by a previous call to CWBSO_CreateListHandle or CWBSO_CreateListHandleEx.

CWBSO_ERR_HANDLE errorHandle - input
A handle to an error that was returned by a previous call to CWBSO_CreateErrorHandle. When the value that is returned by this API is CWBSO_ERROR_OCCURRED, the error handle may be used to retrieve the error message text or display the error to the user.

Return Codes

The following list shows common return values.

CWBSO_NO_ERROR
No error occurred.

CWBSO_BAD_LIST_HANDLE
The list handle that is specified is not valid.

CWBSO_BAD_ERR_HANDLE
The error handle that is specified is not valid.

CWBSO_ERROR_OCCURRED
An error occurred. Use the error handle for more information.

CWBSO_LOW_MEMORY
Not enough memory is available for the request.

Usage

CWBSO_CreateListHandle must be called prior to calling this API. The list handle that is returned by CWBSO_CreateListHandle must be passed as input to this API. CWBSO_CreateErrorHandle must be called prior to calling this API. The error handle that is returned by CWBSO_CreateErrorHandle must be passed as input to this API. The list must currently be open. The list is opened by calling CWBSO_OpenList. This API will not end the conversation with the iSeries server. For the conversation to be ended the list must be deleted using CWBSO_DeleteListHandle.

CWBSO_CopyObjHandle:

Purpose

Creates a new instance of an object and returns a handle to the new instance. This does not create a new object on the iSeries server. It merely creates an additional instance of an iSeries object on the client. Object handles that are returned by CWBSO_GetObjHandle are always destroyed when the list that contains the object is closed. This API allows the creation of an instance of the object that will persist after the list is closed. The object instance that was created by this API is kept in sync with the object in the list. In other words, if one of the objects is changed, the changes will be apparent in the other object.

Syntax

```
unsigned int CWB_ENTRY CWBSO_CopyObjHandle(
                 CWBSO_OBJ_HANDLE objectHandle,
                 CWBSO_OBJ_HANDLE far* lpNewObjectHandle);
```

Parameters

CWBSO_OBJ_HANDLE objectHandle - input
A handle to an object that was returned by a previous call to CWBSO_GetObjHandle or CWBSO_CopyObjHandle.

CWBSO_OBJ_HANDLE far* lpNewObjectHandle - output
A long pointer to a handle which will be set to a new handle for the same iSeries object. This handle may be used with any other API that accepts an object handle with the exception that some APIs only operate on specific types of objects.

Return Codes

The following list shows common return values.

CWBSO_NO_ERROR
No error occurred.

CWBSO_LOW_MEMORY
Not enough memory is available for the request.

CWBSO_BAD_OBJ_HANDLE
The object handle that is specified is not valid.

Usage

CWBSO_GetObjHandle or CWBSO_CopyObjHandle must be called prior to calling this API. The object handle that is returned by CWBSO_GetObjHandle or CWBSO_CopyObjHandle must be passed as input to this API. When the object is no longer needed, the calling program is responsible for doing the following:

- Call CWBSO_DeleteObjHandle to free up resources that are allocated on the client.

CWBSO_CreateErrorHandle:

Purpose

Creates an error handle. An error handle is used to contain error messages that are returned from other APIs. The error handle may be used to display the error in a dialog or retrieve the associated error message text.

Syntax

```
unsigned int CWB_ENTRY CWBSO_CreateErrorHandle(
                CWBSO_ERR_HANDLE far* lpErrorHandle);
```

Parameters

CWBSO_ERR_HANDLE far* lpErrorHandle - output
A long pointer to a handle which will be set to the handle for an error.

Return Codes

The following list shows common return values.

CWBSO_NO_ERROR
No error occurred.

CWBSO_LOW_MEMORY
Not enough memory is available for the request.

Usage

When the error handle is no longer needed, the calling program is responsible for doing the following:

- Call CWBSO_DeleteErrorHandle to free up resources that are allocated on the client.

CWBSO_CreateListHandle:

Purpose

Creates a new list and returns a handle to the list.

Syntax

```
unsigned int CWB_ENTRY CWBSO_CreateListHandle(
                char far* lpszSystemName,
                char far* lpszApplicationName,
                CWBSO_LISTTYPE type,
                CWBSO_LIST_HANDLE far* lpListHandle);
```

Parameters

char far* lpszSystemName - input
The name of the iSeries system on which the list will be built. The name that is specified must be a configured iSeries server. If the client is not currently connected to the iSeries server, a connection will be established when the list is opened. If NULL is specified for the system name, the current iSeries Access default system will be used.

char far* lpszApplicationName - input
A character string that identifies the application that will be interacting with the list. The maximum length of this string is 10 characters, excluding the NULL terminator.

CWBSO_LISTTYPE type - input
The type of list to be built. Specify one of the following:

CWBSO_LIST_JOB
List of jobs.

CWBSO_LIST_SJOB
List of server jobs.

CWBSO_LIST_SJOB
List of server jobs.

CWBSO_LIST_MSG
List of messages.

CWBSO_LIST_PRT
List of printers.

CWBSO_LIST_SFL
List of spooled files.

CWBSO_LIST_IFC
List interfaces.

CWBSO_LIST_ELN
List Ethernet lines.

CWBSO_LIST_TLN
List token-ring lines.

CWBSO_LIST_HWL
List hardware resources.

CWBSO_LIST_SW
List software products.

CWBSO_LIST_RTE
List TCP/IP route.

CWBSO_LIST_PRF
List user profiles.

CWBSO_LIST_SMP
List libraries in QSYS.

CWBSO_LIST_HANDLE far* lpListHandle - output
A long pointer to a handle that will be set to the handle for the newly created list. This handle may be used with any other API that accepts a list handle.

Return Codes

The following list shows common return values.

CWBSO_NO_ERROR
No error occurred.

CWBSO_BAD_LISTTYPE
The value that is specified for type of list is not valid.

CWBSO_LOW_MEMORY
Not enough memory is available for the request.

CWBSO_BAD_SYSTEM_NAME
The system name that is specified is not a valid iSeries system name.

Usage

When the list is no longer needed, the calling program is responsible for doing the following:

- Call CWBSO_DeleteListHandle to free up resources that are allocated on the client.

CWBSO_CreateListHandleEx:

Purpose

Creates a new list and returns a handle to the list.

Syntax

```
unsigned int CWB_ENTRY CWBSO_CreateListHandleEx(
                cwbCO_SysHandle systemObjectHandle,
                CWBSO_LISTTYPE type,
                CWBSO_LIST_HANDLE far* lpListHandle);
```

Parameters

cwbCO_SysHandle systemObjectHandle - input
A handle to the system object that represents the iSeries system on which the list will be built. The handle specified must be for a configured iSeries server.

CWBSO_LISTTYPE
The type of list to be built. Specify one of the following:

CWBSO_LIST_JOB
List of jobs.

CWBSO_LIST_SJOB
List of server jobs.

CWBSO_LIST_SJOB
List of server jobs.

CWBSO_LIST_MSG
List of messages.

CWBSO_LIST_PRT
List of printers.

CWBSO_LIST_SFL
List of spooled files.

CWBSO_LIST_IFC
List interfaces.

CWBSO_LIST_ELN
List Ethernet lines.

CWBSO_LIST_TLN
List token-ring lines.

CWBSO_LIST_HWL
List hardware resources.

CWBSO_LIST_SW
List software products.

CWBSO_LIST_RTE
List TCP/IP route.

CWBSO_LIST_PRF
List user profiles.

CWBSO_LIST_SMP
List libraries in QSYS.

CWBSO_LIST_HANDLE far* lpListHandle - output
A long pointer to a handle that will be set to the handle for the newly created list. This handle may be used with any other API that accepts a list handle.

Return Codes

The following list shows common return values.

CWBSO_NO_ERROR
No error occurred.

CWBSO_BAD_LISTTYPE
The value that is specified for type of list is not valid.

CWBSO_LOW_MEMORY
Not enough memory is available for the request.

CWBSO_BAD_SYSTEM_NAME
The system name that is specified is not a valid iSeries system name.

Usage

When the list is no longer needed, the calling program is responsible for doing the following:

- Call CWBSO_DeleteListHandle to free up resources that are allocated on the client.

CWBSO_CreateObjHandle:

Purpose

Creates a new object handle and returns a handle to the object. Use this API to access remote object that do not conform to the list format.

Syntax

```
unsigned int CWB_ENTRY CWBSO_CreateObjHandle(
                char far* lpszSystemName,
                char far* lpszApplicationName,
                CWBSO_OBJTYPE type,
                CWBSO_OBJ_HANDLE far* lpObjHandle);
```

Parameters

char far* lpszSystemName - input
The name of the iSeries system on which the object will be built. The name that is specified must be a configured iSeries server. If the client is not currently connected to the iSeries, a connection will be established when the list is opened. If NULL is specified for the system name, the current iSeries default system will be used.

char far* lpszApplicationName - input
A character string that identifies the application that will be interacting with the list. The maximum length of this string is 10 characters, excluding the NULL terminator.

CWBSO_OBJTYPE type - input
The type of object to be built. Specify the following:

- CWBSO_OBJ_TCIPATTR - TCP/IP attributes

Return Codes

The following list shows common return values.

CWBSO_NO_ERROR
No error occurred.

CWBSO_LOW_MEMORY
Not enough memory is available for the request.

CWBSO_BAD_SYSTEM_NAME
The system name that is specified is not a valid iSeries system name.

Usage

When the list is no longer needed, the calling program is responsible for doing the following:

- Call CWBSO_DeleteObjHandle to free up resources that are allocated on the client.

CWBSO_CreateParmObjHandle:

Purpose

Creates a parameter object and returns a handle to the object. A parameter object contains a set of parameter IDs and values which may be passed as input to other APIs.

Syntax

```
unsigned int CWB_ENTRY CWBSO_CreateParmObjHandle(
                CWBSO_PARMOBJ_HANDLE far* lpParmObjHandle);
```

Parameters

CWBSO_PARMOBJ_HANDLE far* lpParmObjHandle - output
A long pointer to a handle which will be set to the handle for the new parameter object.

Return Codes

The following list shows common return values.

CWBSO_NO_ERROR
No error occurred.

CWBSO_LOW_MEMORY
Not enough memory is available for the request.

Usage

When the parameter object is no longer needed, the calling program is responsible for doing the following:

- Call CWBSO_DeleteParmObjHandle to free up resources that are allocated on the client.

CWBSO_DeleteErrorHandle:

Purpose

Deletes an error handle and frees up resources allocated on the client.

Syntax

```
unsigned int CWB_ENTRY CWBSO_DeleteErrorHandle(
               CWBSO_ERR_HANDLE errorHandle);
```

Parameters

CWBSO_ERR_HANDLE errorHandle - input
An error handle that is returned by a previous call to CWBSO_CreateErrorHandle.

Return Codes

The following list shows common return values.

CWBSO_NO_ERROR
No error occurred.

CWBSO_BAD_ERR_HANDLE
The error handle that is specified is not valid.

Usage

CWBSO_CreateErrorHandle must be called prior to calling this API. The error handle that is returned by CWBSO_CreateErrorHandle must be passed as input to this API.

CWBSO_DeleteListHandle:

Purpose

Deletes the list of objects and frees up resources allocated on the client.

Syntax

```
unsigned int CWB_ENTRY CWBSO_DeleteListHandle(
                CWBSO_LIST_HANDLE listHandle);
```

Parameters

CWBSO_LIST_HANDLE listHandle - input
A handle to a list that is returned by a previous call to CWBSO_CreateListHandle or CWBSO_CreateListHandleEx.

Return Codes

The following list shows common return values.

CWBSO_NO_ERROR
No error occurred.

CWBSO_BAD_LIST_HANDLE
The list handle that is specified is not valid.

Usage

CWBSO_CreateListHandle must be called prior to calling this API. The list handle that is returned by CWBSO_CreateListHandle must be passed as input to this API.

CWBSO_DeleteObjHandle:

Purpose

Deletes an object handle returned from a previous call to CWBSO_GetObjHandle or CWBSO_CopyObjHandle.

Syntax

```
unsigned int CWB_ENTRY CWBSO_DeleteObjHandle(
                CWBSO_OBJ_HANDLE objectHandle);
```

Parameters

CWBSO_OBJ_HANDLE objectHandle - input
A handle to an object that is returned by a previous call to CWBSO_GetObjHandle or CWBSO_CopyObjHandle.

Return Codes

The following list shows common return values.

CWBSO_NO_ERROR
No error occurred.

CWBSO_BAD_OBJ_HANDLE
The object handle that is specified is not valid.

Usage

CWBSO_GetObjHandle or CWBSO_CopyObjHandle must be called prior to calling this API. The object handle that is returned by CWBSO_GetObjHandle or CWBSO_CopyObjHandle must be passed as input to this API.

CWBSO_DeleteParmObjHandle:

Purpose

Deletes a parameter object handle and frees up resources allocated on the client.

Syntax

```
unsigned int CWB_ENTRY CWBSO_DeleteParmObjHandle(
                CWBSO_PARMOBJ_HANDLE parmObjHandle);
```

Parameters

CWBSO_PARMOBJ_HANDLE parmObjHandle - input
A handle to a parameter object that is returned by a previous call to CWBSO_CreateParmObjHandle.

Return Codes

The following list shows common return values.

CWBSO_NO_ERROR
No error occurred.

CWBSO_BAD_PARMOBJ_HANDLE
The parameter object handle that is specified is not valid.

Usage

CWBSO_CreateParmObjHandle must be called prior to calling this API. The parameter object handle that is returned by CWBSO_CreateParmObjHandle must be passed as input to this API.

CWBSO_DisallowListActions:

Purpose

Sets actions the user is not allowed to perform on objects in a list. This affects the actions available when the list is displayed by calling CWBSO_DisplayList. Disallowed actions do not appear in the menu bar, tool bar, or object pop-up menus. This API can only be called once for a list, and it must be called prior to displaying the list.

Syntax

```
unsigned int CWB_ENTRY CWBSO_DisallowListActions(
                CWBSO_LIST_HANDLE listHandle,
                unsigned short far* lpusActionIDs,
                unsigned short usCount);
```

Parameters

CWBSO_LIST_HANDLE listHandle - input
A handle to a list that is returned by a previous call to CWBSO_CreateListHandle or CWBSO_CreateListHandleEx.

unsigned short far* lpusActionIDs - input
A long pointer to an array of action identifier values These values identify which actions the user will not be allowed to perform. The valid values for this parameter depend on the type of objects in the list. See the appropriate header files for the valid values:

- cwbsojob.h
- cwbsomsg.h
- cwbsoprt.h

- cwbsosfl.h

unsigned short usCount - input
The number of action identifier values specified.

Return Codes

The following list shows common return values.

CWBSO_NO_ERROR
No error occurred.

CWBSO_BAD_LIST_HANDLE
The list handle that is specified is not valid.

CWBSO_BAD_ACTION_ID
An action ID specified is not valid for the type of list.

CWBSO_LOW_MEMORY
Not enough memory is available for the request.

CWBSO_NOT_ALLOWED_NOW
The action that was requested is not allowed at this time.

Usage

CWBSO_CreateListHandle must be called prior to calling this API. The list handle that is returned by CWBSO_CreateListHandle must be passed as input to this API.

CWBSO_DisallowListFilter:

Purpose

Sets the list to disallow the user from changing the filter values for the list. This disables the INCLUDE choice from the VIEW pull-down menu when the list is displayed. The list is displayed by calling CWBSO_DisplayList. This API is only meaningful for lists which are displayed by using the CWBSO_DisplayList API. This API can only be called once for a list, and it must be called prior to displaying the list.

Syntax

```
unsigned int CWB_ENTRY CWBSO_DisallowListFilter(
              CWBSO_LIST_HANDLE listHandle);
```

Parameters

CWBSO_LIST_HANDLE listHandle - input
A handle to a list that is returned by a previous call to CWBSO_CreateListHandle or CWBSO_CreateListHandleEx.

Return Codes

The following list shows common return values.

CWBSO_NO_ERROR
No error occurred.

CWBSO_BAD_LIST_HANDLE
The list handle that is specified is not valid.

Usage

CWBSO_CreateListHandle must be called prior to calling this API. The list handle that is returned by CWBSO_CreateListHandle must be passed as input to this API.

CWBSO_DisplayErrMsg:

Purpose

Displays an error message in a dialog box. This API should only be called when CWBSO_ERROR_OCCURRED is the return value from a call to another API. In this case, there is an error message that is associated with the error handle.

Syntax

```
unsigned int CWB_ENTRY CWBSO_DisplayErrMsg(
                CWBSO_ERR_HANDLE errorHandle);
```

Parameters

CWBSO_ERR_HANDLE errorHandle - input
A handle to an error.

Return Codes

The following list shows common return values.

CWBSO_NO_ERROR
No error occurred.

CWBSO_BAD_ERR_HANDLE
The error handle that is specified is not valid.

CWBSO_NO_ERROR_MESSAGE
The error handle that is specified contains no error message.

CWBSO_DISP_MSG_FAILED
The request to display the message failed.

Usage

CWBSO_CreateErrorHandle must be called prior to calling this API. The error handle that is returned by CWBSO_CreateErrorHandle must be passed as input to this API.

CWBSO_DisplayList:

Purpose

Displays the list in a window. From this window, the user is allowed to perform actions on the objects in the list.

Syntax

```
unsigned int CWB_ENTRY CWBSO_DisplayList(
                CWBSO_LIST_HANDLE listHandle,
                HINSTANCE hInstance,
                int nCmdShow,
                HWND far* lphWnd ,
                CWBSO_ERR_HANDLE errorHandle);
```

Parameters

CWBSO_LIST_HANDLE listHandle - input
A handle to a list that was returned by a previous call to CWBSO_CreateListHandle or CWBSO_CreateListHandleEx.

HINSTANCE hInstance - input
The program instance passed to the calling program's WinMain procedure.

int nCmdShow - input
The show window parameter passed to the calling program's WinMain procedure. Alternatively, any of the constants defined for the Windows API ShowWindow() may be used.

HWND far* lphWnd - output
A long pointer to a window handle. This will be set to the handle of the window in which the list is displayed.

CWBSO_ERR_HANDLE errorHandle - input
A handle to an error object. If an error occurs that there is error text for, this handle may be used to retreive the error message text or display the error to the user.

Return Codes

The following list shows common return values.

CWBSO_NO_ERROR
No error occurred.

CWBSO_BAD_LIST_HANDLE
The list handle that is specified is not valid.

CWBSO_BAD_ERR_HANDLE
The error handle that is specified is not valid.

CWBSO_DISPLAY_FAILED
The window could not be created.

CWBSO_LOW_MEMORY
Not enough memory is available for the request.

CWBSO_ERROR_OCCURRED
An error occurred. Use error handle for more information.

Usage

CWBSO_CreateListHandle must be called prior to calling this API. The list handle that is returned by CWBSO_CreateListHandle must be passed as input to this API. CWBSO_CreateErrorHandle must be called prior to calling this API. The error handle that is returned by CWBSO_CreateErrorHandle must be passed as input to this API. It is not necessary to call CWBSO_OpenList or CWBSO_CloseList when using this API. CWBSO_DisplayList handles both the opening and closing of the list. Your program must have a message loop to receive the Windows messages that will be sent during the use of the system object list.

This API only applies to the following list types: Jobs, Messages, Printers, Printer Output, and Spooled Files.

CWBSO_DisplayObjAttr:

Purpose

Displays the attributes window for an object. From this window, the user is allowed to view the object attributes and change attributes that are changeable.

Syntax

```
unsigned int CWB_ENTRY CWBSO_DisplayObjAttr(
                CWBSO_OBJ_HANDLE objectHandle,
                HINSTANCE hInstance,
                int nCmdShow,
                HWND far* lphWnd ,
                CWBSO_ERR_HANDLE errorHandle);
```

Parameters

CWBSO_OBJ_HANDLE objectHandle - input
A handle to an object that was returned by a previous call to CWBSO_GetObjHandle or CWBSO_CopyObjHandle.

HINSTANCE hInstance - input
The program instance passed to the calling program's WinMain procedure.

int nCmdShow - input
The show window parameter passed to the calling program's WinMain procedure. Alternatively, any of the constants defined for the Windows API ShowWindow() may be used.

HWND far* lphWnd - output
A long pointer to a window handle. This will be set to the handle of the window in which the object attributes are displayed.

CWBSO_ERR_HANDLE errorHandle - input
A handle to an error object. If an error occurs that there is error text for, this handle may be used to retrieve the error message and message help.

Return Codes

The following list shows common return values.

CWBSO_NO_ERROR
No error occurred.

CWBSO_BAD_OBJ_HANDLE
The object handle that is specified is not valid.

CWBSO_BAD_ERR_HANDLE
The error handle that is specified is not valid.

CWBSO_DISPLAY_FAILED
The window could not be created.

CWBSO_LOW_MEMORY
Not enough memory is available for the request.

CWBSO_ERROR_OCCURRED
An error occurred. Use error handle for more information.

Usage

CWBSO_GetObjHandle or CWBSO_CopyObjHandle must be called prior to calling this API. The object handle that is returned by CWBSO_GetObjHandle or CWBSO_CopyObjHandle must be passed as input to this API. CWBSO_CreateErrorHandle must be called prior to calling this API. The error handle that is returned by CWBSO_CreateErrorHandle must be passed as input to this API. Your program must have a message loop to receive the Windows messages that will be sent during the use of the system object attributes window.

This API only applies to the following list types: Jobs, Messages, Printers, Printer Output, and Spooled Files.

CWBSO_GetErrMsgText:

Purpose

Retrieves the message text from an error handle. This API should only be called when CWBSO_ERROR_OCCURRED is the return value from a call to another API. In this case there is an error message associated with the error handle.

Syntax

```
unsigned int CWB_ENTRY CWBSO_GetErrMsgText(
                CWBSO_ERR_HANDLE errorHandle ,
                char far* lpszMsgBuffer ,
                unsigned long ulBufferLength,
                unsigned long far* lpulBytesNeeded);
```

Parameters

CWBSO_ERR_HANDLE errorHandle - input
A handle to an error object. If an error occurs that there is error text for, this handle may be used to retreive the error message and message help.

char far* lpszMsgBuffer - output
A long pointer to the output buffer where the message text will be placed. The message text that is returned by this API will be translated text. The output buffer is not changed when the return code is not set to CWBSO_NO_ERROR.

unsigned long ulBufferLength - input
The size, in bytes, of the output buffer argument.

unsigned long far* lpulBytesNeeded - output
A long pointer to an unsigned long that will be set to the number of bytes needed to place the entire message text in the output buffer. When this value is less than or equal to the size of output buffer that is specified, the entire message text is placed in the output buffer. When this value is greater than the size of output buffer that is specified, the output buffer contains a null string. The output buffer is not changed beyond the bytes that are needed for the message text. This value is set to zero when the return code is not set to CWBSO_NO_ERROR.

Return Codes

The following list shows common return values.

CWBSO_NO_ERROR
No error occurred.

CWBSO_BAD_ERR_HANDLE
The error handle that is specified is not valid.

CWBSO_NO_ERROR_MESSAGE
The error handle that is specified contains no error message.

CWBSO_GET_MSG_FAILED
The error message text could not be retrieved.

Usage

CWBSO_CreateErrorHandle must be called prior to calling this API. The error handle that is returned by CWBSO_CreateErrorHandle must be passed as input to this API. For errors which occurred on the iSeries server, the message text will be in the language that is specified for the user's execution environment. All other message text will be in the language that is specified in the Windows Control Panel on the user's personal computer.

CWBSO_GetListSize:

Purpose

Retrieves the number of objects in a list.

Syntax

```
unsigned int CWB_ENTRY CWBSO_GetListSize(
              CWBSO_LIST_HANDLE listHandle,
              unsigned long  far* lpulSize,
              unsigned short far* lpusStatus,
              CWBSO_ERR_HANDLE errorHandle);
```

Parameters

CWBSO_LIST_HANDLE listHandle - input
A handle to a list that was returned by a previous call to CWBSO_CreateListHandle or CWBSO_CreateListHandleEx.

unsigned long far* lpulSize - output
A long pointer to an unsigned long that will be set to the number of entries currently in the list. If the list status indicates that the list is complete, this value represents the total number of objects for the list. If the list status indicates that the list is not completely built, this value represents the number of objects currently available from the host and a subsequent call to this API may indicate that more entries are available.

unsigned short far* lpusStatus - output
A long pointer to an unsigned short that will be set to indicate whether the list is completely built. The value will be set to 0 if the list is not completely built or it will be set to 1 if the list is completely built.

CWBSO_ERR_HANDLE errorHandle - input
A handle to an error object. If an error occurs that there is error text for, this handle may be used to retrieve the error message and message help.

Return Codes

The following list shows common return values.

CWBSO_NO_ERROR
No error occurred.

CWBSO_BAD_LIST_HANDLE
The list handle that is specified is not valid.

CWBSO_BAD_ERR_HANDLE
The error handle that is specified is not valid.

CWBSO_LOW_MEMORY
Not enough memory is available for the request.

CWBSO_ERROR_OCCURRED
An error occurred. Use error handle for more information.

Usage

CWBSO_CreateListHandle must be called prior to calling this API. The list handle that is returned by CWBSO_CreateListHandle must be passed as input to this API. CWBSO_CreateErrorHandle must be called prior to calling this API. The error handle that is returned by CWBSO_CreateErrorHandle must be passed as input to this API. The list must currently be open. The list is opened by calling CWBSO_OpenList. If CWBSO_CloseList is called to close a list, CWBSO_OpenList must be called again before this API can be called.

CWBSO_GetObjAttr:

Purpose

Retrieves the value of an attribute from an object.

Syntax

```
unsigned int CWB_ENTRY CWBSO_GetObjAttr(
                CWBSO_OBJ_HANDLE objectHandle,
                unsigned short usAttributeID,
                char far* lpszBuffer,
                unsigned long ulBufferLength,
                unsigned long far* lpulBytesNeeded,
                CWBSO_ERR_HANDLE errorHandle);
```

Parameters

CWBSO_OBJ_HANDLE objectHandle - input
A handle to an object that was returned by a previous call to CWBSO_GetObjHandle or CWBSO_CopyObjHandle.

unsigned short usAttributeID - input
The identifier of the attribute to be retrieved. The valid values for this parameter depend on the type of object. See the appropriate header files for the valid values:

- cwbsojob.h
- cwbsomsg.h
- cwbsoprt.h
- cwbsosfl.h

char far* lpszBuffer - output
A long pointer to the output buffer where the attribute value will be placed. The value that is returned by this API is NOT a translated string. For instance, *END would be returned instead of Ending page for the ending page attribute of a spooled file. See "SOA attribute special values" on page 433 for information on special values that may be returned for each type of object. The output buffer is not changed when the return code is not set to CWBSO_NO_ERROR.

unsigned long ulBufferLength - input
The size, in bytes, of the output buffer argument.

unsigned long far* lpulBytesNeeded - output
A long pointer to an unsigned long that will be set to the number of bytes needed to place the entire attribute value in the output buffer. When this value is less than or equal to the size of output buffer that is specified, the entire attribute value is placed in the output buffer. When this value is greater than the size of output buffer that is specified, the output buffer contains a null string. The output buffer is not changed beyond the bytes that are needed for the attribute value. This value is set to zero when the return code is not set to CWBSO_NO_ERROR.

CWBSO_ERR_HANDLE errorHandle - input
A handle to an error object. If an error occurs that there is error text for, this handle may be used to retrieve the error message and message help.

Return Codes

The following list shows common return values.

CWBSO_NO_ERROR
No error occurred.

CWBSO_BAD_OBJ_HANDLE
The object handle that is specified is not valid.

CWBSO_BAD_ERR_HANDLE
The error handle that is specified is not valid.

CWBSO_BAD_ATTRIBUTE_ID
The attribute key is not valid for this object.

CWBSO_LOW_MEMORY
Not enough memory is available for the request.

CWBSO_ERROR_OCCURRED
An error occurred. Use error handle for more information.

Usage

CWBSO_GetObjHandle or CWBSO_CopyObjHandle must be called prior to calling this API. The object handle that is returned by CWBSO_GetObjHandle or CWBSO_CopyObjHandle must be passed as input to this API. CWBSO_CreateErrorHandle must be called prior to calling this API. The error handle that is returned by CWBSO_CreateErrorHandle must be passed as input to this API.

CWBSO_GetObjHandle:

Purpose

Gets a handle to an object in a list. The object handle that is returned by this API is valid until the list is closed or until the object handle is deleted. The object handle may be used to call the following APIs:

- CWBSO_CopyObjHandle
- CWBSO_DeleteObjHandle
- CWBSO_DisplayObjAttr
- CWBSO_GetObjAttr
- CWBSO_RefreshObj
- CWBSO_SetObjAttr
- CWBSO_WaitForObj

Syntax

```
unsigned int CWB_ENTRY CWBSO_GetObjHandle(
              CWBSO_LIST_HANDLE listHandle,
              unsigned long ulPosition,
              CWBSO_OBJ_HANDLE far* lpObjectHandle,
              CWBSO_ERR_HANDLE errorHandle);
```

Parameters

CWBSO_LIST_HANDLE listHandle - input
A handle to a list that is returned by a previous call to CWBSO_CreateListHandle or CWBSO_CreateListHandleEx.

unsigned long ulPosition - input
The position of the object within the list for which a handle is needed. NOTE: The first object in a list is considered position 0.

CWBSO_OBJ_HANDLE far* lpObjectHandle - output
A long pointer to a handle which will be set to the handle for the iSeries object. This handle may be used with any other API that accepts an object handle with the exception that some APIs only operate on specific types of objects.

CWBSO_ERR_HANDLE errorHandle - input
A handle to an error object. If an error occurs that there is error text for, this handle may be used to retrieve the error message and message help.

Return Codes

The following list shows common return values.

CWBSO_NO_ERROR
No error occurred.

CWBSO_BAD_LIST_HANDLE
The list handle that is specified is not valid.

CWBSO_BAD_ERR_HANDLE
The error handle that is specified is not valid.

CWBSO_BAD_LIST_POSITION
The position in list that is specified is not valid.

CWBSO_LOW_MEMORY
Not enough memory is available for the request.

CWBSO_ERROR_OCCURRED
An error occurred. Use error handle for more information.

Usage

CWBSO_CreateListHandle must be called prior to calling this API. The list handle that is returned by CWBSO_CreateListHandle must be passed as input to this API. CWBSO_CreateErrorHandle must be called prior to calling this API. The error handle that is returned by CWBSO_CreateErrorHandle must be passed as input to this API. The list must currently be open. The list is opened by calling CWBSO_OpenList. If CWBSO_CloseList is called to close a list, CWBSO_OpenList must be called again before this API can be called. You cannot access an object by using this API until that object has been included in the list. For example, if you issue this API to get the object in position 100 immediately after calling CWBSO_OpenList, the object may not immediately available. In such instances, use CWBSO_WaitForObj to wait until an object is available. The object handle that is returned by this API must be deleted by a subsequent call to CWBSO_DeleteObjHandle.

CWBSO_OpenList:

Purpose

Opens the list. A request is sent to the iSeries system to build the list.

Syntax

```
unsigned int CWB_ENTRY CWBSO_OpenList(
               CWBSO_LIST_HANDLE listHandle,
               CWBSO_ERR_HANDLE errorHandle);
```

Parameters

CWBSO_LIST_HANDLE listHandle - input
A handle to a list that was returned by a previous call to CWBSO_CreateListHandle or CWBSO_CreateListHandleEx.

CWBSO_ERR_HANDLE errorHandle - input
A handle to an error that was returned by a previous call to CWBSO_CreateErrorHandle. When the value that is returned by this API is CWBSO_ERROR_OCCURRED, the error handle may be used to retrieve the error message text or display the error to the user.

Return Codes

The following list shows common return values.

CWBSO_NO_ERROR
No error occurred.

CWBSO_BAD_LIST_HANDLE
The list handle that is specified is not valid.

CWBSO_BAD_ERR_HANDLE
The error handle that is specified is not valid.

CWBSO_LOW_MEMORY
Not enough memory is available for the request.

CWBSO_ERROR_OCCURRED
An error occurred. Use the error for more information.

Usage

CWBSO_CreateListHandle must be called prior to calling this API. The list handle that is returned by CWBSO_CreateListHandle must be passed as input to this API. CWBSO_CreateErrorHandle must be called prior to calling this API. The error handle that is returned by CWBSO_CreateErrorHandle must be passed as input to this API. When the list is no longer needed, the calling program is responsible for doing the following:

- Call CWBSO_CloseList to close the list and free up resources that are allocated on the iSeries server.
- Call CWBSO_DeleteListHandle to free up resources that are allocated on the client.

CWBSO_ReadListProfile:

Purpose

Reads the filter information for the list from the Windows Registry. The application name must have been set using the CWBSO_SetListProfile API. This API should be called prior to opening the list by using the CWBSO_OpenList or CWBSO_DisplayList APIs.

Syntax

```
unsigned int CWB_ENTRY CWBSO_ReadListProfile(
              CWBSO_LIST_HANDLE listHandle,
              CWBSO_ERR_HANDLE errorHandle);
```

Parameters

CWBSO_LIST_HANDLE listHandle - input
A handle to a list that was returned by a previous call to CWBSO_CreateListHandle or CWBSO_CreateListHandleEx.

CWBSO_ERR_HANDLE errorHandle - input
A handle to an error object that was created by a previous call to CWBSO_CreateErrorHandle. When the value that is returned by this API is CWBSO_ERROR_OCCURRED, the error handle may be used to retrieve the error message text or display the error to the user.

Return Codes

The following list shows common return values.

CWBSO_NO_ERROR
No error occurred.

CWBSO_BAD_LIST_HANDLE
The list handle that is specified is not valid.

CWBSO_BAD_ERR_HANDLE
The error handle that is specified is not valid.

CWBSO_SYSTEM_NAME_DEFAULTED
No system name was specified on the CWBSO_CreateListHandle call for the list.

CWBSO_LOW_MEMORY
Not enough memory is available for the request.

CWBSO_ERROR_OCCURRED
An error occurred. Use the error handle for more information.

Usage

CWBSO_CreateListHandle must be called prior to calling this API. The list handle that is returned by CWBSO_CreateListHandle must be passed as input to this API. CWBSO_SetListProfile must be called prior to calling this API. This API has no effect on a list that has been opened. In order for the filter criteria in the profile to take effect, the list must be opened after calling this API.

CWBSO_RefreshObj:

Purpose

Refreshes an object's attributes from the iSeries server. Refreshes all open System Object Access views of the object.

Syntax

```
unsigned int CWB_ENTRY CWBSO_RefreshObj(
                CWBSO_OBJ_HANDLE objectHandle,
                HWND hWnd ,
                CWBSO_ERR_HANDLE errorHandle);
```

Parameters

CWBSO_OBJ_HANDLE objectHandle - input
A handle to an object that was returned by a previous call to CWBSO_GetObjHandle or CWBSO_CopyObjHandle.

HWND hWnd - input
Handle of window to receive the focus after the refresh is complete. This parameter may be NULL. If this API is being called from an application window procedure, then the current window handle should be supplied. Otherwise, focus will shift to the most recently opened System Object Access window if one is open.

CWBSO_ERR_HANDLE errorHandle - input
A handle to an error object. If an error occurs that there is error text for, this handle may be used to retrieve the error message and message help.

Return Codes

The following list shows common return values.

CWBSO_NO_ERROR
No error occurred.

CWBSO_BAD_OBJ_HANDLE
The object handle that is specified is not valid.

CWBSO_BAD_ERR_HANDLE
The error handle that is specified is not valid.

CWBSO_LOW_MEMORY
Not enough memory is available for the request.

CWBSO_ERROR_OCCURRED
An error occurred. Use error handle for more information.

Usage

CWBSO_GetObjHandle or CWBSO_CopyObjHandle must be called prior to calling this API. The object handle that is returned by CWBSO_GetObjHandle or CWBSO_CopyObjHandle must be passed as input to this API. CWBSO_CreateErrorHandle must be called prior to calling this API. The error handle that is returned by CWBSO_CreateErrorHandle must be passed as input to this API.

CWBSO_ResetParmObj:

Purpose

Resets a parameter object to remove any attribute values from the object.

Syntax

```
unsigned int CWB_ENTRY CWBSO_ResetParmObj(
              CWBSO_PARMOBJ_HANDLE parmObjHandle);
```

Parameters

CWBSO_PARMOBJ_HANDLE parmObjHandle - input
A handle to a parameter object that was returned by a previous call to CWBSO_CreateParmObjHandle.

Return Codes

The following list shows common return values.

CWBSO_NO_ERROR
No error occurred.

CWBSO_BAD_PARMOBJ_HANDLE
The parameter object handle is not valid.

Usage

CWBSO_CreateParmObjHandle must be called prior to calling this API. The parameter object handle that is returned by CWBSO_CreateParmObjHandle must be passed as input to this API.

CWBSO_SetListFilter:

Purpose

Sets a filter value for a list. Depending on the type of list, various filter values may be set. The filter values control which objects will be included in the list when the list is built by a call to CWBSO_OpenList.

Syntax

```
unsigned int CWB_ENTRY CWBSO_SetListFilter(
                CWBSO_LIST_HANDLE listHandle,
                unsigned short usFilterID,
                char far* lpszValue);
```

Parameters

CWBSO_LIST_HANDLE listHandle - input
A handle to a list that was returned by a previous call to CWBSO_CreateListHandle or CWBSO_CreateListHandleEx.

unsigned short usFilterID - input
The filter identifier specifies which portion of the filter to set. The valid values for this parameter depend on the type of objects in the list. See the appropriate header files for the valid values:

- cwbsojob.h
- cwbsomsg.h
- cwbsoprt.h
- cwbsosfl.h

char far* lpszValue - input
The value for the filter attribute. If multiple items are specified, they must be separated by commas. Filter value items that specify iSeries object names must be in uppercase. Qualified object names must be in the form of library/object. Qualified job names must be in the form of job-number/user/job-name. Filter value items specifying special values (beginning with asterisk) must be specified in upper case. See "SOA attribute special values" on page 433 for information on the special values that may be supplied for each type of object.

Return Codes

The following list shows common return values.

CWBSO_NO_ERROR
No error occurred.

CWBSO_BAD_LIST_HANDLE
The list handle that is specified is not valid.

CWBSO_BAD_FILTER_ID
The filter ID specified is not valid for the type of list.

Usage

CWBSO_CreateListHandle must be called prior to calling this API. The list handle that is returned by CWBSO_CreateListHandle must be passed as input to this API. This API has no effect on a list that has been opened. In order for the filter criteria to take effect, the list must be opened after calling this API. Caution should be used when requesting complex filters as list performance may be adversely affected.

CWBSO_SetListProfile:

Purpose

Sets the profile name by adding the application name into the Windows Registry. Use CWBSO_ReadListProfile to read the filter information from the Registry prior to displaying a list. Use CWBSO_WriteListProfile to write the updated filter information to the Registry before deleting the list. If this API is not called, CWBSO_ReadListProfile and CWBSO_WriteListProfile will have no effect.

Syntax

```
unsigned int CWB_ENTRY CWBSO_SetListProfile(
                CWBSO_LIST_HANDLE listHandle,
                char far* lpszKey);
```

Parameters

CWBSO_LIST_HANDLE listHandle - input
A handle to a list that was returned by a previous call to CWBSO_CreateListHandle or to CWBSO_CreateListHandleEx.

char far* lpszKey - input
A long pointer to a string that will be used as the key in the Windows Registry for the list. This name could be the name of the application.

Return Codes

The following list shows common return values.

CWBSO_NO_ERROR
No error occurred.

CWBSO_BAD_LIST_HANDLE
The list handle that is specified is not valid.

CWBSO_BAD_PROFILE_NAME
The profile name that is specified is not valid.

Usage

CWBSO_CreateListHandle must be called prior to calling this API. The list handle that is returned by CWBSO_CreateListHandle must be passed as input to this API.

CWBSO_SetListSortFields:

Purpose

Sets the sort criteria for a list. The sort criteria determines the order objects will appear in the list when the list is built by a call to CWBSO_OpenList. This API is only valid for lists of jobs and lists of spooled files. This API is not allowed for lists of messages and lists of printers.

Syntax

```
unsigned int CWB_ENTRY CWBSO_SetListSortFields(
                CWBSO_LIST_HANDLE listHandle,
                unsigned short far* lpusSortIDs,
                unsigned short usCount);
```

Parameters

CWBSO_LIST_HANDLE listHandle - input
A handle to a list that was returned by a previous call to CWBSO_CreateListHandle or CWBSO_CreateListHandleEx.

unsigned short far* lpusSortIDs - input
A long pointer to an array of sort column identifiers. The sort IDs specified will replace the current sort criteria for the list. The valid values for this parameter depend on the type of objects in the list. See the appropriate header files for the valid values:

- cwbsojob.h
- cwbsosfl.h

Note: If multiple sort IDs are specified, the order in which they appear in the array defines the order in which sorting will take place.

unsigned short usCount - input
The number of sort column identifiers specified.

Return Codes

The following list shows common return values.

CWBSO_NO_ERROR
No error occurred.

CWBSO_BAD_LIST_HANDLE
The list handle that is specified is not valid.

CWBSO_BAD_SORT_ID
A sort ID specified is not valid for the type of list.

CWBSO_LOW_MEMORY
Not enough memory is available for the request.

CWBSO_SORT_NOT_ALLOWED
Sorting is not allowed for this type of list.

Usage

CWBSO_CreateListHandle must be called prior to calling this API. The list handle that is returned by CWBSO_CreateListHandle must be passed as input to this API. This API has no effect on a list that has been opened. In order for the sort criteria to take effect, the list must be opened after calling this API. Caution should be used when requesting complex sorts as list performance may be adversely affected.

CWBSO_SetListTitle:

Purpose

Sets the title for a list. The title is displayed in the title bar of the window when the list is displayed by a call to CWBSO_DisplayList.

Syntax

```
unsigned int CWB_ENTRY CWBSO_SetListTitle(
                CWBSO_LIST_HANDLE listHandle ,
                char far* lpszTitle);
```

Parameters

CWBSO_LIST_HANDLE listHandle - input
A handle to a list that was returned by a previous call to CWBSO_CreateListHandle or CWBSO_CreateListHandleEx.

char far* lpszTitle - input
A long pointer to a string to be used for the list title. The length of the string must be less than or equal to 79.

Return Codes

The following list shows common return values.

CWBSO_NO_ERROR
No error occurred.

CWBSO_BAD_LIST_HANDLE
The list handle that is specified is not valid.

CWBSO_BAD_TITLE
The title that is specified is not valid.

Usage

CWBSO_CreateListHandle must be called prior to calling this API. The list handle that is returned by CWBSO_CreateListHandle must be passed as input to this API.

CWBSO_SetObjAttr:

Purpose

Sets the value of one or more attributes of an object.

Syntax

```
unsigned int CWB_ENTRY CWBSO_SetObjAttr(
                CWBSO_OBJ_HANDLE objectHandle,
                CWBSO_PARMOBJ_HANDLE parmObjHandle,
                unsigned short far* lpusErrorIndex,
                CWBSO_ERR_HANDLE errorHandle);
```

Parameters

CWBSO_OBJ_HANDLE objectHandle - input
A handle to an object that was returned by a previous call to CWBSO_GetObjHandle or CWBSO_CopyObjHandle.

CWBSO_PARMOBJ_HANDLE parmObjHandle - input
A handle to a parameter object that was returned by a previous call to CWBSO_CreateParmObjHandle. The parameter object contains the attributes that are to be changed for the object.

unsigned short far* lpusErrorIndex - output
If an error occurred, this value will be set to the index of the parameter item that caused the error. The first parameter item is 1. This value will be set to 0 if none of the parameter items were in error.

CWBSO_ERR_HANDLE errorHandle - input
A handle to an error object. If an error occurs that there is error text for, this handle may be used to retrieve the error message and message help.

Return Codes

The following list shows common return values.

CWBSO_NO_ERROR
No error occurred.

CWBSO_BAD_OBJECT_HANDLE
The object handle that is specified is not valid.

CWBSO_BAD_PARMOBJ_HANDLE
The parameter object handle that is specified is not valid.

CWBSO_BAD_ERR_HANDLE
The error handle that is specified is not valid.

CWBSO_CANNOT_CHANGE_ATTRIBUTE
Attribute is not changeable at this time.

CWBSO_LOW_MEMORY
Not enough memory is available for the request.

CWBSO_ERROR_OCCURRED
An error occurred. Use error handle for more information.

Usage

CWBSO_GetObjHandle or CWBSO_CopyObjHandle must be called prior to calling this API. The object handle that is returned by CWBSO_GetObjHandle or CWBSO_CopyObjHandle must be passed as input to this API. CWBSO_CreateErrorHandle must be called prior to calling this API. The error handle that is returned by CWBSO_CreateErrorHandle must be passed as input to this API.

CWBSO_SetParameter:

Purpose

Sets the value of an attribute of an object. Multiple calls may be made to this API prior to calling CWBSO_SetObjAttr. This allows you to change several attributes for a specific object with one call to CWBSO_SetObjAttr.

Syntax

```
unsigned int CWB_ENTRY CWBSO_SetParameter(
                CWBSO_PARMOBJ_HANDLE parmObjHandle,
                unsigned short usAttributeID,
                char far* lpszValue,
                CWBSO_ERR_HANDLE errorHandle);
```

Parameters

CWBSO_PARMOBJ_HANDLE parmObjHandle - input
A handle to a parameter object that was returned by a previous call to CWBSO_CreateParmObjHandle.

unsigned short usAttributeID - input
The attribute ID for the parameter to be set. The valid values for this parameter depend on the type of object. See the appropriate header files for the valid values:

- cwbsojob.h
- cwbsomsg.h
- cwbsoprt.h
- cwbsosfl.h

char far* lpszValue - input
A long pointer to an attribute value. Note that only ASCIIZ strings are accepted. Binary values must be converted to strings by using the appropriate library function. See "SOA attribute special values" on page 433 for information on the special values that may be supplied for each type of object.

CWBSO_ERR_HANDLE errorHandle - input
A handle to an error object. If an error occurs that there is error text for, this handle may be used to retreive the error message and message help.

Return Codes

The following list shows common return values.

CWBSO_NO_ERROR
No error occurred.

CWBSO_BAD_PARMOBJ_HANDLE
The parameter object handle that is specified is not valid.

CWBSO_BAD_ERR_HANDLE
The error handle that is specified is not valid.

CWBSO_LOW_MEMORY
Not enough memory is available for the request.

CWBSO_ERROR_OCCURRED
An error occurred. Use error handle for more information.

Usage

CWBSO_CreateParmObjHandle must be called prior to calling this API. The parameter object handle that is returned by CWBSO_CreateParmObjHandle must be passed as input to this API. CWBSO_CreateErrorHandle must be called prior to calling this API. The error handle that is returned by CWBSO_CreateErrorHandle must be passed as input to this API. Calling this API does NOT update an object's attributes on the iSeries server. You must call CWBSO_SetObjAttr to actually update the attribute value or values on the iSeries server for the specified object.

CWBSO_WaitForObj:

Purpose

Waits until an object is available in a list that is being built asynchronously.

Syntax

```
unsigned int CWB_ENTRY CWBSO_WaitForObj(
                CWBSO_LIST_HANDLE listHandle,
                unsigned long ulPosition,
                CWBSO_ERR_HANDLE errorHandle);
```

Parameters

CWBSO_LIST_HANDLE listHandle - input
A handle to a list that was returned by a previous call to CWBSO_CreateListHandle or CWBSO_CreateListHandleEx.

unsigned long ulPosition - input
The position of the desired object within the list. NOTE: The first object in a list is considered position 0.

CWBSO_ERR_HANDLE errorHandle - input
A handle to an error object. If an error occurs that there is error text for, this handle may be used to retrieve the error message and message help.

Return Codes

The following list shows common return values.

CWBSO_NO_ERROR
No error occurred.

CWBSO_BAD_LIST_HANDLE
The list handle that is specified is not valid.

CWBSO_BAD_ERR_HANDLE
The error handle that is specified is not valid.

CWBSO_BAD_LIST_POSITION
The position in list that is specified does not exist.

CWBSO_LOW_MEMORY
Not enough memory is available for the request.

CWBSO_ERROR_OCCURRED
An error occurred. Use error handle for more information.

Usage

CWBSO_CreateListHandle must be called prior to calling this API. The list handle that is returned by CWBSO_CreateListHandle must be passed as input to this API. CWBSO_CreateErrorHandle must be called prior to calling this API. The error handle that is returned by CWBSO_CreateErrorHandle must be passed as input to this API.

CWBSO_WriteListProfile:

Purpose

Writes the filter information for the list to the specified key in the Windows registry. The key name must previously have been set using the CWBSO_SetListProfile API. This API should be called before deleting the list. This will save any filter criteria that was changed by the user during the CWBSO_DisplayList API. Filter information is saved in the registry by iSeries system and by type of list. For example, if your application accesses objects from two different iSeries systems, and displays all four types of lists, you would have eight different sections in the registry that specify filter information.

Syntax

```
unsigned int CWB_ENTRY CWBSO_WriteListProfile(
               CWBSO_LIST_HANDLE listHandle,
               CWBSO_ERR_HANDLE errorHandle);
```

Parameters

CWBSO_LIST_HANDLE listHandle - input
A handle to a list that was returned by a previous call to CWBSO_CreateListHandle or CWBSO_CreateListHandleEx.

CWBSO_ERR_HANDLE errorHandle - input
A handle to an error object that was created by a previous call to CWBSO_CreateErrorHandle. When the value that is returned by this API is CWBSO_ERROR_OCCURRED, the error handle may be used to retrieve the error message text or display the error to the user.

Return Codes

The following list shows common return values.

CWBSO_NO_ERROR
No error occurred.

CWBSO_BAD_LIST_HANDLE
The list handle that is specified is not valid.

CWBSO_BAD_ERR_HANDLE
The error handle that is specified is not valid.

CWBSO_SYSTEM_NAME_DEFAULTED
No system name was specified on the CWBSO_CreateListHandle call for the list.

CWBSO_LOW_MEMORY
Not enough memory is available for the request.

CWBSO_ERROR_OCCURRED
An error occurred. Use the error for more information.

Usage

CWBSO_CreateListHandle must be called prior to calling this API. The list handle that is returned by CWBSO_CreateListHandle must be passed as input to this API. CWBSO_SetListProfile must be called prior to calling this API.

SOA attribute special values:

The topics that are listed below provide a description of special values that may be returned by CWBSO_GetObjAttr, and specified on CWBSO_SetObjAttr, for each type of object. In addition, any special values that may be specified on CWBSO_SetListFilter for each type of list object are discussed.

Special considerations:

- For attributes that are numeric, it is common practice for iSeries APIs to return negative numeric values to indicate which special value (if any) an object attribute contains. System Object Access automatically maps these negative numbers to their corresponding special value string. For example, the Retrieve Spooled File Attributes (QUSRSPLA) API returns ″-1″ for page rotation if output reduction is performed automatically. CWBSO_GetObjAttr returns "*AUTO".
- Some list filter criteria accept multiple values. For example, it is possible to filter a list of printers on multiple printer names. In such cases, commas should separate the supplied values.

Where to find additional information about attribute special values:

See the i5/OS APIs topic in the iSeries Information Center.

Job attributes:

System Object Access uses the List Job (QUSLJOB) and Retrieve Job Information (QUSRJOBI) iSeries APIs to retrieve attributes for jobs.

The possible special values are the same as those that are documented in the i5/OS APIs: Work Management APIs topic in the iSeries Information Center. The following special value mappings are not documented explicitly:

CWBSO_JOB_CpuTimeUsed
If the field is not large enough to hold the actual result, QUSRJOBI returns -1. System Object Access returns "++++".

CWBSO_JOB_MaxCpuTimeUsed,

CWBSO_JOB_MaxTemporaryStorage,

CWBSO_JOB_DefaultWaitTime
If the value is `*NOMAX`, QUSRJOBI returns -1. System Object Access returns "*NOMAX".

CWBSO_SetListFilter accepts all special values that are supported by the List Job (QUSLJOB) API.

Message attributes:

System Object Access uses the List Nonprogram Messages (QMHLSTM) i5/OS API to retrieve attributes for messages.

The possible special values are the same as those that are documented in the i5/OS APIs: Message Handling APIs topic in the iSeries Information Center.

CWBSO_SetListFilter accepts the special values that are supported by the List Nonprogram Messages (QMHLSTM) API for Severity Criteria. In addition, a 10-character user name may be supplied, by specifying the CWBSO_MSGF_UserName filter ID. "*CURRENT" may be used to obtain a list of messages for the current user.

Printer attributes:

System Object Access uses iSeries APIs to retrieve attributes for printer objects.

A printer is a "logical" object that is actually a combination of a device description, a writer, and an output queue. The attributes and their possible values are as follows.

CWBSO_PRT_AdvancedFunctionPrinting
Whether the printer device supports Advanced Function Printing™ (AFP).

***NO** The printer device does not support Advanced Function Printing.

***YES** The printer device supports Advanced Function Printing.

CWBSO_PRT_AllowDirectPrinting
Whether the printer writer allows the printer to be allocated to a job that prints directly to a printer.

***NO** Direct printing is not allowed

***YES** Direct printing is allowed.

CWBSO_PRT_BetweenCopiesStatus
Whether the writer is between copies of a multiple copy spooled file. The possible values are Y (yes) or N (no).

CWBSO_PRT_BetweenFilesStatus
Whether the writer is between spooled files. The possible values are Y (yes) or N (no).

CWBSO_PRT_ChangesTakeEffect
The time at which the pending changes to the writer take effect. Possible values are:

***NORDYF**
When all the current eligible files are printed.

***FILEEND**
When the current spooled file is done printing.

blank No pending changes to the writer.

CWBSO_PRT_CopiesLeftToProduce
The number of copies that are left to be printed. This field is set to 0 when no file is printing.

CWBSO_PRT_CurrentPage
The page number in the spooled file that the writer is currently processing. The page number shown may be lower or higher than the actual page number being printed because of buffering done by the system. This field is set to 0 when no spooled file is printing.

CWBSO_PRT_Description
The text description of the printer device.

CWBSO_PRT_DeviceName
The name of the printer device.

CWBSO_PRT_DeviceStatus
The status of the printer device. Possible values are the same as the device status that is returned by the Retrieve Configuration Status (QDCRCFGS) API.

CWBSO_PRT_EndAutomatically
When to end the writer if it is to end automatically.

***NORDYF**
When no files are ready to print on the output queue from which the writer is selecting files to be printed.

***FILEEND**
When the current spooled file has been printed.

***NO** The writer will not end, but it will wait for more spooled files.

CWBSO_PRT_EndPendingStatus
Whether an End Writer (ENDWTR) command has been issued for this writer. Possible values are:

N No ENDWTR command was issued.

I *IMMED: The writer ends as soon as its output buffers are empty.

C *CNTRLD: The writer ends after the current copy of the spooled file has been printed.

P *PAGEEND: The writer ends at the end of the page.

CWBSO_PRT_FileName
The name of the spooled file that the writer is currently processing. This field is blank when no file is printing.

CWBSO_PRT_FileNumber
The number of the spooled file that the writer is currently processing. This field is set to 0 when no spooled file is printing.

CWBSO_PRT_FormsAlignment
The time at which the forms alignment message will be sent. Possible values are:

***WTR** The writer determines when the message is sent.

***FILE** Control of the page alignment is specified by each file.

CWBSO_PRT_FormType
The type of form that is being used to print the spooled file. Possible values are:

***ALL** The writer is started with the option to print all spooled files of any form type.

***FORMS**
The writer is started with the option to print all the spooled files with the same form type before using a different form type.

***STD** The writer is started with the option to print all the spooled files with a form type of *STD.

form type name
The writer is started with the option to print all the spooled files with the form type you specified.

CWBSO_PRT_FormTypeNotification
Message option for sending a message to the message queue when this form is finished. Possible values are:

***MSG** A message is sent to the message queue.

***NOMSG**
No message is sent to the message queue.

***INFOMSG**
An informational message is sent to the message queue.

***INQMSG**
An inquiry message is sent to the message queue.

CWBSO_PRT_HeldStatus
Whether the writer is held. The possible values are Y (yes) or N (no).

CWBSO_PRT_HoldPendingStatus
Whether a Hold Writer (HLDWTR) command has been issued for this writer. Possible values are:

N No HLDWTR command was issued.

I *IMMED: The writer is held as soon as its output buffers are empty.

C *CNTRLD: The writer is held after the current copy of the file has been printed.

P *PAGEEND: The writer is held at the end of the page.

CWBSO_PRT_JobName
The name of the job that created the spooled file which the writer is currently processing. This field is blank when no spooled file is printing.

CWBSO_PRT_JobNumber
The number of the job that created the spooled file which the writer currently is processing. This field is blank when no spooled file is printing.

CWBSO_PRT_MessageKey
The key to the message that the writer is waiting for a reply. This field will be blank when the writer is not waiting for a reply to an inquiry message.

CWBSO_PRT_MessageQueueLibrary
The name of the library that contains the message queue.

CWBSO_PRT_MessageQueueName
The name of the message queue that this writer uses for operational messages.

CWBSO_PRT_MessageWaitingStatus
Whether the writer is waiting for a reply to an inquiry message. The possible values are Y (yes) or N (no).

CWBSO_PRT_NextFormType
The name of the next form type to be printed. Possible values are:

***ALL** The writer is changed with the option to print all spooled files of any form type.

***FORMS**
The writer is changed with the option to print all the spooled files with the same form type before using a different form type.

***STD** The writer is changed with the option to print all the spooled files with a form type of *STD.

form type name
The writer is changed with the option to print all the spooled files with the form type name you specified.

blank No change has been made to this writer.

CWBSO_PRT_NextFormTypeNotification
The message option for sending a message to the message queue when the next form type is finished. Possible values are:

***MSG** A message is sent to the message queue.

***NOMSG**
No message is sent to the message queue.

***INFOMSG**
An informational message is sent to the message queue.

***INQMSG**
An inquiry message is sent to the message queue.

blank No change is pending.

CWBSO_PRT_NextOutputQueueLibrary
The name of the library that contains the next output queue. This field is blank if no changes have been made to the writer.

CWBSO_PRT_NextOutputQueueName
The name of the next output queue to be processed. This field is blank if no changes have been made to the writer.

CWBSO_PRT_NextSeparatorDrawer
This value indicates the drawer from which to take the separator pages if there is a change to the writer. Possible values are:

***FILE** Separator pages print from the same drawer that the spooled file prints from. If you specify a drawer different from the spooled file that contains colored or different type paper, the page separator is more identifiable.

***DEVD**
Separator pages print from the separator drawer that is specified in the printer device description.

empty string
No pending change to the writer.

1 The first drawer.

2 The second drawer.

3 The third drawer.

CWBSO_PRT_NextSeparators
The next number of separator pages to be printed when the change to the writer takes place. Possible values are:

***FILE** The number of separator pages is specified by each file.

empty string
No pending change to the writer.

number of separators
The number of separator pages to be printed.

CWBSO_PRT_NumberOfSeparators
The number of separator pages to be printed. Possible values are:

***FILE** The number of separator pages is specified by each file.

Number of separators
The number of separator pages to be printed.

CWBSO_PRT_OnJobQueueStatus
Whether the writer is on a job queue and, therefore, is not currently running. The possible values are Y (yes) or N (no).

CWBSO_PRT_OutputQueueLibrary
The name of the library that contains the output queue from which spooled files are selected for printing.

CWBSO_PRT_OutputQueueName
The name of the output queue from which spooled files are being selected for printing.

CWBSO_PRT_OutputQueueStatus

The status of the output queue from which spooled files are being selected for printing. Possible values are:

H The output queue is held.

R The output queue is released.

CWBSO_PRT_PrinterDeviceType

The type of the printer that is being used to print the spooled file. Valid values are:

***SCS** SNA (Systems Network Architecture) character stream

***IPDS** Intelligent Printer Data Stream™

CWBSO_PRT_SeparatorDrawer

Identifies the drawer from which the job and file separator pages are to be taken. Possible values are:

***FILE** The separator page prints from the same drawer that the file is printed from. If you specify a drawer different from the file that contains colored or different type paper, the page separator is more identifiable.

***DEVD**

The separator pages will print from the separator drawer that is specified in the printer device description.

1 The first drawer.

2 The second drawer.

3 The third drawer.

CWBSO_PRT_StartedByUser

The name of the user that started the writer.

CWBSO_PRT_Status

The overall status of the logical printer. This field is derived from the printer device status (from the Retrieve Configuration Status QDCRCFGS API), the output queue status (from the List Printer and Writer Status and the XPF macro) and writer status (from the Retrieve Writer Information, QSPRWTRI, API). Possible values are:

1 Unavailable

2 Powered off or not yet available

3 Stopped

4 Message waiting

5 Held

6 Stop (pending)

7 Hold (pending)

8 Waiting for printer

9 Waiting to start

10 Printing

11 Waiting for printer output

12 Connect pending

13 Powered off

14 Unusable

15 Being serviced

999 Unknown

CWBSO_PRT_TotalCopies
The total number of copies to be printed.

CWBSO_PRT_TotalPages
The total number of pages in the spooled file. Possible values are:

number
The number of pages in the spooled file.

0 No spooled file is printing.

CWBSO_PRT_User
The name of the user who created the spooled file that the writer is currently processing. This field is blank when no file is printing.

CWBSO_PRT_UserSpecifiedData
The user-specified data that describe the file that the writer is currently processing. This field is blank when no file is printing.

CWBSO_PRT_WaitingForDataStatus
Whether the writer has written all the data that is currently in the spooled file and is waiting for more data. Possible values are:

N The writer is not waiting for more data.

Y The writer has written all the data currently in the spooled file and is waiting for more data. This condition occurs when the writer is producing an open spooled file with SCHEDULE(*IMMED) that is specified.

CWBSO_PRT_WaitingForDeviceStatus
Whether the writer is waiting to get the device from a job that is printing directly to the printer.

N The writer is not waiting for the device.

Y The writer is waiting for the device

CWBSO_PRT_WriterJobName
The job name of the printer writer.

CWBSO_PRT_WriterJobNumber
The job number of the printer writer.

CWBSO_PRT_WriterJobUser
The name of the system user.

CWBSO_PRT_WriterStarted
Indication of whether a writer is started for this printer. Possible values are:

0 No writer is started

1 Writer is started

CWBSO_PRT_WriterStatus
The status of the writer for this printer. Possible values are:

X'01' Started

X'02' Ended

X'03' On job queue

X'04' Held

X'05' Waiting on message

CWBSO_PRT_WritingStatus
Whether the printer writer is in writing status. The possible values are:

Y The writer is in writing status.

N The writer is not in writing status.

S The writer is writing the file separators.

System Object Access accepts a comma-separated list of printer names. Up to 100 printer names may be specified. A special value of “*ALL” may be supplied to request a list of all printers on the iSeries server.

Printer output attributes:

System Object Access uses the List Spooled Files (QUSLSPL) and Retrieve Spooled File Attributes (QUSRSPLA) iSeries APIs to retrieve attributes for printer output.

The possible special values are the same as those that are documented in the i5/OS APIs: Spooled File APIs topic in the iSeries Information Center. The following special value mappings are not explicitly documented:

CWBSO_SFL_StartingPage
If the ending page value is to be used, QUSRSPLA returns -1. System Object Access returns “*ENDPAGE”.

CWBSO_SFL_EndingPage
If the last page is to be the ending page, QUSRSPLA returns 0 or 2147483647. System Object Access returns “*END”.

CWBSO_SFL_MaximumRecords
If there is no maximum, QUSRSPLA returns 0. System Object Access returns “*NOMAX”.

CWBSO_SFL_PageRotation
If no rotation is done, QUSRSPLA returns 0. System Object Access returns “*NONE”.

An undocumented API is used to retrieve the printer device name or names for a spooled file. The attribute and its possible values are described below.

CWBSO_SFL_DeviceNames
The name of the printer device that will print the file. If the printer output is assigned to more than one printer device, this field contains all of the printer names in the group of printers. Possible values are:

printer name
The name of the printer to which the printer output is assigned.

list of printer names
The names of the printers in the group to which the printer output is assigned. Commas will separate the printer names.

empty string
The printer output is not assigned to a printer or group of printers.

CWBSO_SetListFilter accepts all special values that are supported by the List Spooled Files (QUSLSPL) API.

TCP/IP interfaces attributes:

System Object Access uses the iSeries API List Network Interfaces (QtocLstNetIfc) to retrieve attributes for TCP/IP interfaces.

To retrieve attributes used by System Object Access for TCP/IP interfaces use one of the following APIs.

- Change IPv4 Interface (QTOCC4IF) API
  - This API is documented by a program temporary fix (PTF). For the PTF details, enter SI17284 in the search function on the following page:
    - iSeries Access for Windows Service Packks (http://www.ibm.com/servers/eserver/iseries/access/casp.htm)
- List Network Interfaces (QtocLstNetIfc) API

Ethernet lines attributes:

You can find information about Ethernet lines in the Configuration APIs topic.

See the Configuration APIs topic in the iSeries Information Center.

Token-ring lines attributes:

You can find information about token-ring lines in the Configuration APIs topic.

See the Configuration APIs topic in the iSeries Information Center.

Hardware resources attributes:

You can find information about hardware resources in the Hardware Resource APIs topic.

See the Hardware Resource APIs topic in the iSeries Information Center.

Software products attributes:

You can find information about software products in the Software Product APIs topic.

See the Software Product APIs topic in the iSeries Information Center.

TCP/IP routes attributes:

System Object Access uses the iSeries API TCP/IP route (QTOCRTEU) to retrieve attributes for TCP/IP routes.

The possible special values are:

CWBSO_RTE_TCPIPNetworkName

CWBSO_RTE_InternetAddress

CWBSO_RTE_BinaryInternetAddress
*RTVxxxLST only - The list of routes returned immediately will follow the I/O Variable header. The interface structure will repeat for each route returned.

CWBSO_RTE_SubnetMask

CWBSO_RTE_BinarySubnetMask
*RTVxxxLST only - The list of routes returned immediately will follow the I/O Variable header. The interface structure will repeat for each route returned.

CWBSO_RTE_NextHopAddress

CWBSO_RTE_BinaryNextHop
*RTVxxxLST only - The list of routes returned immediately will follow the I/O Variable header. The interface structure will repeat for each route returned.

CWBSO_RTE_BindingInterface

CWBSO_RTE_BinaryBindingIP
*RTVxxxLST only - The list of routes returned immediately will follow the I/O Variable header. The interface structure will repeat for each route returned.

CWBSO_RTE_MaximumTransmissionUnit

CWBSO_RTE_TypeOfService

- 1=Normal
- 2=Minmum delay
- 3=Maximum throughput
- 4=Maximum reliability
- 5=Minimum cost

CWBSO_RTE_RoutePrecedence

CWBSO_RTE_RIPMetric

CWBSO_RTE_RIPRedistribution

- 1=Yes
- 2=No

CWBSO_RTE_PPPProfile
Not valid for *xxxRTE

CWBSO_RTE_PPPCallerUserid
Not valid for *xxxRTE

CWBSO_RTE_PPPCallerIP
Not valid for *xxxRTE

CWBSO_RTE_ApplicationDefined

Users and groups attributes:

The possible users and groups special values are valid for users and groups.

- CWBSO_USR_ProfileName
- CWBSO_USR_ProfileOrGroupIndicator
- CWBSO_USR_GroupHasMembers
- CWBSO_USR_TextDescription
- CWBSO_USR_PreviousSignonDate
- CWBSO_USR_PreviousSignonTime
- CWBSO_USR_SignonAttemptsNotValid
- CWBSO_USR_Status
- CWBSO_USR_PasswordChangeDate
- CWBSO_USR_NoPasswordIndicator
- CWBSO_USR_PasswordExpirationInterval
- CWBSO_USR_DatePasswordExpires
- CWBSO_USR_DaysUntilPasswordExpires
- CWBSO_USR_SetPasswordToExpire
- CWBSO_USR_DisplaySignonInformation
- CWBSO_USR_UserClassName
- CWBSO_USR_AllObjectAccess
- CWBSO_USR_SecurityAdministration
- CWBSO_USR_JobControl

- CWBSO_USR_SpoolControl
- CWBSO_USR_SaveAndRestore
- CWBSO_USR_SystemServiceAccess
- CWBSO_USR_AuditingControl
- CWBSO_USR_SystemConfiguration
- CWBSO_USR_GroupProfileName
- CWBSO_USR_Owner
- CWBSO_USR_GroupAuthority
- CWBSO_USR_LimitCapabilities
- CWBSO_USR_GroupAuthorityType
- CWBSO_USR_SupplementalGroups
- CWBSO_USR_AssistanceLevel
- CWBSO_USR_CurrentLibraryName
- CWBSO_USR_InitialMenuName
- CWBSO_USR_InitialMenuLibraryName
- CWBSO_USR_InitialProgramName
- CWBSO_USR_InitialProgramLibraryName
- CWBSO_USR_LimitDeviceSessions
- CWBSO_USR_KeyboardBuffering
- CWBSO_USR_MaximumAllowedStorage
- CWBSO_USR_StorageUsed
- CWBSO_USR_HighestSchedulingPriority
- CWBSO_USR_JobDescriptionName
- CWBSO_USR_JobDescriptionNameLibrary
- CWBSO_USR_AccountingCode
- CWBSO_USR_MessageQueueName
- CWBSO_USR_MessageQueueLibraryName
- CWBSO_USR_MessageQueueDeliveryMethod
- CWBSO_USR_MessageQueueSeverity
- CWBSO_USR_OutputQueue
- CWBSO_USR_OutputQueueLibrary
- CWBSO_USR_PrintDevice
- CWBSO_USR_SpecialEnvironment
- CWBSO_USR_AttentionKeyHandlingProgramName
- CWBSO_USR_AttentionKeyHandlingProgramLibrary
- CWBSO_USR_LanguageID
- CWBSO_USR_CountryID
- CWBSO_USR_CharacterCodeSetID
- CWBSO_USR_ShowParameterKeywords
- CWBSO_USR_ShowAllDetails
- CWBSO_USR_DisplayHelpOnFullScreen
- CWBSO_USR_ShowStatusMessages
- CWBSO_USR_DoNotShowStatusMessages
- CWBSO_USR_ChangeDirectionOfRollkey
- CWBSO_USR_SendMessageToSpoolFileOwner

- CWBSO_USR_SortSequenceTableName
- CWBSO_USR_SortSequenceTableLibraryName
- CWBSO_USR_DigitalCertificateIndicator
- CWBSO_USR_CharacterIDControl
- CWBSO_USR_ObjectAuditValue
- CWBSO_USR_CommandUsage
- CWBSO_USR_ObjectCreation
- CWBSO_USR_ObjectDeletion
- CWBSO_USR_JobTasks
- CWBSO_USR_ObjectManagement
- CWBSO_USR_OfficeTasks
- CWBSO_USR_ProgramAdoption
- CWBSO_USR_SaveAndRestoreTasks
- CWBSO_USR_SecurityTasks
- CWBSO_USR_ServiceTasks
- CWBSO_USR_SpoolManagement
- CWBSO_USR_SystemManagement
- CWBSO_USR_OpticalTasks
- CWBSO_USR_UserIDNumber
- CWBSO_USR_GroupIDNumber
- CWBSO_USR_DoNotSetAnyJobAttributes
- CWBSO_USR_UseSystemValue
- CWBSO_USR_CodedCharacterSetID
- CWBSO_USR_DateFormat
- CWBSO_USR_DateSeparator
- CWBSO_USR_SortSequenceTable
- CWBSO_USR_TimeSeparator
- CWBSO_USR_DecimalFormat
- CWBSO_USR_HomeDirectoryDelimiter
- CWBSO_USR_HomeDirectory
- CWBSO_USR_Locale
- CWBSO_USR_IndirectUser
- CWBSO_USR_PrintCoverPage
- CWBSO_USR_MailNotification
- CWBSO_USR_UserID
- CWBSO_USR_LocalDataIndicator
- CWBSO_USR_UserAddress
- CWBSO_USR_SystemName
- CWBSO_USR_SystemGroup
- CWBSO_USR_UserDescription
- CWBSO_USR_FirstName
- CWBSO_USR_PreferredName
- CWBSO_USR_MiddleName
- CWBSO_USR_LastName
- CWBSO_USR_FullName

- CWBSO_USR_JobTitle
- CWBSO_USR_CompanyName
- CWBSO_USR_DepartmentName
- CWBSO_USR_NetworkUserID
- CWBSO_USR_PrimaryTelephoneNumber
- CWBSO_USR_SecondaryTelephoneNumber
- CWBSO_USR_FaxNumber
- CWBSO_USR_Location
- CWBSO_USR_BuildingNumber
- CWBSO_USR_OfficeNumber
- CWBSO_USR_MailingAddress
- CWBSO_USR_MailingAddress2
- CWBSO_USR_MailingAddress3
- CWBSO_USR_MailingAddress4
- CWBSO_USR_CCMailAddress
- CWBSO_USR_CCMailComment
- CWBSO_USR_MailServerFrameworkServiceLevel
- CWBSO_USR_PreferredAddressFieldName
- CWBSO_USR_PreferredAddressProductID
- CWBSO_USR_PreferredAddressTypeValue
- CWBSO_USR_PreferredAddressTypeName
- CWBSO_USR_PreferredAddress
- CWBSO_USR_ManagerCode
- CWBSO_USR_SMTPUserID
- CWBSO_USR_SMTPDomain
- CWBSO_USR_SMTPRoute
- CWBSO_USR_GroupMemberIndicator

Note: In release/version V4R4 and later, the following attributes are meaningful only when Lotus Notes® is installed on the iSeries server:

- CWBSO_USR_NotesServerName
- CWBSO_USR_NotesCertifierID
- CWBSO_USR_MailType
- CWBSO_USR_NotesMailFileName
- CWBSO_USR_CreateMailFiles
- CWBSO_USR_NotesForwardingAddress
- CWBSO_USR_SecurityType
- CWBSO_USR_LicenseType
- CWBSO_USR_MinimumNotesPasswordLength
- CWBSO_USR_UpdateExistingNotesUser
- CWBSO_USR_NotesMailServer
- CWBSO_USR_LocationWhereUserIDIsStored
- CWBSO_USR_ReplaceExistingNotesID
- CWBSO_USR_NotesComment
- CWBSO_USR_NotesUserLocation

- CWBSO_USR_UserPassword
- CWBSO_USR_NotesUserPassword
- CWBSO_USR_NotesCertifierPassword
- CWBSO_USR_ShortName

Libraries in QSYS attributes:

You can find information about libraries in QSYS in the Object APIs topic.

See the Object APIs topic in the iSeries Information Center.

iSeries Access for Windows: Database programming

iSeries Access for Windows provides multiple programming interfaces for accessing database files on the iSeries server.

Some of the common interfaces allow you to write a single application to access both the iSeries database and non-iSeries databases. In addition, a proprietary C API interface is supported to expose the unique strengths of DB2® for iSeries. You can also use both Structured Query Language (SQL) to access DB2 Universal Database™ (UDB) for iSeries database files and stored procedures and use record-level access interfaces for access to single records within a file.

The following are the iSeries Access for Windows interfaces that are supported:

> IBM Toolbox for Java JDBC Driver Allows Java programs to access iSeries database files using standard JDBC interfaces.

The *DB2 UDB for iSeries SQL Programming* book contains detailed information.

How to access the book:

Follow these steps to view a hypertext markup language (HTML) online version of the *DB2 UDB for iSeries SQL Programming* book, and to print a PDF version:

1. Link to the DB2 Universal Database for iSeries SQL Reference topic in the **iSeries Information Center**
2. Select **SQL Programming**

Note: By using the code examples, you agree to the terms of the "Code license and disclaimer information" on page 552.

iSeries Access for Windows .NET provider

iSeries Access for Windows .NET provider allows .NET managed programs to access the iSeries database files using SQL.

Your iSeries Access for Windows .NET support is known by any of the following:

- **Managed Provider**
- **IBM DB2 UDB for iSeries .NET Provider**
- **IBM.Data.DB2.iSeries data provider**

Regardless of the name that is referenced, this data provider allows development and support for your PC-to-iSeries SQL applications, when the .NET Data Access Framework connects you to your iSeries server. It consists of a set of classes and data types that provide access to connection, command, DataAdapter, and DataReader functions as defined and supported by the ADO.NET architectural model.

The **IBM.Data.DB2.iSeries data provider** complements the existing OLE DB database providers. It allows you to use Visual Basic and C# to develop your .NET client/server applications. You can use the Programmer's Toolkit along with this provider to make development of your .NET Windows client PC applications quicker and easier.

The **Managed Provider** follows the .NET Framework specifications for managed code, including the requirement to have the .NET Framework already installed on your PC. Once it is installed, follow these steps to install the provider using **Selective Setup**:

1. **Start** → **Programs** → **IBM iSeries Access for Windows** → **Selective Setup**.
2. On the Component Selection panel, in the Data Access component select .NET Data Provider.
3. Continue through the Selective Setup wizard.

See Microsoft Web site for the architecture and details on Microsoft's .NET Framework, ADO.NET, Windows Installer, GAC, the CLR, and specifications for managed code.

To access technical details:

- The **IBM DB2 UDB for iSeries .NET Provider Technical Reference**, which is shipped with iSeries Access for Windows, provides complete documentation of the **Managed Provider's** support. To access this information, use this path: **Start** → **Programs** → **IBM iSeries Access for Windows** → **Programmer's Toolkit** → **Programmer's Toolkit** → **Common Interfaces** → **ADO.NET**.
- **Restriction:**
  - There are some iDB2CommandBuilder restrictions on pre-V5R2M0 servers.

.NET framework

See Microsoft Web site for the architecture and details on Microsoft's .NET Framework, ADO.NET, Windows Installer, GAC, the CLR, and specifications for managed code.

To install Programmer's Toolkit :

- You can optionally install the Programmer's Toolkit when you install iSeries Access for Windows or you can run **Selective Setup** after iSeries Access for Windows is already installed. See Programmer's Toolkit.

Other .NET information resources:

- IBM iSeries Access for Windows .NET Provider Web site
- IBM Redbook Integrating DB2 Universal Database for iSeries with Microsoft ADO .NET. SG24-6440

iDB2CommandBuilder restrictions on pre-V5R2M0 servers

Due to limitations in iSeries i5/OS releases prior to V5R2M0, using the iDB2CommandBuilder on these servers has limited support.

Properly specifying Select command text on the iDB2Command object used with the iDB2CommandBuilder is key when connecting to pre-V5R2M0 servers. Here are some recommended guidelines for creating Select statements for use on pre-V5R2M0 servers.

- Simple statements produce the best results. For example, SELECT * FROM MYSCHEMA.MYTABLE.
- Fully qualify the table name with its schema. For example, MYSCHEMA.MYTABLE.
- Selection fields are allowed, but must be specified in simple format. Only columns specified in the query table should be used. For example, SELECT ID, NAME, BALANCE FROM MYSCHEMA.MYTABLE.

- Derived fields or constants in the selection criteria are discouraged. They may produce unpredictable results. For example, SELECT ID, LENGTH(NAME), 'Name' FROM MYSCHEMA.MYTABLE.

iSeries Access for Windows OLE DB provider

Supports record-level access and SQL access to iSeries database files. Use the ActiveX Data Objects (ADO) and the OLE DB interfaces to take advantage of this support.

The iSeries Access for Windows OLE DB Providers, along with the Programmer's Toolkit, make iSeries client/server application development quick and easy from the Windows client PC. The iSeries Access for Windows OLE DB Provider component gives iSeries programmers record-level access interfaces to iSeries logical and physical DB2 Universal Database (UDB) for iSeries database files. In addition, they provide support for SQL, data queues, programs, and commands. If you use Visual Basic, the Visual Basic Wizards make it simple and easy to develop customized, working applications.

ADO and OLE DB standards provide programmers with consistent interfaces to iSeries server data and services. All three of the providers (the **IBMDA400**, the **IBMDASQL**, and the **IBMDARLA**) handle all iSeries server-to-PC and data type-to-data type conversions.

To install OLE DB Provider:

When you install iSeries Access for Windows(or when you run **Selective Setup** if iSeries Access for Windows is installed), select the **Data Access** component. Make sure that the **OLE DB Provider** subcomponent also is selected.

Note: The OLE DB Provider will not be installed if the computer does not have MDAC 2.5 or later installed, before installing iSeries Access for Windows. MDAC can be downloaded from Microsoft: www.microsoft.com/data/doc.htm.

To access OLE DB Technical Reference:

The iSeries Access for Windows OLE DB Technical Reference, which is shipped with iSeries Access for Windows, provides complete documentation of OLE DB Provider support. To access it from the Programmer's Toolkit, select **Overview** → **Common Interfaces** → **ADO/OLE DB**.

To install Programmer's Toolkit and the iSeries ADO Wizards for Visual Basic:

When you install iSeries Access for Windows (or when you run **Selective Setup** if iSeries Access for Windows is installed), select the **Programmer's Toolkit** component. See "Install the Programmer's Toolkit" on page 5 for more information.

Other OLE DB information resources:

- IBM iSeries Access for Windows OLE DB Support Web site.
- IBM Redbook Fast Path to iSeries Client/Server Using iSeries OLE DB Support: SG24-5183

iSeries Access for Windows ODBC

A common database interface that uses SQL as its database access language. iSeries Access for Windows provides an ODBC driver to support this interface.

What is ODBC?

ODBC stands for open database connectivity. It consists of:

- A well-defined set of functions (application programming interfaces)
- Standards for SQL syntax (that are recommended but not imposed)
- Error codes
- Data types

The application programming interfaces provide a rich set of functions to connect to a database management system, run SQL statements and to retrieve data. Also included are functions to interrogate the SQL catalog of the database and the capabilities of the driver.

ODBC drivers return standard error codes and translate data types to a common (ODBC) standard. ODBC allows the application developer to obtain integrated database error information, and to avoid some of the most complex problems that are involved with making applications portable.

What you can do with ODBC:

Use ODBC to:

- Send SQL requests to the database management system (DBMS).
- Use the same program to access different database management system (DBMS) products without recompiling.
- Create an application that is independent of the data communications protocol.
- Handle data in a format convenient to the application.

The flexibility of ODBC APIs allows you to use them in transaction-based, line-of-business applications (where the SQL is predefined) and also in query tools (where the select statement is created at run time).

Structured Query Language (SQL):

ODBC supports dynamic SQL, which sometimes is associated with poor performance. However, careful use of parameter markers enables repeated statements to achieve static SQL-like performance. Also, extended dynamic SQL–a special capability of the iSeries Access for Windows ODBC driver–enables previously prepared SQL statements to achieve performance that rivals static SQL.

For more information on SQL, see the IBM *SQL Reference* book. View an HTML online version of the book, or print a PDF version, from the DB2 Universal Database for iSeries SQL Reference iSeries Information Center topic.

iSeries Access for Windows ODBC topics:

Note: The information linked to from this page applies to the iSeries Access for Windows 32-bit ODBC driver, the iSeries Access for Windows 64-bit ODBC driver, and the iSeries Access for Linux® ODBC driver. For additional information regarding setup for the iSeries Access for Linux ODBC driver see iSeries ODBC Driver for Linux.

You can find documentation on the ODBC standard by searching for ODBC at the Microsoft Web site.

Files required to build an ODBC application

Identify the files required to build an ODBC application.

Choose from the following topics for information on files and other concepts used in building an ODBC application.

Note: The Programmer's Toolkit provides ODBC documentation, and links to sample programs and related information. To access this information, open the Programmer's Toolkit and select **Database** → **ODBC**.

Choose an interface to access the ODBC driver:

There are different programming interfaces that can be used with the iSeries Access for Windows ODBC Driver. Each interface has its strengths and weaknesses.

Three of the more common programming interfaces are ActiveX Data Objects (ADO), Rapid Application Development (RAD) tools, and ODBC APIs. The supported languages, reasons for using, and sources of more information for these three interfaces, are provided below.

ActiveX Data Objects (ADO)

ADO refers to ActiveX Data Objects and is Microsoft's high level object model for data access.

- Supported programming languages:
  - Visual Basic
  - Active Server Pages (ASP)
  - Delphi
  - Visual Basic Script
  - any other language or script that supports ActiveX or COM
- Reasons to use this method:
  - Eliminates the coding of ODBC APIs
  - Supports switching providers, when needed
- Where to go for more information:
  - More on how to use ADO, see the ADO documentation that comes in MDAC: www.microsoft.com/data/doc.htm
  - More on using the iSeries Access OLE-DB Provider through ADO refer to:"iSeries Access for Windows OLE DB provider" on page 448
- Special notes:
  - To use ODBC through ADO an application needs to specify the MSDASQL provider in a connection string. MSDASQL converts ADO calls into ODBC API calls which communicate with the ODBC driver.
  - An example using an ADO connection string follows:

```
ConnectionString = "Provider=MSDASQL;Data Source=MYODBCDS;"
```

Rapid Application Development (RAD) tools

Rapid Application Development tools are tools that help in creating applications quickly. The tools make it so that the application writer does not have to know much about the ODBC specification.

- Supported programming languages:
  - Depends on which RAD tool is used.
  - Some of the more commonly used tools include Powerbuilder, Delphi, and Seagate Crystal Reports.
- Reasons to use this method:
  - Eliminates the coding of ODBC APIs
  - Works with multiple ODBC drivers using one program, with few or no changes
- Where to go for more information:
  - Refer to the documentation included with the RAD tool.

Direct ODBC API calls

Direct ODBC API calls are when an application is written directly to the ODBC specification.

- Supported programming language:

  C/C++
- Reasons to use this method:

- Allows direct control over which ODBC APIs are called so can be faster than using ADO objects or RAD tools
- Designed to take advantage of driver-specific features

- Where to go for more information:
  - For information on the ODBC specification and some samples see the ODBC documentation that comes in MDAC: www.microsoft.com/data/doc.htm.
  - For more information about driver-specific features see "Implementation issues of ODBC APIs" on page 470

ODBC C/C++ application header files:

Identify C/C++ header files for an ODBC C/C++ application.

Header files	Import library	Dynamic Link Library
sql.h sqlext.h sqltypes.h sqlucode.h	odbc32.lib	odbc32.dll

ODBC APIs: General concepts:

The following general concepts apply to ODBC APIs:

Environments:
The environment in which Windows makes available some memory for ODBC to monitor its run-time information.

Connections:
Within the environment there can be multiple connections, each to a data source. The connections may be to different physical servers, to the same server, or any combination of both.

Statements:
Multiple statements can be run within each connection.

Handles:
Handles are identifiers for storage areas that are allocated by the Driver Manager or individual drivers. The three types of handles are:

Environment handle:
Global information, that includes other handles. One handle is allowed per application.

Connection handle:
Information about connection to a data source. Multiple connection handles are allowed per environment.

Statement handle:
Information about a particular SQL statement. Multiple statement handles are allowed per connection. Statement handles can be reused for other SQL statements and long as the statement state is valid.

Descriptor handle:
Information about explicit descriptors that are associated with the connection handle. The application creates these, and asks the driver to use them instead of the implicit descriptors associated with a statement handle.

Essentially, a **handle** can be considered as an identifier for a resource that is recognized by ODBC (an environment, connection or statement). ODBC provides an identifier (the handle) for this resource that you can use in your program. Exactly what ODBC stores in the handle (which is held as a long integer) is not relevant. Be careful not to change the value, and to assign unique names to the variables that hold the various handles.

Some APIs set the handle (for example, SQLAllocEnv or SQLAllocHandle with SQL_HANDLE_ENV handle type), and you must pass in a reference, or pointer to the variable. Some APIs refer to a handle that previously was set (for example, **SQLExecute**), and you must pass in the variable by value.

Parameter markers:

Parameter markers act as place holders for values that are supplied by the program when you instruct the data source to run the SQL statement.

When you use **SQLPrepare**, the statement that contains the parameter markers is passed to the data source to be prepared by the SQL "Optimizer" on page 518. The Optimizer builds a plan of the statement and holds it for later reference. Each parameter marker must be associated with a program variable (strictly, a pointer to a program variable), and **SQLBindParameter** is used for this purpose.

SQLBindParameter is a complex function. Careful study of the relevant section in the *Microsoft ODBC Software Development Kit and Programmer's Reference* ISBN 1-57231-516-4 is strongly recommended. For most SQL statements, using **SQLBindParameter** provides input information to the function, but with stored procedures it also can receive data back.

After you have prepared the statement and bound the parameters, use **SQLExecute** to set to the data source the current values of the associated variables.

SQLFetch and SQLGetData:

SQLGetData provides an alternative to **SQLBindCol** to retrieve data from the columns of a retrieved row. It can only be called after calling fetch APIs and when the array size is 1.

As a general rule, **SQLBindCol** is preferable to **SQLGetData**. There is less performance overhead; you need to run **SQLBindCol** only once rather than after every fetch. However, there are special considerations for using **SQLBindCol** in Visual Basic.

Visual Basic moves character strings to different locations to conserve memory. If a string variable is bound to a column, the memory that is referenced by a subsequent **SQLFetch** may not place the data in the desired variable. It is likely that a **General Protection Fault** will result. A similar problem can occur with **SQLBindParameter**.

Using strings in Visual Basic is not recommended. One way to avoid this problem is to use **byte arrays**. Byte arrays are of a fixed size and are not subject to movement in memory.

Another circumvention is to employ Windows memory allocation API functions that are documented in the Microsoft Development Library Knowledge Base. However, this method involves some difficult programming that is not totally transportable between Windows 3.1 and later releases.

Using **SQLGetData** rather than **SQLBindCol** and **SQLParamData** and **SQLPutData** in conjunction with **SQLBindParameter** produce software that is more in keeping with Visual Basic. However, this method involves some difficult programming.

Code directly to ODBC APIs:

Many PC applications make ODBC calls that allow the user to seamlessly access data on different platforms. Before you begin developing your own application with ODBC APIs, you should understand how an ODBC application connects to and exchanges information with a database server.

There are supported ODBC APIs that:

- Set up the ODBC environment
- Establish and end connections to data sources
- Execute SQL statements
- Clean up the ODBC environment

Call stored procedures:

Use stored procedures to improve the performance and function of an ODBC application.

Any iSeries program can act as a stored procedure. iSeries stored procedures support input, input/output and output parameters. They also support returning result sets, both single and multiple. The stored procedure program can return a result set by specifying a cursor to return (from an embedded SQL statement) or by specifying an array of values. See "Stored procedures" on page 536 for more information.

To call a stored procedure, complete the following steps:

1. Verify that the stored procedure has been declared by using the SQL statement CREATE PROCEDURE.

   Detail: CREATE PROCEDURE should be executed only once for the life of the stored procedure. DROP PROCEDURE can be used to delete the procedure without deleting the procedure's program. DECLARE PROCEDURE also can be used, but this method has several disadvantages. The *Database Programming* book contains additional information about DECLARE PROCEDURE. View an HTML online version of the book, or print a PDF version, from the DB2 Universal Database for iSeries SQL Reference topic in the **iSeries Information Center**.
2. Prepare the call of the stored procedure by using **SQL Prepare**.
3. Bind the parameters for input and output parameters.
4. Execute the call to the stored procedure.
5. Retrieve the result set (if one is returned)

In this C example, a COBOL program named NEWORD which resided in the default iSeries library, is called. A value in a field named **szCustId** is passed, and it returns a value to a field named **szName**.

```
SQLRETURN rc;
HSTMT hstmt;
SQLCHAR Query[320];
SQLCHAR szCustId[10];
SQLCHAR szName[30];
SQLINTEGER strlen_or_indPtr = SQL_NTS, strlen_or_indPtr2 = SQL_NTS;

rc = SQLAllocHandle(SQL_HANDLE_STMT, hdbc, &hstmt);

// Create the stored procedure definition.
// The create procedure could be moved to the application's
// install program so that it is only executed once.
strcpy(Query,"CREATE PROCEDURE NEWORD (:CID IN CHAR(10), :NAME OUT CHAR(30) )");
strcat(Query," (EXTERNAL NAME NEWORD LANGUAGE COBOL GENERAL WITH NULLS)");

// Create the stored procedure
rc = SQLExecDirect(hstmt, (unsigned char *)Query, SQL_NTS);

strcpy(Query, "CALL NEWORD(?,?)");

// Prepare the stored procedure call
rc = SQLPrepare(hstmt, (unsigned char *)Query, SQL_NTS);
```

```
// Bind the parameters
rc = SQLBindParameter(hstmt, 1, SQL_PARAM_INPUT, SQL_C_CHAR, SQL_VARCHAR,
                                      10, 0, szCustId, 11, &strlen_or_intPtr);

rc = SQLBindParameter(hstmt, 2, SQL_PARAM_OUTPUT, SQL_C_CHAR, SQL_VARCHAR,
                                      30, 0, szName, 31, &strlen_or_indPtr2);
strcpy (szCustId,"0000012345");
// Execute the stored procedure
rc = SQLExecute(hstmt);
```

Block insert and block fetch C example:

Block inserts and block fetches can be used to enhance the performance of an ODBC application.

They allow you to insert or retrieve rows in blocks, rather than individually. This reduces the data flows and line turnaround between the client and the server. Block fetches can be accomplished using either the SQLFetch (forward only) or SQLExtendedFetch or SQLFetchScroll API.

A block fetch:

- Returns a block of data (one row set) in the form of an array for each bound column.
- Scrolls through the result set according to the setting of a scroll type argument; forward, backward, or by row number.
- Uses the row set size specified with the SQLSetStmtAttr API.

The C example below does a block insert of 6 rows of data followed by two block fetches of two rows.

```
#define NUM_ROWS_INSERTED 6
#define NAME_LEN          10

HSTMT hstmt;
SQLINTEGER rowcnt = NUM_ROWS_INSERTED;
SQLCHAR itemNames[NUM_ROWS_INSERTED][NAME_LEN+1] = { "puzzle    ", "candy bar ",
 "gum       ","kite      ", "toy car   ", "crayons   " };
SQLINTEGER itemPrices[NUM_ROWS_INSERTED] = { 5, 2, 1, 10, 3, 4 };
SQLCHAR queryItemNames[NUM_ROWS_INSERTED][NAME_LEN+1];  // Name return array
SQLINTEGER queryItemPrices[NUM_ROWS_INSERTED];  // price return array
SQLINTEGER cbqueryItemNames[NUM_ROWS_INSERTED], cbqueryItemPrices[NUM_ROWS_INSERTED];

rc = SQLAllocHandle(SQL_HANDLE_STMT, hdbc, &hstmt);

rc = SQLExecDirect(hstmt, "CREATE TABLE ITEMS (NAME VARCHAR(10), PRICE INT)", SQL_NTS);

// set the paramset size to 6 as we are block inserting 6 rows of data
rc = SQLSetStmtAttr(hstmt, SQL_ATTR_PARAMSET_SIZE, (SQLPOINTER)rowcnt, SQL_IS_INTEGER);

// bind the arrays to the parameters
rc = SQLBindParameter(hstmt, 1, SQL_PARAM_INPUT, SQL_C_CHAR, SQL_VARCHAR,
                                      NAME_LEN, 0, itemNames[0], NAME_LEN + 1, NULL);
rc = SQLBindParameter(hstmt, 2, SQL_PARAM_INPUT, SQL_C_LONG, SQL_INTEGER,
                                      NUM_ROWS_INSERTED, 0, &itemPrices[0],
                                       sizeof(long), NULL);

// do the block insert
rc = SQLExecDirect(hstmt, "INSERT INTO ITEMS ? ROWS VALUES(?,?)", SQL_NTS);

// set up things for the block fetch

// We set the concurrency below to SQL_CONCUR_READ_ONLY, but since SQL_CONCUR_READ_ONLY
// is the default this API call is not necessary.  If update was required then you would use
// SQL_CONCUR_LOCK value as the last parameter.
rc = SQLSetStmtAttr(hstmt, SQL_ATTR_CONCURRENCY, (SQLPOINTER)SQL_CONCUR_READ_ONLY,
                              SQL_IS_INTEGER);

// We set the cursor type to SQL_CURSOR_FORWARD_ONLY, but since SQL_CURSOR_FORWARD_ONLY
// is the default this API call is not necessary.
rc = SQLSetStmtAttr(hstmt, SQL_ATTR_CURSOR_TYPE,
                                  (SQLPOINTER)SQL_CURSOR_FORWARD_ONLY, SQL_IS_INTEGER);

// We want to block fetch 2 rows at a time so we need to set SQL_ATTR_ROW_ARRAY_SIZE to 2.
// If we were going to use SQLExtendedFetch instead of SQLFetchScroll we would instead need
// to set the statement attribute SQL_ROWSET_SIZE to 2.
rc = SQLSetStmtAttr(hstmt, SQL_ATTR_ROW_ARRAY_SIZE, (SQLPOINTER)2, SQL_IS_INTEGER);

rc = SQLExecDirect(hstmt, "SELECT NAME, PRICE FROM ITEMS WHERE PRICE < 5", SQL_NTS);

// bind arrays to hold the data for each column in the result set
rc = SQLBindCol(hstmt, 1, SQL_C_CHAR, queryItemNames, NAME_LEN + 1, cbqueryItemNames);
rc = SQLBindCol(hstmt, 2, SQL_C_LONG, queryItemPrices, sizeof(long), cbqueryItemPrices);

// We know that there are 4 rows that fit the criteria for the SELECT statement so we call
// two fetches to get all the data
rc = SQLFetchScroll(hstmt, SQL_FETCH_FIRST, 0);
// at this point 2 rows worth of data will have been fetched and put into the buffers
// that were bound by SQLBindCol

rc = SQLFetchScroll(hstmt, SQL_FETCH_NEXT, 0);
// at this point 2 rows worth of data will have been fetched and put into the buffers
// that were bound by SQLBindCol. Note that this second fetch overwrites the data in
// those buffers with the new data
// ...
// Application processes the data in bound columns...
// ...
```

Example: Block inserts using Visual Basic:

This example is a Visual Basic block insert that is significantly faster than a ″parameterized″ insert.

Block inserts allow you to:

- Insert blocks of records with one SQL call.
- Reduces the flows between the client and server.

See “Block insert and block fetch C example” on page 454 for additional information.

```
Dim cbNTS(BLOCKSIZE - 1)    As Long           'NTS array
    Dim lCustnum(BLOCKSIZE - 1) As Long           'Customer number array

    '2nd parm passed by actual length for demo purposes
    Dim szLstNam(7, BLOCKSIZE - 1)  As Byte      'NOT USING NULL ON THIS PARM
    Dim cbLenLstNam(BLOCKSIZE - 1)  As Long      'Actual length of string to pass
    Dim cbMaxLenLstNam              As Long      'Size of one array element

    'These will be passed as sz string so size must include room for null
    Dim szInit(3, BLOCKSIZE - 1)    As Byte      'Size for field length + null
    Dim szStreet(13, BLOCKSIZE - 1) As Byte      'Size for field length + null
    Dim szCity(6, BLOCKSIZE - 1)    As Byte      'Size for field length + null
    Dim szState(2, BLOCKSIZE - 1)   As Byte      'Size for field length + null
    Dim szZipCod(5, BLOCKSIZE - 1)  As Byte      'Size for field length + null

    Dim fCdtLmt(BLOCKSIZE - 1) As Single
    Dim fChgCod(BLOCKSIZE - 1) As Single
    Dim fBalDue(BLOCKSIZE - 1) As Single
    Dim fCdtDue(BLOCKSIZE - 1) As Single

    Dim irow        As Long           ' row counter for block errors
    Dim lTotalRows  As Long           '  ************ Total rows to send *************
    Dim lNumRows    As Long           '  Rows to send in one block
    Dim lRowsLeft   As Long           '  Number of rows left to send

    Dim I As Long
```

```
  Dim J As Long
  Dim S As String
  Dim hStmt As Long

 ' This program needs QCUSTCDT table in your own collection.
 ' At the iSeries server command line type:
 '===> CRTLIB SAMPCOLL
 '===> CRTDUPOBJ OBJ(QCUSTCDT) FROMLIB(QIWS)
 '        OBJTYPE(*FILE) TOLIB(SAMPCOLL) NEWOBJ(*SAME)
 '===> CHGPF FILE(SAMPCOLL/QCUSTCDT) SIZE(*NOMAX)
 '===> CLRPFM FILE(SAMPCOLL/QCUSTCDT)

 '************** Start ****************************************************
 S = "Number of records to insert into QCUSTCDT.  "
 S = S & "Use menu option Table Mgmt, Create QCUSTCDT to "
 S = S & "create the table.  Use Misc, iSeries Cmd and CLRPFM "
 S = S & "command if you wish to clear it"
 S = InputBox(S, gAppName, "500")
 If Len(S) = 0 Then Exit Sub

 lTotalRows = Val(S)             'Total number to insert

 rc = SQLAllocHandle(SQL_HANDLE_STMT, ghDbc, hStmt)
 If (Not (rc = SQL_SUCCESS Or rc = SQL_SUCCESS_WITH_INFO)) Then GoTo errBlockInsert

 rc = SQLPrepare(hStmt, _
          "INSERT INTO QCUSTCDT ? ROWS VALUES (?,?,?,?,?,?,?,?,?,?,?)", _
         SQL_NTS)
 If (Not (rc = SQL_SUCCESS Or rc = SQL_SUCCESS_WITH_INFO)) Then GoTo errBlockInsert


  rc = SQLBindParameter(hStmt, 1, SQL_PARAM_INPUT, SQL_C_LONG, SQL_INTEGER, _
                         10, 0, lCustnum(0), 0, ByVal 0)
  If (rc = SQL_ERROR) Then _
Call DspSQLDiagRec(SQL_HANDLE_STMT, hStmt, "Problem: Bind Parameter")

  'Pass first parm w/o using a null
  cbMaxLenLstNam = UBound(szLstNam, 1) - LBound(szLstNam, 1) + 1
  rc = SQLBindParameter(hStmt, 2, SQL_PARAM_INPUT, SQL_C_CHAR, SQL_CHAR, _
                         8, _
                         0, _
                         szLstNam(0, 0), _
                         cbMaxLenLstNam, _
                         cbLenLstNam(0))
  If (rc = SQL_ERROR) Then _
Call DspSQLDiagRec(SQL_HANDLE_STMT, hStmt, "Problem: Bind Parameter")

  rc = SQLBindParameter(hStmt, 3, SQL_PARAM_INPUT, SQL_C_CHAR, SQL_CHAR, _
                       3, 0, szInit(0, 0), _
                       UBound(szInit, 1) - LBound(szInit, 1) + 1, _
                       cbNTS(0))
  If (rc = SQL_ERROR) Then _
Call DspSQLDiagRec(SQL_HANDLE_STMT, hStmt, "Problem: Bind Parameter")

  rc = SQLBindParameter(hStmt, 4, SQL_PARAM_INPUT, SQL_C_CHAR, SQL_CHAR, _
                       13, 0, szStreet(0, 0), _
                       UBound(szStreet, 1) - LBound(szStreet, 1) + 1, _
                       cbNTS(0))
  If (rc = SQL_ERROR) Then _
Call DspSQLDiagRec(SQL_HANDLE_STMT, hStmt, "Problem: Bind Parameter")

  rc = SQLBindParameter(hStmt, 5, SQL_PARAM_INPUT, SQL_C_CHAR, SQL_CHAR, _
                       6, 0, szCity(0, 0), _
                       UBound(szCity, 1) - LBound(szCity, 1) + 1, _
                       cbNTS(0))
  If (rc = SQL_ERROR) Then _
Call DspSQLDiagRec(SQL_HANDLE_STMT, hStmt, "Problem: Bind Parameter")
```

```
  rc = SQLBindParameter(hStmt, 6, SQL_PARAM_INPUT, SQL_C_CHAR, SQL_CHAR, _
                      2, 0, szState(0, 0), _
                      UBound(szState, 1) - LBound(szState, 1) + 1, _
                      cbNTS(0))
  If (rc = SQL_ERROR) Then _
Call DspSQLDiagRec(SQL_HANDLE_STMT, hStmt, "Problem: Bind Parameter")

  rc = SQLBindParameter(hStmt, 7, SQL_PARAM_INPUT, SQL_C_CHAR, SQL_NUMERIC, _
                        5, 0, szZipCod(0, 0), _
                        UBound(szZipCod, 1) - LBound(szZipCod, 1) + 1, _
                        cbNTS(0))
  If (rc = SQL_ERROR) Then _
Call DspSQLDiagRec(SQL_HANDLE_STMT, hStmt, "Problem: Bind Parameter")

  rc = SQLBindParameter(hStmt, 8, SQL_PARAM_INPUT, SQL_C_FLOAT, SQL_NUMERIC, _
                         4, 0, fCdtLmt(0), 0, ByVal 0)
  If (rc = SQL_ERROR) Then _
Call DspSQLDiagRec(SQL_HANDLE_STMT, hStmt, "Problem: Bind Parameter")

  rc = SQLBindParameter(hStmt, 9, SQL_PARAM_INPUT, SQL_C_FLOAT, SQL_NUMERIC, _
                         1, 0, fChgCod(0), 0, ByVal 0)
  If (rc = SQL_ERROR) Then _
Call DspSQLDiagRec(SQL_HANDLE_STMT, hStmt, "Problem: Bind Parameter")
  rc = SQLBindParameter(hStmt, 10, SQL_PARAM_INPUT, SQL_C_FLOAT, SQL_NUMERIC, _
                         6, 2, fBalDue(0), 0, ByVal 0)
  If (rc = SQL_ERROR) Then _
Call DspSQLDiagRec(SQL_HANDLE_STMT, hStmt, "Problem: Bind Parameter")
  rc = SQLBindParameter(hStmt, 11, SQL_PARAM_INPUT, SQL_C_FLOAT, SQL_NUMERIC, _
                         6, 2, fCdtDue(0), 0, ByVal 0)
  If (rc = SQL_ERROR) Then _
Call DspSQLDiagRec(SQL_HANDLE_STMT, hStmt, "Problem: Bind Parameter")


  lRowsLeft = lTotalRows        'Initialize row counter
  For J = 0 To ((lTotalRows - 1) \ BLOCKSIZE)
     For I = 0 To BLOCKSIZE - 1
        cbNTS(I) = SQL_NTS                        ' init array to NTS
        lCustnum(I) = I + (J * BLOCKSIZE)         'Customer number = row number
        S = "Nam" & Str(lCustnum(I))              'Last Name
        cbLenLstNam(I) = Len(S)
        rc = String2Byte2D(S, szLstNam(), I)
        'Debug info: Watch address to see layout
        addr = VarPtr(szLstNam(0, 0))
        'addr = CharNext(szLstNam(0, I))           'address of 1,I
        'addr = CharPrev(szLstNam(0, I), szLstNam(1, I))     'address of 0, I)
        'addr = CharNext(szLstNam(1, I))
        'addr = CharNext(szLstNam(6, I))           'should point to null (if used)
        'addr = CharNext(szLstNam(7, I))           'should also point to next row

        rc = String2Byte2D("DXD", szInit, I)
        'Vary the length of the street
        S = Mid("1234567890123", 1, ((I Mod 13) + 1))
        rc = String2Byte2D(S, szStreet, I)

        rc = String2Byte2D("Roches", szCity, I)
        rc = String2Byte2D("MN", szState, I)
        rc = String2Byte2D("55902", szZipCod, I)
        fCdtLmt(I) = I
        fChgCod(I) = 1
        fBalDue(I) = 2 * I
        fCdtDue(I) = I / 2
     Next I

     lNumRows = lTotalRows Mod BLOCKSIZE      ' Number of rows to send in this block
     If (lRowsLeft >= BLOCKSIZE) Then _
             lNumRows = BLOCKSIZE         ' send remainder or full block
        irow = 0
        lRowsLeft = lRowsLeft - lNumRows

        rc = SQLSetStmtAttr(hStmt, SQL_ATTR_PARAMSET_SIZE, lNumRows, 0)
        If (rc = SQL_ERROR) Then GoTo errBlockInsert

        rc = SQLSetStmtAttr(hStmt, SQL_ATTR_PARAMS_PROCESSED_PTR, irow, 0)
        If (rc = SQL_ERROR) Then GoTo errBlockInsert

        rc = SQLExecute(hStmt)
        If (rc = SQL_ERROR) Then
           S = "Error on Row: " & Str(irow) & Chr(13) & Chr(10)
           MsgBox S, , gAppName
           GoTo errBlockInsert
        End If
     Next J
     rc = SQLEndTran(SQL_HANDLE_DBC, ghDbc, SQL_COMMIT)
     If (Not (rc = SQL_SUCCESS Or rc = SQL_SUCCESS_WITH_INFO)) Then GoTo errBlockInsert
     rc = SQLFreeHandle(SQL_HANDLE_STMT, hStmt)
     Exit Sub



errBlockInsert:
     rc = SQLEndTran(SQL_HANDLE_DBC, ghDbc, SQL_ROLLBACK)
     rc = SQLFreeHandle(SQL_HANDLE_STMT, hStmt)

Public Function String2Byte2D(InString As String, OutByte() As Byte, RowIdx As Long)
As Boolean
  'VB byte arrays are layed out in memory opposite of C.  The string would
  'be by column instead of by row so must flip flop the string.
  'ASSUMPTIONS:
  '   Byte array is sized before being passed
  '   Byte array is padded with nulls if > size of string

   Dim I As Integer
   Dim SizeOutByte As Integer
   Dim SizeInString As Integer

   SizeInString = Len(InString)
   SizeOutByte = UBound(OutByte, 1)

   'Convert the string
   For I = 0 To SizeInString - 1
      OutByte(I, RowIdx) = AscB(Mid(InString, I + 1, 1))
   Next I
   'If byte array > len of string pad
   If SizeOutByte > SizeInString Then             'Pad with Nulls
      For I = SizeInString To SizeOutByte - 1
         OutByte(I, RowIdx) = 0
      Next I
   End If
   'ViewByteArray OutByte, "String2Byte"
   String2Byte2D = True
End Function
```

Visual Basic: The compromise between Jet and ODBC APIs:

While the database objects are easy to code, they sometimes can adversely affect performance. Coding to the APIs and to stored procedures can be a frustrating endeavor. Fortunately, if you are using Visual Basic Enterprise Edition in the Windows 95 environment, there are additional options. These options are a good compromise between the usability of database objects and the high performance of APIs: Remote Data Objects (RDO) and Remote Data Control (RDC).

RDO is a thin layer over the ODBC APIs. It provides a simple interface to advanced ODBC functionality without requiring programming to the API level. It does not have all of the overhead of the Jet Engine controlled Data Access Object (DAO) or its SQL optimizer. Yet it maintains a nearly identical programming interface as the DAOs. If you understand programming to the DAO, then switching over to the RDO is relatively simple compared to trying to switch over to API calls.

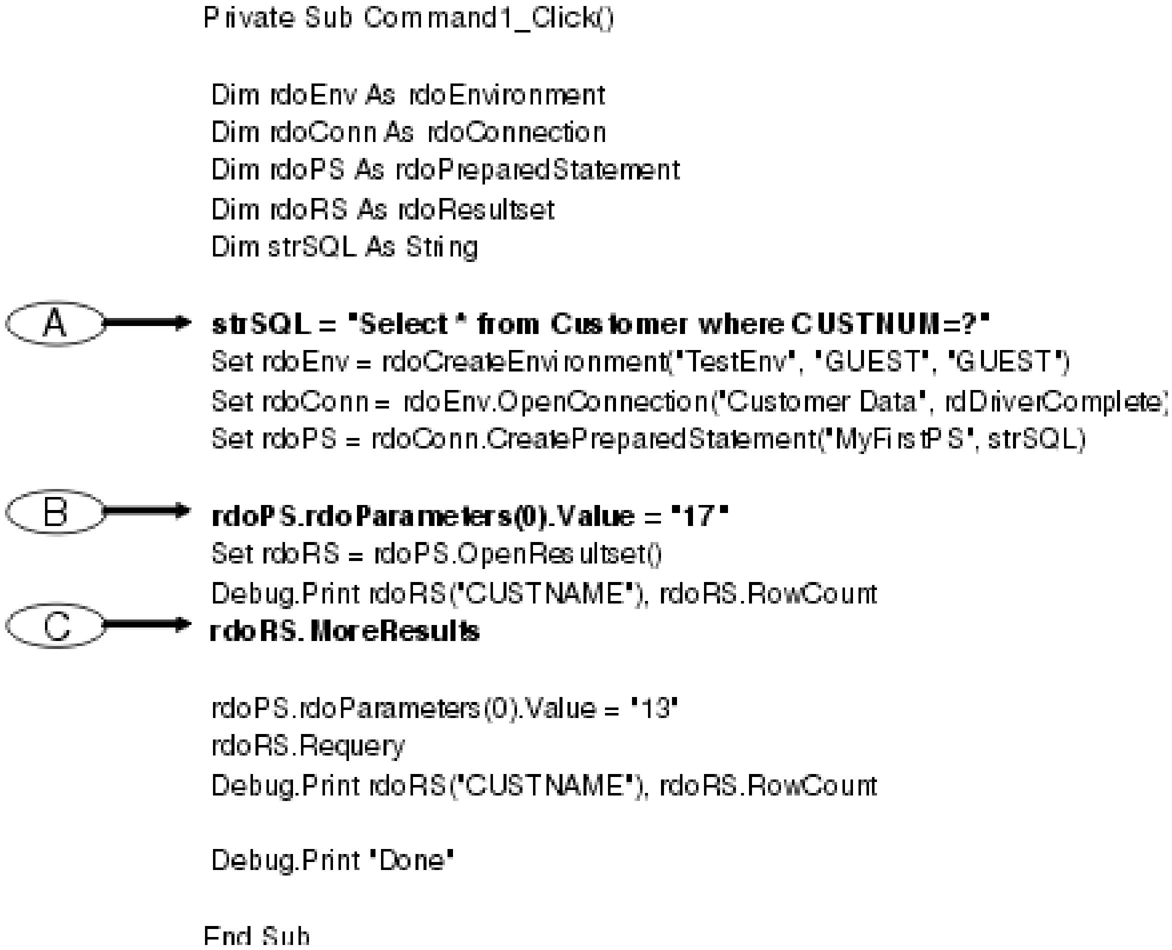
The following are differences between DAO and RDO:

- The DAO model is used for ISAM, Access and ODBC databases. The RDO model is designed for ODBC databases only, and it has been optimized for Microsoft SQL Server 6.0 and Oracle.
- The RDO model can have better performance, with the processing being done by the server and not the local machine. Some processing is done locally with the DAO model, so performance may not be as good.
- The DAO model uses the Jet Engine. The RDO model does not use Jet Engine, it uses the ODBC backend engine.
- The RDO model has the capability to perform synchronous or asynchronous queries. The DAO model has limitations in performing these type of queries.
- The RDO model can perform complex cursors, which are limited in the DAO model.

The RDC is a data control similar to the standard data control. This means that where ever you might have used a data control, and the Jet engine, you now can use the RDC. You can drag a ″data aware″ control on your form. It can be bound to an RDC, as it could be bound to a regular data control.

Some of the advanced ODBC functionality the RDO allows is prepared SQL statements, multiple result sets, and stored procedures. When Jet executes a SQL statement dynamically it is a two-step process on the iSeries server. In the first step, the iSeries server looks at the statement and determines the best plan to retrieve the data requested based on the current database schema. In the second step, that plan is used to actually retrieve the data. Creating that plan can be expensive in terms of time because the iSeries server has to evaluate many alternatives and determine the best way to access the data. There is an alternative to forcing the iSeries server to recreate the access plan every time a SQL statement is run. The **CreatePreparedStatement** method of the **rdoConnection** object allows you to compile a data access plan on the iSeries server for an SQL statement without executing it. You can even include parameters in prepared statements, so you can pass new selection criteria every time you run the select statement.

The following sample Visual Basic code will show how to prepare a SQL statement with a parameter marker and run it multiple times with different values.



```
Private Sub Command1_Click()

 Dim rdoEnv As rdoEnvironment
 Dim rdoConn As rdoConnection
 Dim rdoPS As rdoPreparedStatement
 Dim rdoRS As rdoResultset
 Dim strSQL As String

 strSQL = "Select * from Customer where CUSTNUM=?"
 Set rdoEnv = rdoCreateEnvironment("TestEnv", "GUEST", "GUEST")
 Set rdoConn = rdoEnv.OpenConnection("Customer Data", rdDriverComplete)
 Set rdoPS = rdoConn.CreatePreparedStatement("MyFirstPS", strSQL)

 rdoPS.rdoParameters(0).Value = "17"
 Set rdoRS = rdoPS.OpenResultset()
 Debug.Print rdoRS("CUSTNAME"), rdoRS.RowCount
 rdoRS.MoreResults

 rdoPS.rdoParameters(0).Value = "13"
 rdoRS.Requery
 Debug.Print rdoRS("CUSTNAME"), rdoRS.RowCount

 Debug.Print "Done"

End Sub
```

Figure 1. Visual Basic 4.0 RDO sample code

Label A shows where the SQL statement is defined. Notice that the statement does not include a specific for the CUSTNUM, but has a question mark for the value. The question mark signifies that this value is a parameter of the prepared statement. Before you can create a result set with the prepared statement, you must set the value of any parameters in the statement.

Label B shows where the value for the parameter is defined. Notice that the first parameter is defined as 0 not as 1. Once the value for the parameter is set you can run the **OpenResultSet** method of the **rdoPreapredStatement** to return the requested data.

Before you can re-query a prepared statement on the iSeries server, you have to make sure that the cursor has been completely processed and closed. Label C shows the **MoreResults** method of the **rdoResultSet** being used to do this. The **MoreResults** method queries the database. It determines if there is any more data in the result set to be processed, or if the result set has been processed completely. Once the cursor has been fully processed you can reset the parameter value and run the **ReQuery** method of the **rdoResultSet** to open a new result set.

Retrieve results:

In order to work with all of the rows in a result set, call the **SQLFetch** API until no more rows are returned.

Running some SQL statements returns results to the application program. Running an SQL SELECT statement returns the selected rows in a result set. The **SQLFetch** API then sequentially retrieves the selected rows from the result set into the application program's internal storage.

You also may issue a Select statement where you do not specify what columns you want returned. For example, `SELECT * FROM RWM.DBFIL` selects all columns. You may not know what columns or how many columns will be returned.

SQLNumResultCols

Returns the number of columns in a result set.

- A storage buffer that receives the information is passed as a parameter.

```
 SQLSMALLINT nResultCols;

rc = SQLNumResultCols(hstmt, &nResultCols);
```

SQLDescribeCol

Returns the result descriptor for one column in a result set.

- **Column name**
- **Column type**
- **Column size**

  This is used with **SQLNumResultCols** to retrieve information about the columns returned. Using this approach, as opposed to hard coding the information in the program, makes for more flexible programs.

  The programmer first uses **SQLNumResultCols** to find out how many columns were returned in the result set by a select statement. Then a loop is set up to use **SQLDescribeCol** to retrieve information about each column.

In C, this statement is coded:

```
SQLCHAR szColName[51];
SQLSMALLINT lenColName, colSQLtype, scale, nullable;
SQLUSMALLINT colNum = 1;
SQLUINTEGER cbColDef;

rc = SQLDescribeCol(hstmt, colNum, szColName, sizeof(szColName),
                                  &lenColName, &colSQLtype, &cbColDef, &scale, &nullable);
```

SQLBindCol

Assigns the storage and data type for a column in a result set:

- Storage buffer that receives the information.
- Length of storage buffer.
- Data type conversion.

In C, this statement is coded:

```
SQLUSMALLINT colNum = 1;
SQLUINTEGER cbColDef;
SQLINTEGER idNum, indPtr, strlen_or_indPtr;
SQLCHAR szIDName[51];

colNum = 1;
rc = SQLBindCol(hstmt, colNum, SQL_C_LONG, &idNum, sizeof(SQLINTEGER), &indPtr);
colNum = 2;
rc = SQLBindCol(hstmt, colNum, SQL_C_CHAR, szIDName, sizeof(szIDName), &strlen_or_indPtr);
```

Note: If you use this with Visual Basic, it is recommended that you use an array of Byte data type in place of String data types.

SQLFetch

Each time **SQLFetch** is called, the driver fetches the next row. Bound columns are stored in the locations specified. Data for unbound columns may be retrieved using **SQLGetData**.

In C, this statement is coded:

```
rc = SQLFetch(hstmt);
```

Visual Basic does not directly support pointers or fixed memory location ANSI character null-terminated strings. For this reason, it is best to use another method to bind Character and Binary parameters. One method is to convert Visual Basic String data types to/from an array of Byte data types and bind the array of Byte. Another method is to use the **SQLGetData** function instead of **SQLBindCol**.

SQLGetData

Retrieves data for unbound columns after a fetch. In this example, three columns are returned and **SQLGetData** is used to move them to the correct storage location.

In C, this statement is coded:

```
SQLCHAR szTheName[16], szCredit[2];
float iDiscount, iTax;

rc = SQLFetch(hstmt);
rc = SQLGetData(hstmt, 1, SQL_C_CHAR, szTheName, 16, &strlen_or_indPtr);
rc = SQLGetData(hstmt, 2, SQL_C_FLOAT, &iDiscount, sizeof(float), &indPtr);
rc = SQLGetData(hstmt, 3, SQL_C_CHAR, szCredit, 2, &strlen_or_indPtr);
rc = SQLGetData(hstmt, 4, SQL_C_FLOAT, &iTax, sizeof(float), &indPtr);
```

In Visual Basic, this statement is coded:

```
     rc = SQLFetch(hStmt)
    If rc = SQL_NO_DATA_FOUND Then
        Call DisplayWarning("No record found!")
        rc = SQLCloseCursor(hStmt)
        If rc <> SQL_SUCCESS Then
            Call DspSQLDiagRec(SQL_HANDLE_STMT, hStmt, "Close cursor failed.")
        End If
    Else
        ' Reset lcbBuffer for the call to SQLGetData
        lcbBuffer = 0
        'Get part ID from the fetched record
        rc = SQLGetData(hStmt, 1, SQL_C_LONG, _
      lPartIDReceived, Len(lPartIDReceived), lcbBuffer)
        If rc <> SQL_SUCCESS And rc <> SQL_SUCCESS_WITH_INFO Then _
            Call DspSQLDiagRec(SQL_HANDLE_STMT, hStmt, _
        "Problem getting data for PartID column")

        'Get part description from the fetched record
        rc = SQLGetData(hStmt, 2, SQL_C_CHAR, _
      szDescription(0), 257, lcbBuffer)
        If rc <> SQL_SUCCESS And rc <> SQL_SUCCESS_WITH_INFO Then _
            Call DspSQLDiagRec(SQL_HANDLE_STMT, hStmt, _
       "Problem getting data for PartDescription column")

        'Get part provider from the fetched record
        rc = SQLGetData(hStmt, 3, SQL_C_CHAR, _
      szProvider(0), 257, lcbBuffer)
        If rc <> SQL_SUCCESS And rc <> SQL_SUCCESS_WITH_INFO Then _
            Call DspSQLDiagRec(SQL_HANDLE_STMT, hStmt, _
        "Problem getting data for PartProvider column")

        Call DisplayMessage("Record found!")
        rc = SQLCloseCursor(hStmt)
        If rc <> SQL_SUCCESS Then _
            Call DspSQLDiagRec(SQL_HANDLE_STMT, hStmt, "Close cursor failed.")
    End If
```

Access a database server with an ODBC application:

An ODBC application needs to follow a basic set of steps in order to access a database server.

1. Connect to the data source.
2. Place the SQL statement string to be executed in a buffer. This is a text string.
3. Submit the statement in order that it can be prepared or immediately run.
   - Retrieve and process the results.
   - If there are errors, retrieve the error information from the driver.
4. End each transaction with a commit or rollback operation (if necessary).
5. Terminate the connection.

Establish ODBC connections:

Use these handle types to establish an ODBC connection.

SQLAllocHandle with SQL_HANDLE_ENV as the handle type

- Allocates memory for an environment handle.
  - Identifies storage for global information:
    - Valid connection handles
    - Current active connection handles
    - Variable type HENV
- Must be called by application prior to calling any other ODBC function.
- Variable type HENV is defined by ODBC in the SQL.H header file provided by the C programming language compiler or by the ODBC Software Development Kit (SDK).

  The header file contains a type definition for a far pointer:

  ```
  typedef void far * HENV
  ```
- In C programming language this statement is coded:

  ```
  SQLRETURN rc;
  HENV henv;

  rc = SQLAllocHandle(SQL_HANDLE_ENV, SQL_NULL_HANDLE, &henv);
  ```
- In Visual Basic, this statement is coded:

  ```
  Dim henv As long
  SQLAllocEnv(henv)
  ```

SQLAllocHandle with SQL_HANDLE_DBC as the handle type

- Allocates memory for an connection handle within the environment.
  - Identifies storage for information about a particular connection.
    - Variable type HDBC
    - Application can have multiple connection handles.
- Application must request a connection handle prior to connecting to the data source.
- In C, this statement is coded:

  ```
  HDBC hdbc;

  rc = SQLAllocHandle(SQL_HANDLE_DBC, henv, &hdbc);
  ```
- In Visual Basic, this statement is coded:

```
Dim hdbc As long
SQLAllocConnect(henv,hdbc)
```

SQLSetEnvAttr

- Allows an application to set attributes of an environment.
- To be considered an ODBC 3.x application, you must set the SQL_ATTR_ODBC_VERSION to SQL_OV_ODBC3 prior to allocating a connection handle.
- In C, this statement is coded:

  ```
  rc = SQLSetEnvAttr(henv, SQL_ATTR_ODBC_VERSION, (SQLPOINTER) SQL_OV_ODBC3, SQL_IS_UINTEGER);
  ```

SQLConnect

- Loads driver and establishes a connection.
- Connection handle references information about the connection.
- Data source is coded into application.

  In C, this statement is coded:

  ```
  SQLCHAR source[ ] = "myDSN";
  SQLCHAR uid[ ] = "myUID";
  SQLCHAR pwd[ ] = "myPWD";

  rc = SQLConnect(hdbc, source, SQL_NTS, uid, SQL_NTS, pwd, SQL_NTS);
  ```

  Note: SQL_NTS indicates that the parameter string is a null-terminated string.

SQLDriverConnect

- Alternative to **SQLConnect**
- Allows application to override data source settings.
- Displays dialog boxes (optional).

Execute ODBC functions:

Use these handle types to execute ODBC functions.

SQLAllocHandle with SQL_HANDLE_STMT as the handle type

- Allocates memory for information about an SQL statement.
  - Application must request a statement handle prior to submitting SQL statements.
  - Variable type HSTMT.

    In C, this statement is coded:

    ```
    HSTMT hstmt;

    rc = SQLAllocHandle(SQL_HANDLE_STMT, hdbc, &hstmt);
    ```

SQLExecDirect

- Executes a preparable statement.
- Fastest way to submit an SQL string for one time execution.
- If rc is not equal to SQL_SUCCESS, the SQLGetDiagRec API can be used to find the cause of the error condition.

  In C, this statement is coded:

  ```
  SQLCHAR stmt[ ] = "CREATE TABLE NAMEID (ID INTEGER, NAME VARCHAR(50))";

  rc = SQLExecDirect(hstmt, stmt, SQL_NTS);
  ```

- Return code
  - SQL_SUCCESS
  - SQL_SUCCESS_WITH_INFO
  - SQL_ERROR

- SQL_INVALID_HANDLE

SQLGetDiagRec

To retrieve error information for an error on a statement:

In C, this statement is coded:

```
SQLSMALLINT i = 1, cbErrorMsg ;
SQLCHAR    szSQLState[6], szErrorMsg[SQL_MAX_MESSAGE_LENGTH];
SQLINTEGER nativeError;

rc = SQLGetDiagRec(SQL_HANDLE_STMT, hstmt, i, szSQLState, &nativeError, szErrorMsg,
                                  SQL_MAX_MESSAGE_LENGTH, &cbErrorMsg);
```

- **szSQLState**
  - 5 character string
  - 00000 = success
  - 01004 = data truncated
  - 07001 = wrong number of parameters

  Note: The previous items are only several of many possible SQL states.
- **fNativeError** - specific to data source
- **szErrorMsg** - Error Message text

Execute prepared statements:

If an SQL statement is used more than once, it is best to have the statement prepared and then executed.

When a statement is prepared, variable information can be passed as parameter markers, which are denoted by question marks (?). When the statement is executed, the parameter markers are replaced with the real variable information.

Preparing the statement is performed at the server. The SQL statements are compiled and the access plans are built. This allows the statements to be executed much more efficiently. When compared to using dynamic SQL to execute the statements, the result is much closer to static SQL. Extened Dynamic preserves prepared statements accross job sessions. This allows prepared statements with parameter markers to be executed multiple times within the job session even without Extended Dynamic ON. When the database server prepares the statements, it saves some of them in a special iSeries object called a package (*SQLPKG). This approach is called **Extended Dynamic SQL**. Packages are created automatically by the driver; an option is provided to turn off Package Support. This is covered in “The performance architecture of the iSeries Access for Windows ODBC driver” on page 508.

SQLPrepare

Prepares an SQL statement for execution:

In C, this statement is coded:

```
SQLCHAR szSQLstr[ ] = "INSERT INTO NAMEID VALUES (?,?)";

rc = SQLPrepare(hstmt, szSQLstr, SQL_NTS);
```

Note: SQL_NTS indicates that the string is null-terminated.

SQLBindParameter

Allows application to specify storage, data type, and length associated with a parameter marker in an SQL statement.

In the example, parameter 1 is found in a signed double word field called **id**. Parameter 2 is found in an unsigned character array called **name**. Since the last parameter is null, the driver expects that **name** is null-terminated as it will calculate the string's length.

In C, this statement is coded:

```
SQLCHAR szName[51];
SQLINTEGER id, parmLength = 50, lenParm1 = sizeof(SQLINTEGER) , lenParm2 = SQL_NTS ;

rc = SQLBindParameter(hstmt, 1, SQL_PARAM_INPUT, SQL_C_LONG, SQL_INTEGER,
                                       sizeof(SQLINTEGER), 0, &id, sizeof(SQLINTEGER), &lenParm1);
rc = SQLBindParameter(hstmt, 2, SQL_PARAM_INPUT, SQL_C_CHAR, SQL_VARCHAR,
                                      parmLength, 0, szName, sizeof(szName), &lenParm2);
```

SQLExecute

Executes a prepared statement, using current values of parameter markers:

In C, this statement is coded:

```
id=500;
strcpy(szName, "TEST");
rc = SQLExecute(hstmt);  // Insert a record with id = 500, name = "TEST"
id=600;
strcpy(szName, "ABCD");
rc = SQLExecute(hstmt);  // Insert a record with id = 600, name = "ABCD"
```

SQLParamData / SQLPutData

Visual Basic does not directly support pointers or fixed-location ANSI character null-terminated strings. For this reason, it is best to use another method to bind Character and Binary parameters. One method is to convert Visual Basic String data types to/from an array of Byte data types and bind the array of Byte. This method is demonstrated in "Convert strings and arrays of byte" on page 468.

Another method, that should only be used for input parameters, is to supply the parameters at processing time. This is done using **SQLParamData** and **SQLPutData** APIs:

- They work together to supply parameters.
- **SQLParamData** moves the pointer to the next parameter.
- **SQLPutData** then supplies the data for that parameter.

```
's_parm is a character buffer to hold the parameters
    's_parm(1) contains the first parameter
    Static s_parm(2) As String
        s_parm(1) = "Rear Bumper"
        s_parm(2) = "ABC Auto Part Store"
    Dim rc As Integer
    Dim cbValue As Long
    Dim s_insert As String
    Dim hStmt As Long
    Dim lPartID As Long

    rc = SQLAllocHandle(SQL_HANDLE_STMT, ghDbc, hStmt)
    If rc <> SQL_SUCCESS Then _
  Call DspSQLDiagRec(SQL_HANDLE_DBC, ghDbc, "SQLAllocStmt failed.")

    s_insert = "INSERT INTO ODBCSAMPLE VALUES(?, ?, ?)"

    rc = SQLBindParameter(hStmt, 1, SQL_PARAM_INPUT, SQL_C_LONG, SQL_INTEGER, _
                      4, 0, lPartID, 4, ByVal 0)
    If rc <> SQL_SUCCESS Then _
  Call DspSQLDiagRec(SQL_HANDLE_DBC, ghDbc, "SQLBindParameter failed.")
```

```
'#define SQL_LEN_DATA_AT_EXEC_OFFSET  (-100) the parms will be supplied at run time
   cbValue = -100

' Caller set 8th parameter to "ByVal 2" so driver will return
' 2 in the token when caller calls SQLParamData
   rc = SQLBindParameter(hStmt, 2, SQL_PARAM_INPUT, SQL_C_CHAR, SQL_CHAR, _
                         4, 0, ByVal 2, 0, cbValue)
   If rc <> SQL_SUCCESS Then _
 Call DspSQLDiagRec(SQL_HANDLE_DBC, ghDbc, "SQLBindParameter failed.")

   ' Caller set 8th parameter to "ByVal 3" so driver will return
' 3 in the token when caller calls SQLParamData the second time.
   rc = SQLBindParameter(hStmt, 3, SQL_PARAM_INPUT, SQL_C_CHAR, SQL_CHAR, _
                         4, 0, ByVal 3, 0, cbValue)
   If rc <> SQL_SUCCESS Then _
 Call DspSQLDiagRec(SQL_HANDLE_DBC, ghDbc, "SQLBindParameter failed.")

' Prepare the insert statement once.
   rc = SQLPrepare(hStmt, s_insert, SQL_NTS)

   lPartID = 1
   rc = SQLExecute(hStmt) ' Execute multiple times if needed.

' Since parameters 2 and 3 are bound with cbValue set to -100,
' SQLExecute returns SQL_NEED_DATA

   If rc = SQL_NEED_DATA Then

 ' See comment at SQLBindParameter: token receives 2.
       rc = SQLParamData(hStmt, token)

       If rc <> SQL_NEED_DATA Or token <> 2 Then _
  Call DspSQLDiagRec(SQL_HANDLE_DBC, ghDbc, "SQLParamData failed.")

 ' Provide data for parameter 2.
       rc = SQLPutData(hStmt, ByVal s_parm(1), Len(s_parm(1)))
       If rc <> SQL_SUCCESS Then _
  Call DspSQLDiagRec(SQL_HANDLE_DBC, ghDbc, "SQLPutData failed.")

 ' See comment at SQLBindParameter: token receives 3.
       rc = SQLParamData(hStmt, token)
       If rc <> SQL_NEED_DATA Or token <> 3 Then _
  Call DspSQLDiagRec(SQL_HANDLE_DBC, ghDbc, "SQLParamData failed.")

 ' Provide data for parameter 2.
       rc = SQLPutData(hStmt, ByVal s_parm(2), Len(s_parm(2)))
       If rc <> SQL_SUCCESS Then _
  Call DspSQLDiagRec(SQL_HANDLE_DBC, ghDbc, "SQLPutData failed.")

 ' Call SQLParamData one more time.
 ' Since all data are provided, driver will execute the request.
       rc = SQLParamData(hStmt, token)
       If rc <> SQL_SUCCESS Then _
  Call DspSQLDiagRec(SQL_HANDLE_DBC, ghDbc, "SQLParamData failed.")
   Else
       Call DspSQLDiagRec(SQL_HANDLE_STMT, hStmt, "SQLExecute failed.")
   End If
```

Notes:

1. These two statements operate together to supply unbound parameter values when the statement is executed.
2. Each call to **SQLParamData** moves the internal pointer to the next parameter for **SQLPutData** to supply data to. After the last parameter is filled, **SQLParamData** must be called again for the statement to be executed.

3. If **SQLPutData** supplies data for parameter markers, the parameter must be bound. Use the **cbValue** parameter set to a variable whose value is SQL_DATA_AT_EXEC when the statement is executed.

Convert strings and arrays of byte:

The following Visual Basic functions can assist in converting strings and arrays of byte.

```
Public Sub Byte2String(InByte() As Byte, OutString As String)
  'Convert array of byte to string
   OutString = StrConv(InByte(), vbUnicode)
End Sub

Public Function String2Byte(InString As String, OutByte() As Byte) As Boolean
    'vb byte-array / string coercion assumes Unicode string
    'so must convert String to Byte one character at a time
 'or by direct memory access

    Dim I As Integer
    Dim SizeOutByte As Integer
    Dim SizeInString As Integer

    SizeOutByte = UBound(OutByte)
    SizeInString = Len(InString)
    'Verify sizes if desired

    'Convert the string
    For I = 0 To SizeInString - 1
      OutByte(I) = AscB(Mid(InString, I + 1, 1))
    Next I
   'If size byte array > len of string pad with Nulls for szString
   If SizeOutByte > SizeInString Then           'Pad with Nulls
      For I = SizeInString To SizeOutByte - 1
         OutByte(I) = 0
      Next I
   End If

   String2Byte = True
End Function

Public Sub ViewByteArray(Data() As Byte, Title As String)
   'Display message box showing hex values of byte array

   Dim S As String
   Dim I As Integer
   On Error GoTo VBANext

   S = "Length: " & Str(UBound(Data)) & "  Data (in hex):"
   For I = 0 To UBound(Data) - 1
      If (I Mod 8) = 0 Then
         S = S & "  "         'add extra space every 8th byte
      End If
      S = S & Hex(Data(I)) & " "
   VBANext:
   Next I
   MsgBox S, , Title

End Sub
```

ODBC API return codes:

Every ODBC API function returns a value of type SQLRETURN (a short integer). There are seven possible return codes, and associated with each is a manifest constant.

The following list provides an explanation of each particular code. Some return codes can be interpreted as an error on the function call. Others indicate success. Still others indicate that more information is needed or pending.

A particular function may not return all possible codes. See the *Microsoft ODBC 3.0 Software Development Kit and Programmer's Reference, Version 3.0 ISBN 1-57231-516-4.* for possible values, and for the precise interpretation for that function.

Pay close attention to return codes in your program, particularly those that are associated with the processing of SQL statements processing and with data source data access. In many instances the return code is the only reliable way of determining the success of a function.

SQL_SUCCESS
Function has completed successfully; no additional information available.

SQL_SUCCESS_WITH_INFO
Function completed successfully; possibly with a nonfatal error. The application can call SQLGetDiagRec to retrieve additional information.

SQL_NO_DATA_FOUND
All rows from the result set have been fetched.

SQL_ERROR
Function failed. The application can call SQLGetDiagRec to retrieve error information.

SQL_INVALID_HANDLE
Function failed due to an unusable environment, connection, or statement handle. Programming error.

SQL_NEED_DATA
The driver is asking the application to send parameter data values.

End ODBC functions:

The last procedure that must be completed before ending an ODBC application is to free the resources and memory allocated by the application. This must be done so that they are available when the application is run the next time.

SQLFreeStmt
Stops processing associated with a specific statement handle.

```
rc = SQLFreeStmt(hstmt, option); // option can be SQL_CLOSE, SQL_RESET_PARAMS. or SQL_UNBIND
```

SQL_CLOSE
Closes the cursor associated with the statement handle, and discards all pending results. Alternately, you can use SQLCloseCursor.

SQL_RESET_PARAMS
Releases all common buffers that are bound by SQLBindParameter.

SQL_UNBIND
Releases all common buffers that are bound by SQLBindCol.

SQLFreeHandle with SQL_HANDLE_STMT as the handle type
Frees all resources for this statement.

```
  rc = SQLFreeHandle(SQL_HANDLE_STMT, hstmt);
```

SQLDisconnect
Closes the connection associated with a specific connection handle.

```
rc = SQLDisconnect(hdbc);
```

SQLFreeHandle with SQL_HANDLE_DBC as the handle type
Releases connection handle and frees all memory associated with a connection handle.

```
rc = SQLFreeHandle(SQL_HANDLE_DBC, hdbc);
```

SQLFreeHandle with SQL_HANDLE_ENV as the handle type

Frees environment handle and releases all memory associated with the environment handle.

```
rc = SQLFreeHandle(SQL_HANDLE_ENV, henv);
```

Implementation issues of ODBC APIs

Learn about implementations issues when using ODBC APIs.

Choose from the following topics for information regarding implementation of ODBC APIs.

Note: For a description and work-around for several problems that can occur when using the iSeries Access ODBC driver with Microsoft's ADO interface, search the Software Knowledge Base, using ADO Stored Procedure Calls with MSDASQL as a search string.

Related reference

"Example: Run CL commands that use SQL stored procedures and ODBC" on page 538
Stored procedure support provides a means to run iSeries server Control Language (CL) commands by using the SQL CALL statement.

Related information

Software Knowledge Base
For a description and work-around for several problems that can occur when using the iSeries Access ODBC driver with Microsoft's ADO interface, search the Software Knowledge Base, using ADO Stored Procedure Calls with MSDASQL as a search string.

ODBC 3.x APIs Notes:

The following table lists ODBC 3.x APIs by their associated task and identifies considerations for each API.

Notes:

- The iSeries Access for Windows ODBC Driver is a Unicode driver; however, ANSI applications will still continue to work with it. The ODBC Driver Manager will handle converting an ANSI ODBC API call to the wide version before calling the iSeries Access for Windows ODBC Driver. To write a Unicode application, you must call the wide version for some of these APIs. When writing an application to the wide ODBC interface, you need to know whether the length for each API is defined as character, in bytes, or if the length is not applicable. Refer to the 'Type' column in the following table for this information.
- For more details on how these APIs work, search for ODBC at the Microsoft Web site.

Type	API	Description	Other considerations
Connecting to a data source **Note:** For information on how the connection APIs prompt signon dialogs see "Signon dialog behavior" on page 497..Also see connection pooling for more information.			
N/A	SQLAllocHandle	Obtains an environment and connection handle. One environment handle is used for one or more connections. May also allocate a statement or a descriptor handle.	
Char	SQLConnect	Connects to a specific data source name with a specific user ID and password.	There is an option to control whether this API prompts a signon dialog when the user ID and password are not specified. This option can be set from the **Connection option**s dialog on the **General** tab of the DSN.

Type	API	Description	Other considerations
Char	SQLDriverConnect	Connects to a specific driver by connection string or requests that the Driver Manager and driver display connection dialogs for the user.	Uses all keywords. Only DSN is required. Other values are optional. Refer to “Connection string keywords” on page 480 for more information.
Char	SQLBrowseConnect	Returns successive levels of connection attributes and valid attribute values. When a value has been specified for each connection attribute, connects to the data source.	To make a connection attempt the SYSTEM keyword and either the DSN or DRIVER keywords must be specified. All the other keywords are optional. Note, the PWD keyword is not returned in the output string for security purposes. Refer to “Connection string keywords” on page 480 for more implementation issues.
Get information regarding a driver or data source			

Type	API	Description	Other considerations
Byte	SQLGetInfo	Returns information about a specific driver and data source.	Special attributes returned differently based on attributes and keywords.The information that is returned by SQLGetInfo can vary depending on which keywords and attributes are in use. The InfoType options that are affected are: • SQL_CATALOG_NAME_SEPARATOR – By default a period is returned. If the connection string keyword NAM is set to 1, a comma is returned. • SQL_CURSOR_COMMIT_BEHAVIOR, SQL_CURSOR_ROLLBACK_BEHAVIOR – By default SQL_CB_PRESERVE is returned. If the connection attribute, 1204, is set SQL_CB_DELETE is returned. • SQL_DATA_SOURCE_READ_ONLY – By default N is returned. If the connection string keyword CONNTYPE is set to 0 then Y is returned. • SQL_IDENTIFIER_QUOTE_CHAR – By default a double-quote mark is returned. If the application in use is MS QUERY (MSQRY32) then a single blank is returned. • SQL_IDENTIFIER_CASE – By default SQL_IC_UPPER is returned. If the connection string keyword DEBUG has the option 2 set then SQL_IC_MIXED is rteurned. • SQL_MAX_QUALIFIER_NAME_LEN – By default 18 is returned. If the connection string keyword DEBUG has the 8 bit set then 0 is returned. • SQLDriverVer - Returns the version of the driver in the format of VV.RR.SSST, where, – VV represents the version of iSeries Access for Windows, – RR is the release identifier of iSeries Access for Windows, – SSS is the number of the service pack that has been applied to iSeries Access for Windows, and – T is the version of the test fix that has been applied for an ODBC driver problem, otherwise, it is 0.

Type	API	Description	Other considerations
N/A	SQLGetTypeInfo	Returns information about supported data types.	Different result sets can be seen when running to different iSeries server versions. For example, the BIGINT data type is only in the result set when running to V4R5 or later servers. The ″LONG VARCHAR″ data type is not returned in the result set. This is due to problems that were seen with some applications expecting to specify a length with this type. ″LONG VARCHAR FOR BIT DATA″ and ″LONG VARGRAPHIC″ are also not returned for similar reasons. In the TYPE_NAME column, when a data type requires a value to be in parentheses, the parentheses are included in the data type name. However the parentheses are omitted when the parentheses would end up at the end of the data type string. In the following string example, the ″CHAR″ data type is followed by parenthesis while the ″DATA″ data type is not followed by parentheses: ″CHAR( ) FOR BIT DATA″. The setting for the connection string keyword GRAPHIC affects whether the driver returns graphic (DBCS) data types as supported types or not.See “ODBC data types and how they correspond to DB2 UDB database types” on page 498 for more information.
Set and retrieve driver attributes **Note:** Refer to “Connection and statement attributes” on page 501 for details on driver-specific connection and statement attributes applicable to the following APIs.			
Byte	SQLSetConnectAttr	Sets a connection option.	
Byte	SQLGetConnectAttr	Returns the value of a connection option.	
N/A	SQLSetEnvAttr	Sets an environment option.	
N/A	SQLGetEnvAttr	Returns the value of an environment option.	

Type	API	Description	Other considerations
Byte	SQLSetStmtAttr	Sets a statement option.	The SQL_ATTR_PARAMSET_SIZE, SQL_ATTR_ROW_ARRAY_SIZE, SQL_DESC_ARRAY_SIZE, and SQL_ROWSET_SIZE attributes support up to 32767 rows. If working with LOB locator fields the driver restricts these values to 1 row at a time. LOB fields are handled as locators if the MAXFIELDLEN connection string value is less than the LOB field size. SELECT statements that contain the FOR FETCH ONLY or FOR UPDATE clause override the current setting of SQL_ATTR_CONCURRENCY attribute. An error is not returned during the SQLExecute or SQLExecDirect if the SQL_ATTR_CONCURRENCY setting conflicts with the clause in the SQL statement. The following are not supported: • SQL_ATTR_ASYNC_ENABLE • SQL_ATTR_RETRIEVE_DATA • SQL_ATTR_SIMULATE_CURSOR • SQL_ATTR_USE_BOOKMARKS • SQL_ATTR_FETCH_BOOKMARK_PTR • SQL_ATTR_KEYSET_SIZE Setting SQL_ATTR_MAX_ROWS is supported, however, it only impacts performance for static cursors. The full result set is still built with other cursor types even if this option is set. Using the FETCH FIRST x ROWS ONLY clause in your SQL query may work better since it reduces the amount of work the server does.This API has been extended to also contain the cursor row count for the following two result set types: • stored procedure result sets • static cursor result sets
Byte	SQLGetStmtAttr	Returns the value of a statement option.	The following are not supported: • SQL_ATTR_ASYNC_ENABLE • SQL_ATTR_RETRIEVE_DATA • SQL_ATTR_SIMULATE_CURSOR • SQL_ATTR_USE_BOOKMARKS • SQL_ATTR_FETCH_BOOKMARK_PTR
Set and retrieve descriptor fields			
Byte	SQLGetDescField	Returns a piece of information from a descriptor.	
Char	SQLGetDescRec	Returns several pieces of information from a descriptor.	
Byte	SQLSetDescField	Sets a descriptor field.	Can not set descriptor fields for an IRD other than SQL_DESC_ARRAY_STATUS_PTR and SQL_DESC_ROWS_PROCESSED_PTR. Does not support named parameters.

Type	API	Description	Other considerations
Char	SQLSetDescRec	Sets several options for a descriptor.	
N/A	SQLCopyDesc	Copies information from one descriptor to another descriptor.	SQLCopyDesc does not support named parameters.
		Prepare SQL requests	
Char	SQLPrepare	Prepares an SQL statement for later processing.	Packages are created the first time a SQL statement is prepared for that Connection. This results in the first prepare taking slightly longer to complete than it would normally take. If there are any problems with a pre-existing package the first prepare may return an error depending on the setting for the package as specified in the DSN setup GUI. On the Package tab of the DSN setup GUI are default package settings. These settings are used when package settings have not already been customized for that application. Note, these are not global settings By default, the driver sends SQL statement text to the host in the EBCDIC CCSID associated with your job. Set the UNICODESQL keyword equal 1 or equal 2, to enable the driver to send SQL statement text to the host in Unicode. Note that when sending Unicode SQL statements the driver generates a different package name to avoid collisions with existing packages that contain EBCDIC SQL statements. Setting the connection string keyword UNICODESQL allows an application to specify Unicode data for literals in the SQL statement. See SQL Statement Considerations for several SQL statements that are not recommended to be prepared and executed. For information on which escape sequences and scalar functions the driver supports see "SQLPrepare and SQLNativeSQL escape sequences and scalar functions" on page 503.

Type	API	Description	Other considerations
Byte	SQLBindParameter	Assigns storage for a parameter in an SQL statement. See “Parameter markers” on page 452 for additional information.	Data conversions are made directly from the C type that is specified to the actual host parameter (column) data type. The SQL data type and column size that are specified are ignored. Conversions that involve character data convert directly from the client codepage to the column CCSID. The driver returns an error during the execution of the SQL statement if SQL_DEFAULT_PARAM is specified for the Strlen_or_IndPtr parameter. Default parameters are not supported by the DB2 UDB database. The driver handles the binding of a parameter with the SQL_DEFAULT_PARAM option by returning an error with an SQLSTATE of 07S01 during the execution of the CALL statement.
Char	SQLGetCursorName	Returns the cursor name associated with a statement handle.	The driver will upper case all cursor names without double-quotes around the name.
Char	SQLSetCursorName	Specifies a cursor name.	The cursor name is converted to capital letters if it is not entered in quotes. Cursor names that are entered in quotes are not converted. For example, **myCursorName** becomes **MYCURSORNAME** while ″**myCursorName**″ is treated as **myCursorName**, with a length of 14 since the quotes are included in the length. The driver supports only these characters in cursor names: ″″**,a-z, A-Z, 0-9, or** _. No error will be returned by SQLSetCursorName if an invalid name is entered, however, an error will be returned later when trying to use an invalid name. The cursor name can only be 18 characters long, including the leading and trailing double quotes if they exist, and must be in characters that can be translated from UNICODE to ANSI. If an application wishes to use a DRDA® connection through ODBC then they will have the following restrictions: • Cursor name changes are not allowed during the DRDA connection. • Cursor names will be changed by the driver and should be checked via SQLGetCursorName after the cursor is open. (after SQLExecute or SQLExecDirect).
Submit requests			

Type	API	Description	Other considerations
N/A	SQLExecute	Runs a prepared statement.	SQLExecute is affected by the settings of several of the connection string keywords such as PREFETCH, CONNTYPE, CMT, and LAZYCLOSE. Refer to “Connection string keywords” on page 480 for descriptions of these keywords.
Char	SQLExecDirect	Runs a statement.	See SQLPrepare and SQLExecute.
Char	SQLNativeSQL	Returns the text of an SQL statement as translated by the driver.	
Char	SQLDescribeParam	Returns the description for a specific parameter in a statement.	
N/A	SQLNumParams	Returns the number of parameters in a statement.	
N/A	SQLParamData	Returns the storage value assigned to a parameter for which data will be sent at run time (useful for long data values).	
Byte	SQLPutData	Send part or all of a data value for a parameter (useful for long data values).	
		Retrieve results and related information	
N/A	SQLRowCount	Returns the number of rows that are affected by an insert, update, or delete request.	This API has been extended to also contain the cursor row count for a result set using a static cursor to V5R1 or later server versions.
N/A	SQLNumResultCols	Returns the number of columns in the result set.	
Char	SQLDescribeCol	Describes a column in the result set.	
Byte	SQLColAttribute	Describes attributes of a column in the result set.	
Byte	SQLBindCol	Assigns storage for a result column and specifies the data type.	
N/A	SQLExtendedFetch	Returns rows in the result set. This is a supported 2.x ODBC API. However, new applications should use SQLFetchScroll API instead.	Uses the value of the statement attribute SQL_ROWSET_SIZE instead of SQL_ATTR_ROW_ARRAY_SIZE for the rowset size. You can only use SQLExtendedFetch in combination with SQLSetPos and SQLGetData if the row size is 1. SQL_FETCH_BOOKMARK is not supported. The result set for catalog APIs (such as SQLTables and SQLColumns) is forward only and read only. When SQLExtendedFetch is used with result sets generated by catalog APIs, no scrolling is allowed.

Type	API	Description	Other considerations
N/A	SQLFetch	Returns rows in the result set.	Can only be used with SQL_FETCH_FIRST and SQL_FETCH_NEXT since the cursor is forward only.
N/A	SQLFetchScroll	Returns rows in the result set. Can be used with scrollable cursors.	Does not support the fetch orientation of SQL_FETCH_BOOKMARK because the driver does not support bookmarks.
Byte	SQLGetData	Returns part or all of one column of one row of a result set (useful for long data values). See "SQLFetch and SQLGetData" on page 452 for additional information.	SQLGetData can only be used with single row fetches. Errors are reported by SQLGetData if the row array size is larger than one.
N/A	SQLSetPos	Positions a cursor within a fetched block of data.	SQL_UPDATE, SQL_DELETE, SQL_ADD are unsupported options for Operations parameter. SQL_LOCK_EXCLUSIVE, SQL_LOCK_UNLOCK are unsupported options for the LockType parameter.
N/A	SQLBulkOperations	Performs bulk insertions and bulk bookmark operations, including update, delete, and fetch by bookmark.	The driver does not support SQLBulkOperations.
N/A	SQLMoreResults	Determines whether there are more result sets available and if so, initializes processing for the next result set.	
Byte	SQLGetDiagField	Returns a piece of diagnostic information.	The SQL_DIAG_CURSOR_ROW_COUNT option is only accurate for static cursors when running to V5R1 or later server versions.
Char	SQLGetDiagRec	Returns additional error or status information.	
Get data source system table information			
Char	SQLColumnPrivileges	Returns a list of columns and associated privileges for one or more tables.	Returns an empty result set when: • V5R1 or earlier servers or • V5R2 servers, when option 2 of the CATALOGOPTIONS connection string keyword is not set By default, when accessing V5R2 servers, column privilege information will be returned.
Char	SQLColumns	Returns a list of information on columns in one or more tables.	
Char	SQLForeignKeys	Returns a list of column names that comprise foreign keys, if they exist for a specified table.	

Type	API	Description	Other considerations
Char	SQLProcedureColumns	Returns the list of input and output parameters, as well as the columns that make up the result set for the specified procedures.	The driver does not return information about columns that make up result sets generated by procedures. The driver only returns information about the parameters to the procedures.
Char	SQLProcedures	Returns the list of procedure names stored in a specific data source.	
Char	SQLSpecialColumns	Retrieves information about the optimal set of columns that uniquely identifies a row in a specified table. It also retrieves information about the columns that are automatically updated when any value in the row is updated by a transaction.	If called with the SQL_BEST_ROWID option, returns all indexed columns of that table.
Char	SQLStatistics	Retrieves statistics about a single table and the list of indexes that are associated with the table.	Beginning with V5R4, you can define a derived key index. When SQLStatistics is used to retrieve information about the index, the COLUMN_NAME result set column returns the expression that represents the derived key index.
Char	SQLTables	Returns a list of schemas, tables, or table types in the data source.	See "SQLTables Description" on page 506
Char	SQLTablePrivileges	Returns a list of tables and the privileges that are associated with each table.	Returns an empty result set when: • V5R1 or earlier servers or • V5R2 servers, when option 2 of the CATALOGOPTIONS connection string keyword is not set By default, when accessing V5R2 servers, tables privilege information will be returned.
Char	SQLPrimaryKeys	Returns the list of column name or names that comprise the primary key for a table.	
Clean up a statement			
N/A	SQLFreeStmt	Ends statement processing and closes the associated cursor, and discards pending results.	
N/A	SQLCloseCursor	Closes a cursor that is open on the statement handle.	
N/A	SQLCancel	Cancels an SQL statement.	Not all queries can be cancelled. This is recommended only for long running queries. For more information, see "Handle long-running queries" on page 506.
N/A	SQLEndTran	Commits or rolls back a transaction.	For information regarding commitment control, see Commitment control considerations.
Terminate a connection			
N/A	SQLDisconnect	Closes the connection.	

Type	API	Description	Other considerations
N/A	SQLFreeHandle	Releases resources associated with handles.	

Related information

ODBC API restrictions and unsupported functions
The way in which some functions are implemented in the iSeries Access for Windows ODBC Driver does not meet the specifications in the Microsoft ODBC Software Development Kit Programmer's Reference.

Microsoft Web site

SQL Statement Considerations:

Identify SQL statement functions that are accomplished using ODBC.

There are several SQL statements that are not recommended to be prepared and executed. Examples of these are:

- SET™ TRANSACTION
- SET SCHEMA
- SET PATH
- COMMIT
- ROLLBACK
- CONNECT TO
- DISCONNECT ALL

For these statements, you can accomplish the same behavior in other ways through ODBC. For example, if you turn off autocommit for the ODBC connection, you can use the SQLEndTran option instead of attempting to execute a COMMIT or ROLLBACK statement.

Note that the SET SESSION AUTHORIZATION SQL statement changes the user that is in control of that connection which leads to unpredictable behavior when used in combination with ODBC connection pooling. The recommended way to use the SET SESSION AUTHORIZATION statement, through ODBC, is to free all open statement handles except for the SET SESSION AUTHORIZATION on which is it to run. Once SET SESSION AUTHORIZATION is run, you should free the statement handle.

Connection string keywords:

The iSeries Access ODBC driver has many connection string keywords that can be used to change the behavior of the ODBC connection.

These same keywords and their values are stored when an ODBC data source is setup. When an ODBC application makes a connection, any keywords specified in the connection string override the values specified in the ODBC data source.

Choose from the following tables for more information on the connection string keywords that are recognized by the iSeries Access ODBC driver.

Connection string keywords - General properties:

Use these iSeries Access ODBC driver connection string keywords to change General properties of the ODBC connection.

The following table lists connection string keywords for General properties that are recognized by the iSeries Access ODBC driver:

Table 3. iSeries Access ODBC connection string keywords for General properties

Keyword	Description	Choices	Default
DSN	Specifies the name of the ODBC data source that you want to use for the connection.	Data source (DSN) name	none
DRIVER	Specifies the name of the ODBC driver that you want to use. **Note:** This should not be used if the DSN property has been specified.	"iSeries Access ODBC Driver" Client Access ODBC Driver (32-bit) **Note:** When installing iSeries Access, V5R2 or later, two ODBC drivers are registered. Both the **Client Access ODBC Driver (32-bit)** and the **iSeries Access ODBC Driver** names are registered, however, both of these registered names point to the same ODBC driver. These two registered names do not indicate that two different ODBC drivers are installed. The older name of **Client Access ODBC Driver (32-bit)** is registered to support backward compatibility.	none
PWD or Password	Specifies the password for connecting to the iSeries server.	iSeries password	none
SIGNON	Specifies what default user ID to use if the connection cannot be completed with the current user ID and password information.	0 = Use Windows user name 1 = Use default user ID 2 = None 3 = Use iSeries Navigator default 4 = Use Kerberos principal	3
SSL	Specifies whether a Secure Sockets Layer (SSL) connection is used to communicate with the server. SSL connections are only available when connecting to servers at V4R4 or later.	0 = Encrypt only the password 1 = Encrypt all clients/server communication	0
SYSTEM	Specifies the name of the iSeries server that you want to connect to.	iSeries server name. See iSeries system name formats for ODBC Connection APIs.	none
UID or UserID	Specifies the user ID for connecting to the iSeries server.	iSeries user ID	none

Connection string keywords - Server Properties:

Use these iSeries Access ODBC driver connection string keywords to change Server properties of the ODBC connection.

The following table lists connection string keywords for Server properties that are recognized by the iSeries Access ODBC driver:

Table 4. iSeries Access ODBC connection string keywords for Server properties

Keyword	Description	Choices	Default
CMT or CommitMode	Specifies the default transaction isolation level.	0 = Commit immediate (*NONE) 1 = Read committed (*CS) 2 = Read uncommitted (*CHG) 3 = Repeatable read (*ALL) 4 = Serializable (*RR)	2
CONNTYPE or ConnectionType	Specifies the level of database access for the connection.	0 = Read/Write (all SQL statements allowed) 1 = Read/Call (SELECT and CALL statements allowed) 2 = Read-only (SELECT statements only)	0
DATABASE	Specifies the iSeries relational database (RDB) name to connect. Note, this option is only valid to V5R2 iSeries servers. This option will be ignored when connecting to earlier pre-V5R2 servers. Special values for this option include specifying an empty-string or *SYSBAS. An empty-string indicates to use the user-profile's default setting for database. Specifying *SYSBAS will connect a user to the SYSBAS database (RDB name).	iSeries relational database name	empty-string
DBQ or DefaultLibraries	Specifies the iSeries libraries to add to the server job's library list. The libraries are delimited by commas or spaces, and *USRLIBL may be used as a place holder for the server job's current library list. The library list is used for resolving unqualified stored procedure calls and finding libraries in catalog API calls. If *USRLIBL is not specified, the specified libraries will replace the server job's current library list. **Note:** The first library listed in this property will also be the default library, which is used to resolve unqualified names in SQL statements. To specify no default library, a comma should be entered before any libraries.	iSeries libraries Only 25 libraries are supported in a library list on a connection to a pre-V5R1 server. 75 entries are supported on a V5R1 and later servers. Entries over 75 are ignored.	QGPL
MAXDECPREC or Maximum Decimal Precision	Specifies the maximum precision of decimal data that will be returned.	31 or 63	31
MAXDECSCALE or Maximum Decimal Scale	Specifies the maximum scale used in arithmetic calculations involving decimal data. This value must be less than the value of MAXDECPREC.	0 – 63	31

Table 4. iSeries Access ODBC connection string keywords for Server properties (continued)

Keyword	Description	Choices	Default
MINDIVSCALE or Minimum Divide Scale	Specifies the minimum scale used in arithmetic calculations involving decimal data.	0 – 9	0
NAM or Naming	Specifies the naming convention used when referring to tables.	0 = ″sql″ (as in *schema.table*) 1 = ″system″ (as in *schema/table*)	0

Connection string keywords - Format properties:

Use these iSeries Access ODBC driver connection string keywords to change Format properties of the ODBC connection.

The following table lists connection string keywords for Format properties that are recognized by the iSeries Access ODBC driver:

Table 5. iSeries Access ODBC connection string keywords for Format properties

Keyword	Description	Choices	Default
DFT or DateFormat	Specifies the date format used in date literals within SQL statements.	0 = yy/dd (*JUL) 1 = mm/dd/yy (*MDY) 2 = dd/mm/yy (*DMY) 3 = yy/mm/dd (*YMD) 4 = mm/dd/yyyy (*USA) 5 = yyyy-mm-dd (*ISO) 6 = dd.mm.yyyy (*EUR) 7 = yyyy-mm-dd (*JIS)	5
DSP or DateSeparator	Specifies the date separator used in date literals within SQL statements. This property has no effect unless the DateFormat property is set to 0 (*JUL), 1 (*MDY), 2 (*DMY), or 3 (*YMD).	0 = ″/″ (forward slash) 1 = ″-″ (dash) 2 = ″.″ (period) 3 = ″,″ (comma) 4 = ″ ″ (blank)	1
DEC or Decimal	Specifies the decimal separator used in numeric literals within SQL statements.	0 = ″.″ (period) 1 = ″,″ (comma)	0
TFT or TimeFormat	Specifies the time format used in time literals within SQL statements.	0 = hh:mm:ss (*HMS) 1 = hh:mm AM/PM (*USA) 2 = hh.mm.ss (*ISO) 3 = hh.mm.ss (*EUR) 4 = hh:mm:ss (*JIS)	0

Table 5. iSeries Access ODBC connection string keywords for Format properties (continued)

Keyword	Description	Choices	Default
TSP or TimeSeparator	Specifies the time separator used in time literals within SQL statements. This property has no effect unless the ″time format″ property is set to ″hms″.	• 0 = ″:″ (colon) • 1 = ″.″ (period) • 2 = ″,″ (comma) • 3 = ″ ″ (blank)	0

Connection string keywords - Package properties:

Use these iSeries Access ODBC driver connection string keywords to change Package properties of the ODBC connection.

The following table lists connection string keywords for Package properties that are recognized by the iSeries Access ODBC driver:

Table 6. iSeries Access ODBC connection string keywords for the Package properties

Keyword	Description	Choices	Default
DFTPKGLIB or DefaultPkgLibrary	Specifies the library for the SQL package. This property has no effect unless the XDYNAMIC property is set to 1.	Library for SQL package	QGPL
PKG or DefaultPackage	Specifies how the extended dynamic (package) support will behave. The string for this property must be in the following format: **A/DEFAULT(IBM),x,0,y,z,0** The x, y, and z are special attributes that need to be replaced with how the package is to be used. • x = Specifies whether or not to add statements to an existing SQL package. • y = Specifies the action to take when SQL package errors occur. When a SQL package error occurs, the driver will return a return code based on the value of this property. • z = Specifies whether or not to cache SQL packages in memory. Caching SQL packages locally reduces the amount of communication to the server in some cases. **Note:** This property has no effect unless the XDYNAMIC property is set to 1.	**A/DEFAULT(IBM),x,0,y,z,0** Values for x option: • 1 = Use (Use the package, but do not put any more SQL statements into the package) • 2 = Use/Add (Use the package and add new SQL statements into the package) Values for y option: • 0 = Return an error (SQL_ERROR) to the application • 1 = Return a warning (SQL_SUCCESS_WITH_INFO) to the application • 2 = Return success (SQL_SUCCESS) to the application Values for z option: • 0 = Do not cache SQL package locally • 1 = Cache SQL package locally	default

Table 6. iSeries Access ODBC connection string keywords for the Package properties (continued)

Keyword	Description	Choices	Default
XDYNAMIC or ExtendedDynamic	Specifies whether to use extended dynamic (package) support. Extended dynamic support provides a mechanism for caching dynamic SQL statements on the server. The first time a particular SQL statement is run, it is stored in a SQL package on the server. On subsequent runs of the same SQL statement, the server can skip a significant part of the processing by using information stored in the SQL package. **Note:** For more information see "Use Extended Dynamic SQL" on page 510.	0 = Disable extended dynamic support 1 = Enable extended dynamic support	1

Note: A/DEFAULT(IBM),x,0,y,z,0 is the default value for PKG or DefaultPackage.

Connection string keywords - Performance properties:

Use these iSeries Access ODBC driver connection string keywords to change Performance properties of the ODBC connection.

The following table lists connection string keywords for Performance properties that are recognized by the iSeries Access ODBC driver:

Table 7. iSeries Access ODBC connection string keywords for Performance properties

Keyword	Description	Choices	Default
BLOCKFETCH	Specifies whether or not internal blocking will be done on fetches of 1 row. When set, the driver will try to optimize the fetching of records when one record is requested by the application. Multiple records will be retrieved and stored by the driver for later retrieval by the application. When an application requests another row, the driver will not need to send another flow to the host database to get it. If not set, blocking will be used according to the application's ODBC settings for that particular statement. **Note:** For more information on setting this option see the Fine-tuning record blocking topic.	0 = Use ODBC settings for blocking 1 = Use blocking with a fetch of 1 row	1
BLOCKSIZE or BlockSizeKB	Specifies the block size (in kilobytes) to retrieve from the iSeries server and cache on the client. This property has no effect unless the BLOCKFETCH property is 1. Larger block sizes reduce the frequency of communication to the server, and therefore may increase performance.	1 – 8192	32

Table 7. iSeries Access ODBC connection string keywords for Performance properties (continued)

Keyword	Description	Choices	Default
COMPRESSION or AllowDataCompression	Specifies whether to compress data sent to and from the server. In most cases, data compression improves performance due to less data being transmitted between the driver and the server.	0 = Disable compression 1 = Enable compression	1
CONCURRENCY	Specifies whether to override the ODBC concurrency setting by opening all cursors as updateable. **Note:** In the following two cases, setting this option has no effect: 1. When building a SELECT SQL statement the FOR FETCH ONLY or FOR UPDATE clause can be added. If either of these clauses are present in a SQL statement the ODBC driver will honor the concurrency that is associated with the clause. 2. Catalog result sets are always read-only.	0 = Use ODBC concurrency settings 1 = Open all cursors as updateable	0
CURSORSENSITIVITY	Specifies the cursor sensitivity to use when opening cursors. This option applies to all forward-only and dynamic cursors that are opened on the same connection. Static cursors are always insensitive.	0 - Unspecified/Asensitive 1 = Insensitive 2 = Sensitive	
EXTCOLINFO or ExtendedColInfo	The extended column information affects what the SQLGetDescField and SQLColAttribute APIs return as Implementation Row Descriptor (IRD) information. The extended column information is available after the SQLPrepare API has been called. The information that is returned is: • SQL_DESC_AUTO_UNIQUE_VALUE • SQL_DESC_BASE_COLUMN_NAME • SQL_DESC_BASE_TABLE_NAME and SQL_DESC_TABLE_NAME • SQL_DESC_LABEL • SQL_DESC_SCHEMA_NAME • SQL_DESC_SEARCHABLE • SQL_DESC_UNNAMED • SQL_DESC_UPDATABLE **Note:** the driver sets the SQL_DESC_AUTO_UNIQUE_VALUE flag only if a column is an identity column with the ALWAYS option over a numeric data type (such as integer). Refer to the DB2 UDB SQL Reference for details on identity columns.	0 = Do not retrieve extended column information 1 = Retrieve extended column information	0

Table 7. iSeries Access ODBC connection string keywords for Performance properties (continued)

Keyword	Description	Choices	Default
LAZYCLOSE	Specifies whether to delay closing cursors until subsequent requests. This will increase overall performance by reducing the total number of requests. **Note:** This option can cause problems due to the cursors still holding locks on the result set rows after the close request.	0 = Close all cursors immediately 1 = Delay closing of cursors until the next request	0
MAXFIELDLEN or MaxFieldLength	Specifies the maximum LOB (large object) size (in kilobytes) that can be retrieved as part of a result set. LOBs that are larger than this threshold will be retrieved in pieces using extra communication to the server. Larger LOB thresholds will reduce the frequency of communication to the server, but will download more LOB data, even if it is not used. Smaller LOB thresholds may increase frequency of communication to the server, but they will only download LOB data as it is needed. **Notes:** • Setting this property to 0 forces the driver to always retrieve the LOB values with additional communication flows. • Setting this property larger than 15360 KB has no effect. Anything larger than 15360 KB is retrieved in pieces from the server. Retrieving the data in pieces reduces the amount of memory needed, at any given time, on the client.	0 — 2097152	32
PREFETCH	Specifies whether to prefetch data upon executing a SELECT statement. This will increase performance when accessing the initial rows in the ResultSet.	0 = Do not prefetch data 1 = Prefetch data	0
QUERYTIMEOUT	Specifies whether the driver will disable support for the query timeout attribute, SQL_ATTR_QUERY_TIMEOUT. If disabled, SQL queries will run until they finish.	0 = Disable support for the query timeout attribute 1 = Allow the query timeout attribute to be set	1

Related reference

"Fine-tune record-blocking" on page 509
Record-blocking is a technique that significantly reduces the number of network flows.

Connection string keywords - Sort properties:

Use these iSeries Access ODBC driver connection string keywords to change Sort properties of the ODBC connection.

The following table lists connection string keywords for Sort properties that are recognized by the iSeries Access ODBC driver:

Table 8. iSeries Access ODBC connection string keywords for Sort properties

Keyword	Description	Choices	Default
LANGUAGEID	Specifies a 3-character language id to use for selection of a sort sequence. This property has no effect unless the SORTTYPE property is set to 2.	AFR, ARA, BEL, BGR, CAT, CHS, CHT, CSY, DAN, DES, DEU, ELL, ENA, ENB, ENG, ENP, ENU, ESP, EST, FAR, FIN, FRA, FRB, FRC, FRS, GAE, HEB, HRV, HUN, ISL, ITA, ITS, JPN, KOR, LAO, LVA, LTU, MKD, NLB, NLD, NON, NOR, PLK, PTB, PTG, RMS, ROM, RUS, SKY, SLO, SQI, SRB, SRL, SVE, THA, TRK, UKR, URD, VIE	ENU
SORTTABLE	Specifies the library and file name of a sort sequence table stored on the iSeries server. This property has no effect unless the SORTTYPE property is set to 3.	Qualified sort table name	none
SORTTYPE or SortSequence	Specifies how the server sorts records before sending them to the client.	0 or 1 = Sort based on hexadecimal values 2 = Sort based on the language set in LANGUAGEID property 3 = Sort based on the sort sequence table set in the SORTTABLE property	0
SORTWEIGHT	Specifies how the server treats case while sorting records. This property has no effect unless the SORTTYPE property is set to 2.	0 = Shared-Weight (uppercase and lowercase characters sort as the same character) 1 = Unique-Weight (uppercase and lowercase characters sort as different characters)	0

Connection string keywords - Catalog properties:

Use these iSeries Access ODBC driver connection string keywords to change Catalog properties of the ODBC connection.

The following table lists connection string keywords for Catalog properties that are recognized by the iSeries Access ODBC driver:

Table 9. iSeries Access ODBC connection string keywords for the Catalog properties

Keyword	Description	Choices	Default
CATALOGOPTIONS	Specifies one or more options to affect how catalog APIs return information. To specify multiple catalog options, add the values associated with the options that you want.	To determine the value for this keyword, add the values below that are associated with each option that you want. 1 = Return information about aliases in the SQLColumns result set. 2 = Return result set information for SQLTablePrivileges and SQLColumnPrivileges. Note, this will only work with V5R2 hosts. On older hosts the driver will return an empty result set.	3
LIBVIEW or LibraryView	Specifies the set of libraries to be searched when returning information when using wildcards with catalog APIs. In most cases, use the default library list or default library option as searching all the libraries on the server will take a long time.	0 = Use default library list 1 = All libraries on the server 2 = Use default library only	0
REMARKS or ODBCRemarks	Specifies the source of the text for REMARKS columns in catalog API result sets.	0 = i5/OS object description 1 = SQL object comment	0
SEARCHPATTERN	Specifies whether the driver will interprets string search patterns and underscores in the library and table names as wildcards (search patterns). By default, % is treated as an ’any number of characters’ wildcard, and _ is treated as a ’single character’ wildcard.	0 = Do not treat search patterns as wildcards 1 = Treat search patterns as wildcards	1

Note: ″A/DEFAULT(IBM),x,0,y,z,0″ is the default value for PKG or DefaultPackage.

Connection string keywords - Translation properties:

Use these iSeries Access ODBC driver connection string keywords to change Translation properties of the ODBC connection.

The following table lists connection string keywords for Translation properties that are recognized by the iSeries Access ODBC driver:

Table 10. iSeries Access ODBC connection string keywords for Translation properties

Keyword	Description	Choices	Default
ALLOWUNSCHAR or AllowUnsupportedChar	Specifies whether or not to suppress error messages which occur when characters that can not be translated (because they are unsupported) are detected.	0 = Report error messages when characters can not be translated 1 = Suppress error messages when characters can not be translated	0
CCSID	Specifies a codepage to override the default client codepage setting with.	Client codepage setting or 0 (use default client codepage setting)	0

Table 10. iSeries Access ODBC connection string keywords for Translation properties (continued)

Keyword	Description	Choices	Default
GRAPHIC	This property affects the handling of the graphic (DBCS) data types of GRAPHIC, VARGRAPHIC, LONG VARGRAPHIC, and DBCLOB that have a CCSID other than Unicode. This property affects two different behaviors: 1. Whether the length of a graphic field is reported as a character count or as a byte count by the SQLDescribeCol API. 2. Whether graphic fields are reported as a supported type in the SQLGetTypeInfo result set	0 = Report character count, report as not supported 1 = Report character count, report as supported 2 = Report byte count, report as not supported 3 = Report byte count, report as supported	0
HEXPARSEROPT or Hex Parser Option	Specifies how SQL hexadecimal constants will be interpreted in SQL statements.	0 = Treat hexadecimal constants as character data 1 = Treat hexadecimal constants as binary data	0
TRANSLATE or ForceTranslation	Specifies whether or not to convert binary data (CCSID 65535) to text. When this property is set to 1, binary fields are treated as character fields. **Note:** This setting has no effect when accessing tables on V5R3 and later servers that contain the new BINARY and VARBINARY data types.	0 = Do not convert binary data to text 1 = Convert binary data to text	0
UNICODESQL	Specifies whether or not to send Unicode SQL statements to the server. If set to 0, the driver will send EBCDIC SQL statements to the server. This option is only available when connecting to servers at V5R1 or later.	0 = Send EBCDIC SQL statements to the server 1 = Send Unicode SQL statements to the server	0
XLATEDLL or TranslationDLL	Specifies the full path name of the DLL to be used by the ODBC driver to translate the data that is passed between the ODBC driver and the server. The DLL is loaded when a connection is established.	Full path name of the translation DLL	none
XLATEOPT or TranslationOption	Specifies a 32-bit integer translation option that is passed to the translation DLL. This parameter is optional. The meaning of this option depends on the translation DLL that is being used. Refer to the documentation provided with the translation DLL for more information. This option is not used unless the XLATEDLL property is set.	32-bit integer translation option	0

Connection string keywords - Diagnostic properties:

Use these iSeries Access ODBC driver connection string keywords to change Diagnostic properties of the ODBC connection.

The following table lists connection string keywords for Diagnostic properties that are recognized by the iSeries Access ODBC driver:

Table 11. iSeries Access ODBC connection string keywords for Diagnostic properties

Keyword	Description	Choices	Default
MAXTRACESIZE	Specifies the maximum trace size (in MB) of the internal driver trace. Specifying a value of 0 means no limit. This property has no effect unless the TRACE property has option 1 set.	0 (no limit) - 1000	0
MULTTRACEFILES or MultipleTraceFiles	Specifies whether or not trace data from the internal driver trace will be put into multiple files. A new file will be created for each thread that the application is using. This property has no effect unless the TRACE property has option 1 set.	0 = Trace data into a single file 1 = Trace data into multiple files	1
QAQQINILIB or QAQQINILibrary	Specifies a query options file library. When a query options file library is specified the driver will issue the command CHGQRYA passing the library name for the QRYOPTLIB parameter. The command is issued immediately after the connection is established. This option should only be used when debugging problems or when recommended by support as enabling it will adversely affect performance.	Query options file library	none
SQDIAGCODE	Specifies DB2 UDB SQL diagnostic options to be set. Use only as directed by your technical support provider.	DB2 UDB SQL diagnostic options	none
TRACE	Specifies one or more trace options. To specify multiple trace options add together the values for the options that you want. For example, if you want the Database Monitor and Start Debug command to be activated on the server then the value you would want to specify is 6. These options should only be used when debugging problems or when recommended by support as they will adversely affect performance.	To determine the value for this keyword, add the values below that are associated with each option that you want. 0 = No tracing 1 = Enable internal driver tracing 2 = Enable Database Monitor 4 = Enable the Start Debug (STRDBG) command 8 = Print job log at disconnect 16 = Enable job trace 32 = Enable database host server trace	0

Table 11. iSeries Access ODBC connection string keywords for Diagnostic properties (continued)

Keyword	Description	Choices	Default
TRACEFILENAME	Specifies the full path name to either the file or the directory in which to put the internal driver trace data into. A path name to the file should be specified if MULTTRACEFILES is set to 0. A path name to a directory should be specified if MULTTRACEFILES is set to 1. This property has no effect unless the TRACE property has option 1 set.	Full path name to file or directory	none

Connection string keywords - other properties:

Use these iSeries Access ODBC driver connection string keywords to change other properties of the ODBC connection.

The following table lists other connection string keywords that are recognized by the iSeries Access ODBC driver:

Table 12. iSeries Access ODBC connection string keywords for other properties

Keyword	Description	Choices	Default
ALLOWPROCCALLS	Specifies whether stored procedures can be called when the connection attribute, SQL_ATTR_ACCESS_MODE, is set to SQL_MODE_READ_ONLY.	0 = Do not allow stored procedures to be called 1 = Allow stored procedures to be called	0
DB2SQLSTATES	Specifies whether or not to return ODBC-defined SQL States or DB2 SQL States. Refer to the DB2 UDB SQL Reference for more details on the DB2 SQL States. This option should be used only if you have the ability to change the ODBC application's source code. If not, you should leave this option set to 0 as most applications are coded only to handle the ODBC-defined SQL States.	0 = Return ODBC-defined SQLStates 1 = Return DB2 SQL States	0

Table 12. iSeries Access ODBC connection string keywords for other properties (continued)

Keyword	Description	Choices	Default
DATETIMETOCHAR or ConvertDateTimeToChar	Specifies one or more options on how date, time, and timestamp data types are reported to an application. To specify multiple options add together the values for the options. This option supports cases in which date values such as 24:00:00 are used.	To determine the value for this keyword, add the values below that are associated with each option that you want. 0 = Continue to map the DATE, TIME, and TIMESTAMP data types as SQL_TYPE_DATE, SQL_TYPE_TIME, and SQL_TYPE_TIMESTAMP 1 = Return DATE data type as SQL_CHAR 2 = Return TIME data type as SQL_CHAR 4 = Return TIMESTAMP data type as SQL_CHAR	0
DBCSNoTruncError	Specifies whether or not to report a DBCS string conversion overflow error as an ODBC trunctation error.	0 = Report DBCS string conversion overflow error as ODBC truncation error 1 = Ignore truncation error	0

Table 12. iSeries Access ODBC connection string keywords for other properties (continued)

Keyword	Description	Choices	Default
DEBUG	Specifies one or more debug options. To specify multiple debug options add together the values for the options that you want. In most cases you will not need to set this option.	To determine the value for this keyword, add the values below that are associated with each option that you want. 2 = Return SQL_IC_MIXED for the SQL_IDENTIFIER_CASE option of SQLGetInfo 4 = Store all SELECT statements in the package 8 = Return zero for the SQL_MAX_QUALIFIER_NAME_LEN option of option of SQLGetInfo 16 = Add positioned UPDATEs / DELETEs into packages 32 = Convert static cursors to dynamic cursors 64 = Send the entire column size worth of data for variable length fields (VARCHAR, VARGRAPHIC, BLOB, etc.) Note, set this option with caution as this can have an adverse impact on performance. 128 = Subtract one from the SQLBindParameter sourcelength if the last character in the buffer is a null-terminator character. 256 = Ignore data decimal errors 512 = Ignore case warnings (SQL0402) for scrollable cursors 1024 = Disable variable length compression 2048 = Return no support for SQL_CVT_DATE when calling the SQLGetInfo's SQL_CONVERT_TIMESTAMP option. 32768 = If the result of a query results in a column being divided by 0, return a NULL value instead of an error.	0

Table 12. iSeries Access ODBC connection string keywords for other properties (continued)

Keyword	Description	Choices	Default
TRUEAUTOCOMMIT	Specifies how to handle autocommit support. In past ODBC drivers, turning autocommit on resulted in the server running under the *NONE isolation level. Now autocommit can run under any isolation level. Applications that require strict conformance to the SQL specification should use setting 1. Note that this setting requires that all files be journaled. Setting 0 offers better performance for most applications. See the SQL reference for further information on Transaction Isolation levels.	0 = run autocommit under the *NONE isolation level 1 = run autocommit under the isolation level that is set for the connection. The connection's isolation level is set using the SQLSetConnectAttr API and the SQL_ATTR_TXN_ISOLATION option.	0
NEWPWD	Specifies a new password used to override the current user's iSeries password. This option is only honored if set by an application. When using this option, the UID and PWD keywords should also be specified.	New password to use	none
XALCS or XALooselyCoupledSupport	Specifies whether locks are shared between loosely coupled distributed transaction branches.	0 = Locks are not shared 1 = Locks are shared	1 (for Windows) 0 (for Linux)
XALOCKTIMEOUT	Specifies the maximum amount of time (in seconds) that a distributed transaction waits on a lock request before timing out.	0 = Use the default system setting 0 – 999999999 = the number of seconds to wait	0
XATXNTIMEOUT or XATransactionTimeout	Specfies the amount of time (in seconds) that a distributed transaction waits before timing out.	0 = Wait indefinitely for the transaction to finish 0 – 999999999 = the number of seconds to wait	0

Version and release changes in the ODBC driver behavior:

This topic describes version and release changes in the ODBC driver behavior.

The following list describes some of the important changes for V5R4:

There are several new features available when using the ODBC driver to access data on a V5R4 iSeries server. These features include:

- Support for 128-byte column names
- Support for longer SQL statements (commands can be up to 2,097,152 bytes or 1,048,576 characters long)
- Support for passing an IBM Enterprise Workload Manager (eWLM) correlator to the iSeries host
- Improved support for table and column names that are not all uppercase
- Enhanced distributed transaction support for loosely coupled transactions
- A Linux 64-bit ODBC driver

The following list describes some of the important changes for V5R3:

There are several new features available when using the ODBC driver to access data on a V5R3 iSeries server. These features include:

- DB2 UDB database types of BINARY and VARBINARY
- UTF-8 and UTF-16 data
- Increased precision of decimal numbers
- Support for accessing stored procedure result sets with scrollable cursors
- Enhanced commitment control model so that autocommit can run with any isolation level
- Enhanced Microsoft Transaction Server (MTS) / XA support which allows the coordination of transactions across multiple iSeries connections

The following list describes some of the important changes for V5R2:

There are several new features available when using the ODBC driver to access data on a V5R2 iSeries server. These features include:

- Ability to send Structured Query Language (SQL) statements that are 64K bytes long to the DB2 UDB database (the previous limit was 32K bytes)
- Ability to make use of the DB2 UDB database type of ROWID
- Ability to get back additional descriptor information, such as the base table name for a result set column
- Ability to access multiple databases on the same iSeries server
- Ability to retrieve meaningful information from the SQLTablePrivileges and SQLColumnPrivileges APIs
- Ability to use Kerberos support for authenticating a user to an iSeries server
- Ability to retrieve, regardless of the iSeries server version, more information in the result sets for the catalog APIs. The driver now queries the iSeries catalog tables directly to provide the result set for the catalog APIs.

The following list describes some of the important changes for V5R1:

- Character data for parameter markers is converted from the iSeries Access(PC) codepage directly to the column CCSID. If a new iSeries Access codepage setting was specified on the Advanced Translation Options dialog of the DSN setup GUI, it will be the iSeries Access(PC) codepage. The V4R5 driver first converted character data from the iSeries Access(PC) codepage to the job CCSID before it was converted to the column CCSID.
- Character column data is converted directly from the column CCSID to the iSeries Access(PC) codepage. If the C type specified is SQL_C_WCHAR, then the data is converted to Unicode.
- If the value type specified in SQLBindParameter is SQL_C_WCHAR, then the driver converts the parameter marker data from Unicode to the column CCSID.
- When calling SQLBindParameter for a SQL_C_CHAR to INTEGER conversion, if BufferLength is 0 and the buffer contains an empty string then an error is returned. The V4R5 driver would accept the empty string and insert the value of 0 into the table.
- The lazy close option default is 0 (OFF), and in V4R5 its default was 1 (ON).
- The prefetch option default is 0 (OFF), and in V4R5 its default was 1 (ON).
- Unicode SQL statements can be sent to V5R1 or later iSeries servers. The package names are generated differently than in V4R5 when sending Unicode SQL statements.
- Managed DSNs (created through V4R5 or earlier iSeries Navigator) are not supported. They are instead treated like a User DSN, meaning that the DSN information is not updated from the server copy.
- BIGINT data type is supported to V4R5 (or later) hosts.
- Static cursor supported to V5R1 or later hosts. In earlier hosts, and in previous iSeries Access for Windows ODBC drivers, static cursor type is mapped to dynamic.

- The V5R1 driver supports the ODBC 3.51 specification. In V4R5, the ODBC 2.5 specification was supported.
- In V5R1, no conversion is performed when fetching data from a char field and retrieving it as SQL_C_BINARY. In V4R5, the driver translated data from EBCDIC codepages to ASCII codepages.

ODBC API restrictions and unsupported functions:

The way in which some functions are implemented in the iSeries Access for Windows ODBC Driver does not meet the specifications in the Microsoft ODBC Software Development Kit Programmer's Reference.

The table below describes some global restrictions and unsupported functions. See "ODBC 3.x APIs Notes" on page 470 for a list of individual APIs and their associated considerations.

Table 13. Limitations of ODBC API functions

Function	Description
Global considerations	No asynchronous processes are supported. However, SQLCancel can be called, from a different thread (in a multi-threaded application), to cancel a long running query. Translation DLLs are only called when converting data from buffers.
SQLSetScrollOptions (2x API)	SQL_CONCUR_ROWVER, SQL_CONCUR_VALUES are unsupported options for Concurrency parameter. The SQL_SCROLL_KEYSET_DRIVEN is mapped to SQL_SCROLL_DYNAMIC by the driver.

Signon dialog behavior:

The signon dialog behavior has been simplified from the behavior seen in previous iSeries Access for Windows ODBC drivers. The signon dialog behavior is based on how your data source is set up and which ODBC API (SQLConnect, SQLDriverConnect, SQLBrowseConnect) your application uses to connect.

When configuring an ODBC data source there are two options which can influence the signon dialog behavior. These are both located on the dialog you get after clicking **Connection Options** on the **General** tab of the DSN Setup GUI.

Note: On the DSN setup GUI there is an option which controls whether or not a dialog prompting for signon information is allowed or not. An application that calls SQLConnect in a 3-tier environment should always choose 'Never prompt for SQLConnect'. This 3-tier application also needs to make sure it specifies the userid and password when calling SQLConnect.

- In the **Default user ID** section you can specify which default user ID to use:
  - Use Windows user name
  - Use the user ID specified below
  - None
  - Use iSeries Navigator default
  - Use Kerberos principal
- In the **Signon dialog prompting** section you can specify if the signon dialog should be prompted if your application uses the SQLConnect ODBC API.

When coding your application you have total control over how the userid, password, and signon dialog prompting will behave. The userid and password that is used is figured out in the following order:

1. Userid / Password arguments specified by the application.
   - The SQLConnect API accepts userid and password arguments.

- The SQLDriverConnect and SQLBrowseConnect APIs accept the UID, PWD, and SIGNON connection string keywords.

2. GUI setting for Default user ID

The signon dialog prompting depends on which ODBC API is used by the application to connect. SQLConnect prompts the signon dialog if needed unless the GUI setting for Signon dialog prompting says to never prompt. SQLDriverConnect prompts the signon dialog according to the value of the DriverCompletion. A setting of SQL_DRIVER_NOPROMPT will prevent any signon dialogs from being prompted. A setting of SQL_DRIVER_PROMPT, SQL_DRIVER_COMPLETE or SQL_DRIVER_COMPLETE_REQUIRED will prompt the signon dialog if needed. SQLBrowseConnect prompts the signon dialog if needed.

ActiveX Data Objects (ADO) prompting

When coding your ODBC application using ActiveX Data Objects (ADO) the default behavior for prompting is **adPromptNever**. To prompt differently, set the Prompt property on the Connection object prior to calling the Connection’s Open method. For example, the following ADO code would result in prompting only as needed. Adding the SIGNON, UID, or PWD keywords allow you to have more control over the amount of prompting.

```
Dim conn As New ADODB.Connection
conn.Properties("Prompt") = adPromptComplete
conn.Open "Provider = MSDASQL;DSN=myODBCDSN;
```

ODBC data types and how they correspond to DB2 UDB database types:

The ODBC driver maps data types between ODBC types and DB2 UDB types. The following table shows this mapping.

For more information see DB2 UDB database types.

Table 14.

3.x ODBC Data Type	DB2 UDB Database Type
SQL_BIGINT	BIGINT
SQL_BINARY	BINARY or CHAR FOR BIT DATA
SQL_CHAR	CHAR or GRAPHIC
SQL_DECIMAL	DECIMAL
SQL_DOUBLE	DOUBLE
SQL_FLOAT	FLOAT
SQL_INTEGER	INTEGER
SQL_LONGVARBINARY	BLOB
SQL_LONGVARCHAR	CLOB or DBCLOB
SQL_NUMERIC	NUMERIC
SQL_REAL	REAL
SQL_SMALLINT	SMALLINT
SQL_TYPE_DATE	DATE
SQL_TYPE_TIME	TIME
SQL_TYPE_TIMESTAMP	TIMESTAMP

Table 14. (continued)

3.x ODBC Data Type	DB2 UDB Database Type
SQL_VARBINARY	VARBINARY VARCHAR FOR BIT DATA LONG VARCHAR FOR BIT DATA ROWID
SQL_VARCHAR	VARCHAR VARGRAPHIC LONG VARCHAR LONG VARGRAPHIC DATALINK
SQL_WCHAR	GRAPHIC CCSID 1200 GRAPHIC CCSID 13488
SQL_WLONGVARCHAR	DBCLOB CCSID 1200 DBCLOB CCSID 13488
SQL_WVARCHAR	VARGRAPHIC CCSID 1200 VARGRAPHIC CCSID 13488 LONGVARGRAPHIC CCSID 1200 LONG VARGRAPHIC CCSID 13488

Implementation notes:

- All conversions in the Microsoft ODBC Software Development Kit Programmer's Reference Version 3.5 are supported for these ODBC SQL data types.
- Call the ODBC API SQLGetTypeInfo to learn more about each of these data types.
- The database type of VARCHAR will be changed to LONG VARCHAR by the database if the column size that is specified is larger than 255.
- The ODBC driver does not support any of the interval SQL data types.
- 2.x ODBC applications use the SQL_DATE, SQL_TIME, and SQL_TIMESTAMP defines in place of the SQL_TYPE_DATE, SQL_TYPE_TIME, and SQL_TYPE_TIMESTAMP defines.
- Unicode fields, which are the data types with a CCSID of 1200 (UTF-16) or 13488 (UCS-2), report to ODBC 2.x applications as SQL_CHAR, SQL_VARCHAR, and SQL_LONGVARCHAR instead of SQL_WCHAR, SQL_WVARCHAR, and SQL_WLONGVARCHAR.
- LOBs (BLOB, CLOB, and DBCLOB) up to 2 GB in size are supported with V5R2 (or later) iSeries servers. Earlier releases support up to 15 MB. For more information on LOBs and datalinks see "Large objects (LOBs) considerations."
- Increased decimal precision for its data types is available on V5R3 (and later) iSeries servers. Note that to retrieve decimal fields with large precision successfully you must bind the column as SQL_C_CHAR. The structure that stores SQL_C_NUMERIC data can hold 38 digits.

Large objects (LOBs) considerations:

Use LOBs with iSeries Access for Windows ODBC to store and access large text documents.

Large objects (LOBs):

Large object (LOB) data types allow applications to store large data objects as strings. On V5R1, and earlier servers, the ODBC driver could access LOB fields that were 15 MB or less in size. On V5R2 and later servers the ODBC driver can access 2 GB LOBs.

When uploading large LOB data fields to the server, it is recommended that you use the SQLParamData and SQLPutData APIs. The SQLPutData API sends the LOB data to the server as it is received and reduces the amount of memory needed on the client.

LOB data types:

BLOB Binary large data objects

CLOB Single-byte large character data objects

DBCLOB
Double-byte character large data objects

To view an example that uses the BLOB data type:
See “Example: Use the BLOB data type”

For more information on LOBs:
See the **Using Large Objects** topic under the **Using the Object-Relational Capabilities** heading in the SQL Programming Concepts Information Center topic.

DataLinks:

DataLink data types allow you to store many types of data in a database. Data is stored as a uniform resource locator (URL). The URL points to an object, which might be an image file, sound file, text file, and so forth.

For more information on DataLinks:
See the **Using DataLinks** topic under the **Processing special data types** heading in the SQL Programming Concepts Information Center topic.

Example: Use the BLOB data type:

The following is a partial C program that uses the BLOB data type:

```
BOOL params = TRUE; // TRUE if you want to use parameter markers
SQLINTEGER char_len = 10, blob_len = 400;
SQLCHAR szCol1[21], szCol2[400], szRecCol1[21], szRecCol2[400];
SQLINTEGER cbCol1, cbCol2;
SQLCHAR stmt[2048];

// Create a table with a CHAR field and a BLOB field
rc = SQLExecDirect(hstmt, "CREATE TABLE TABBLOB(COL1 CHAR(10), COL2 BLOB(400))", SQL_NTS);

strcpy(szCol1, "1234567890");
if (!params)  // no parameter markers
{
  strcpy(szCol2, "414243444546"); // 0x41 = 'A', 0x42 = 'B', 0x43 = 'C', ...
  wsprintf(stmt, "INSERT INTO TABBLOB VALUES('%s', BLOB(x'%s'))", szCol1, szCol2);
}
else
{
  strcpy(szCol2, "ABCDEF"); // 'A' = 0x41, 'B' = 0x42, 'C' = 0x43, ...
  strcpy(stmt, "INSERT INTO TABBLOB VALUES(?,?)");
}

// Prepare the 'Insert' statement
rc = SQLPrepare(hstmt, stmt, SQL_NTS);

// Bind the parameter markers
if (params)  // using parameter markers
{
  cbCol1 = char_len;
  rc = SQLBindParameter(hstmt, 1, SQL_PARAM_INPUT, SQL_C_CHAR, SQL_CHAR,
                                      char_len, 0, szCol1, char_len + 1, &cbCol1);

  cbCol2 = 6;
  rc = SQLBindParameter(hstmt, 2, SQL_PARAM_INPUT, SQL_C_BINARY, SQL_LONGVARBINARY,
                                      blob_len, 0, szCol2, blob_len, &cbCol2);
}

// Execute the 'Insert' statement to put a row of data into the table
rc = SQLExecute(hstmt);

// Prepare and Execute a 'Select' statement
rc = SQLExecDirect(hstmt, "SELECT * FROM TABBLOB", SQL_NTS);

// Bind the columns
rc = SQLBindCol(hstmt, 1, SQL_C_CHAR, szRecCol1, char_len + 1, &cbCol1);
rc = SQLBindCol(hstmt, 2, SQL_C_BINARY, szRecCol2, blob_len, &cbCol2);

// Fetch the first row
rc = SQLFetch(hstmt);
szRecCol2[cbCol2] = '\0';

// At this point szRecCol1 should contain the data "1234567890"
// szRecCol2 should contain the data 0x414243444546 or "ABCDEF"
```

Connection and statement attributes:

The ODBC specification defines several connection and statement attributes.

This ODBC specification is extended with several iSeries Access for Windows customized attributes, that are described in the following 2 tables.

Table 15. Customized connection attributes

Attribute	Get/Set	Description
1204	both	An unsigned value that controls the cursor commit behavior and cursor rollback behavior. Possible values: • 0 - SQL_CB_DELETE is returned for SQLGetInfo's SQL_CURSOR_COMMIT_BEHAVIOR and SQL_CURSOR_ROLLBACK_BEHAVIOR options. • 1 - (default) SQL_CB_PRESERVE is returned for SQLGetInfo's SQL _CURSOR_COMMIT_BEHAVIOR and SQL_CURSOR_ROLLBACK_BEHAVIOR options.
2100	both	Can be used as an alternative to using the DFTPKGLIB connection string keyword This is a character string that specifies the default package library to be used. This should be set prior to preparing a statement on this connection.
2101	both	This is a character string that specifies the package name to be used. This should be set prior to preparing a statement on this connection.
2103	get	Returns an unsigned integer value which is the server CCSID value (job CCSID) that the ODBC connection is dealing with. By default, SQL statements will be sent to the host in this CCSID
2104	both	Can be used as an alternative to the Divide by zero option of the DEBUG connection string keyword. This is an unsigned value indicating whether or not dividing a value by zero should return an error for data in a particular cell in the result set. Possible values: • 0 - (default) A cell in a result set that contains a value calculated by dividing by zero will be returned as an error. • 1 - A cell in a result set that contains a value calculated by dividing by zero will be returned as a NULL value. No error will be returned.

Table 15. Customized connection attributes (continued)

Attribute	Get/Set	Description
2106	both	An alternative to using the COMPRESSION connection string keyword. This is an unsigned integer value. Possible values: • 0 = compression off • 1 = compression on
2109	set	An unsigned value specifying whether or not to trim trailing spaces from data returned from CHAR fields. This will make CHAR fields appear like VARCHAR fields as VARCHAR fields are always trimmed of trailing spaces. Possible values: • 0 - (default) - don't trim CHAR fields • 1 - trim CHAR fields
2110	get	Returns a character string containing information about the prestart job that the ODBC connection is using. The information is returned as a string with the following format: • 10 character job name, • 10 character user, • 6 character job
2116	set	A pointer to a buffer containing the IBM Enterprise Workload Manager (eWLM) correlator. Specifying this attribute allows you to tie your application with the eWLM support (Enterprise Workload Manager).
2140	both	An unsigned integer value that specifies the amount of time (in seconds) that a distributed transaction waits before timing out. A value of 0 indicates to wait indefinitely for the transaction to finish. Setting this overrides any value that was set for the XATIMEOUT connection string keyword. The default value for this attribute is 0.
2141	both	An unsigned integer value that specifies the maximum amount of time (in seconds) that a distributed transaction waits on a lock request before timing out. A value of 0 indicates to use the default system settings. Setting this overrides any value that was set for the XALOCKTIMEOUT connection string keyword. The default value for this attribute is 0.
2142	both	An integer value that specifies the RMID to use for XA transaction work. This can be set at anytime. The RMID that is set must be unique for the process. If this value is set to 0 it indicates that any current XA transaction work has been completed for this connection. The default value for this attribute is 0.
2143	get	A character string that identifies the iSeries Access driver to call into for XA calls. This string is only valid if the 2142 connection attribute has been set. This string is set after the connection is established. The default value for this attribute is an empty-string.

Table 16. Customized statement attributes

Attribute	Get/Set	Description
1014	get	Returns an unsigned integer value indicating how many result sets are available to be fetched. This is useful when a stored procedure has been called and an application wants to know how many result sets the stored procedure generated.
2106	both	Allows compression to be turned on an off at the statement level. Possible values are: • 0 = compression off, • 1 = compression on
2114	get	Returns an unsigned integer value that indicates the offset into a SQL statement at which a SQL syntax error has occurred. This will be set when SQLExecute or SQLExecDirect returns an SQL_ERROR return code.

Connection pooling:

Connection pooling refers to the behavior where ODBC connections are left open after the application has requested to disconnect them. Connections that are in the pool can be reused by the same application avoiding the time consuming operation of creating a brand new connection.

To get an application to use connection pooling support with the iSeries Access ODBC driver two basic steps must be taken:

1. Connection pooling support has to be enabled for the driver. To enable this support, open ODBC Administrator, click on the Connection Pooling tab, double-click on iSeries Access ODBC Driver (32-bit), and switch the checkbox to indicate to pool connections to this driver. There is also a spot on the window to fill in the amount of time that unused connections remain in the pool.

   Note: Beginning with the V5R3 iSeries Access product, connection pooling support is automatically enabled for the driver. No additional steps are needed unless you want to override the default time (60 seconds) that unused connections remain in the pool.
2. Connection pooling support has to be enabled by the application. An application does this by setting the SQL_ATTR_CONNECTION_POOLING environment attribute as part of the connection process.

For more details on connection pooling support, search for ODBC at Microsoft's web site.

SQLPrepare and SQLNativeSQL escape sequences and scalar functions:

ODBC has escape sequences and scalar functions that can be used to avoiding having to code directly to the syntax of a particular DBMS's version of SQL.

See Microsoft's ODBC specification on how to use escape sequences. The following ODBC escape sequences are supported by the iSeries Access for Windows ODBC driver.

Escape sequences:

- d
- t
- ts
- escape
- oj
- call
- ?=call – This escape sequence should be used when trying to take advantage of the DB2 UDB for iSeries support for return values from a stored procedure. The parameter marker will need to be bound as an output parameter using the SQLBindParameter API. Note, at this time stored procedures can only return values of type integer.
- fn – This escape sequence is used when using the scalar functions below. The syntax is { fn scalar_function }.

Scalar functions mapped by the ODBC driver to the DB2 UDB for iSeries SQL syntax:

- length
- log
- database (Mapped on pre-V5R3 servers only)
- insert (Mapped on pre-V5R3 servers only)
- right (Mapped on pre-V5R3 servers only)

Note: All other scalar functions are supported natively in the DB2 UDB for iSeries SQL syntax, so no mapping is required.

Distributed transaction support:

Distributed transactions allow an application to coordinate units of work across multiple databases.

There are two different interfaces into the ODBC driver that allow one to complete a distributed transaction. The two interfaces are MTS (Microsoft Transaction Server) and XA API support. Both of these interfaces are affected by the setting of the XALOCKTIMEOUT and XATXNTIMEOUT connection string settings.

MTS

For more information on MTS refer to Using Microsoft Transaction Server (MTS).

XA API support

Refer to the 2140, 2141, 2142, and 2143 connection attributes on the **Connection and statement attributes** page for a description of some of the relevant options for getting the XA support to work. Note, that the 2141 and 2142 connection attributes do the same thing as the XALOCKTIMEOUT and XATXNTIMEOUT connection string settings.

Note:

- Multiple iSeries connections can be included in the distributed transaction only on V5R3 or later servers.
- xa_open is only called by the application for recovery purposes. When connecting through the ODBC API SQLConnect or SQLDriverConnect the xa_open is done automatically if the RMID was set via the 2142 connection attribute.
- The connection attribute SQL_ATTR_AUTOCOMMIT must be set as SQL_AUTOCOMMIT_ON.
- If an application wishes to start an XA transaction and then do some non-XA transaction work, one must set the RMID to 0 to indicate to the driver that the XA work is completed.
- To do XA recovery an application calls xa_open with a string of: *SYSTEM=mySystem;UID=myUserID;PWD="myPassword";DATABASE=myDatabase;* – replacing mySystem with your system name, myUserID with your user ID on that system, and myPassword with that user ID’s password. Note that the string must be specified exactly as shown. Alternatively you can specify just *SYSTEM=mySystem;*.

Cursor Behavior Notes:

Cursor behaviors can affect how data is fetched when working with the iSeries Access ODBC driver.

Cursor types can be set via SQLSetStmtAttr with the SQL_ATTR_CURSOR_TYPE option.

Cursor types:

- SQL_CURSOR_FORWARD_ONLY - All catalog and stored procedure result sets use this type of cursor. When a catalog or stored procedure result set has been generated the cursor type will be automatically changed to this.
- SQL_CURSOR_KEYSET_DRIVEN - mapped to SQL_CURSOR_STATIC if the host supports it, otherwise it is mapped to SQL_CURSOR_DYNAMIC
- SQL_CURSOR_DYNAMIC - supported.
- SQL_CURSOR_STATIC - A static cursor is supported to V5R1 and later iSeries servers. This cursor type is mapped to SQL_CURSOR_DYNAMIC for earlier iSeries versions.

Note: For more information on cursor types and stored procedure result sets see Stored procedure result sets.

The following factors can affect the concurrency of the cursor:

- If the SQL statement contains the ″FOR UPDATE″ clause the value for SQL_ATTR_CONCURRENCY will be set to SQL_CONCUR_LOCK.
- If the CONCURRENCY keyword / DSN setting is set to 1 (checked) then if the SQL statement does not have ″FOR FETCH ONLY″ clause in it the ODBC driver will lock records from the result set.

Rowset size:

The ODBC driver uses the value of SQL_ROWSET_SIZE when dealing with SQLExtendedFetch. The driver uses the value of SQL_ATTR_ROW_ARRAY_SIZE when dealing with SQLFetch and SQLFetchScroll.

When there are LOBs in a result set there is a chance that locators may be used by the driver. Locators are internal handles to LOB fields. Locators are used when the setting for the MAXFIELDLEN connection option has a smaller value than the size of a LOB column in the result set. Locators can improve performance in some cases as the driver only gets the data the application asks for. The downside of locators is that there is some extra communication needed with the server. When locators are not used the driver will download more LOB data even if it is not used. It is strongly encouraged that the COMPRESSION connection option be enabled if locators are not being used. See Connection String keywords descriptions for more details on the MAXFIELDLEN keyword

SQLGetData can only be used for accessing data from single row fetches. Calling SQLGetData with multiple-row fetches is not supported.

Result set row counts:

There are several options that your application can use to determine the row count before fetching data:

- You can set the cursor type to SQL_CURSOR_STATIC.
- If your application uses ADO, you can use client-side cursors.
- Your application can use the COUNT() function by calling SELECT COUNT(*) FROM MYTABLE prior to running the actual query.
- You can run the same query twice. The first time the query is run, fetch all the data to count the number of rows.

Extended dynamic disabled error:

The *Extended dynamic support disabled* message is seen when a SQL package is unusable for some reason.

On older servers, this message can be seen when a user connects with a different default library than the user who created the package. To workaround this message you can either:

1. Delete the SQL package on the system so that when you run your application the package will be created with your default package settings
2. Change the *SQL default library* connection string setting to match the setting that is saved with the SQL package
3. Switch the*Return code for unusable package* ODBC DSN setting to *Ignore* or *Warning*. Alternatively, you can get this same behavior by setting the PKG connection string setting.
4. Disable the XDYNAMIC connection string setting.

Restrictions of the 64–bit iSeries Access for Windows ODBC Driver:

MTS is not supported on the 64-bit iSeries Access for Windows ODBC driver.

For more information on MTS see Use Microsoft Transaction Server (MTS) .

SQLTables Description:

The following is a discussion about SQLTables description.

- The CatalogName parameter is ignored, with or without wildcards, since the catalog name is always the relational database name. The only time the catalog name value matters is when it must be an empty string to generate a list of libraries for the server.

  You must specify table names for the TableName parameter exactly as you would when creating a SQL statement. In other words, you must capitalize the table name unless you created the table name with double quotes around the table name. If you created the table with double quotes around the table name, you need to specify the TableName parameter as it appears in quotes, matching the case of the letters.
- The ″Library view″ option on the **Catalog** tab of the DSN setup GUI only affects this API when you choose the combination that attempts to retrieve the list of libraries for that server. It does not allow you to generate a result set based on a search through multiple libraries for specific tables.
- The ″Object description type″ option on the **Catalog** tab of the DSN setup GUI affects the output you get in the ″RESULTS″ column of the result set when getting a list of tables.
- If you have a string with mixed ′_′ and ′_′ then if SQL_ATTR_METADATA_ID is SQL_FALSE then we′ll treat the first ′_′ as an actual ′_′, but the ′_′ will be treated as the wildcard. If SQL_ATTR_METADATA_ID is SQL_TRUE then the first ′_′ will be treated like an actual ′_′ and the ′_′ will also be treated like an actual ′_′. The driver will internally convert the second ′_′ to a ′_′.
- In order to use the wildcard character underscore (_) as a literal precede it with a backlash (\). For example, to search for only MY_TABLE (not MYATABLE, MYBTABLE, etc...) you need to specify the search string as MY_TABLE.

  Specifiying ′\%′ in a name is invalid, as the iSeries server does not allow an actual ′%′ in a library or table name.

  When queried for the list of libraries, the driver returns the TABLE_CAT and REMARKS fields as meaningful data.

  The ODBC specification says to return everything, except the TABLE_SCHEM as nulls.

Handle long-running queries:

There are at least two ways you can handle long running queries through ODBC.

1. An application can set the SQL_ATTR_QUERY_TIMEOUT connection attribute to specify the maximum amount of time a query can run. Note, the query will not start if the SQL Optimizer determines that the amount of time needed to process the query will exceed the SQL_ATTR_QUERY_TIMEOUT value. The default value for SQL_ATTR_QUERY_TIMEOUT is 0 which indicates that the query will run until completion.
2. An application can call the SQLCancel API. To do this an application needs to be multi-threaded. While the long running query is running on one thread, another thread calls SQLCancel using the same statement handle.

Commitment control considerations:

Run ODBC autocommit support to different commit levels.

Beginning with V5R3, the commitment control model for the iSeries server, allows you to run ODBC autocommit support to use other commit levels than just *NONE. Prior to V5R3, autocommit support always runs under the *NONE commit level and *NONE will continue to be the default.

By specifying something other than *NONE, you can run autocommit under a different commit level. Be aware that an autocommit commitment levels other than *NONE require that you make additional other changes and that it changes the behavior of some functions, like eliminating the ability to update non-journaled files. For more ....

There is a SQLDriverConnect keyword called TRUEAUTOCOMMIT which allows an application to control whether or not it run autocommit under the *NONE commit level or the SQL_ATTR_TXN_ISOLATION setting. If TRUEAUTOCOMMIT is set to 1 in the SQLDriverConnect connection string then the application will run autocommit using the SQL_ATTR_TXN_ISOLATION setting. If TRUEAUTOCOMMIT is not set, the default value of 0 is used. The default behavior will run autocommit using the *NONE commit level.

iSeries Access for Windows ODBC performance

See any of the following ODBC performance topics.

Performance-tuning iSeries Access for Windows ODBC:

A key consideration for ODBC application developers is achieving maximum **performance** from client/server applications.

The following topics explore client/server performance issues in general, and address the performance implications of ODBC with popular query tools and development environments:

Introduction to server performance:

The performance characteristics of any computing environment may be described in the following terms.

Response time
The amount of time that is required for a request to be processed

Utilization
The percentage of resources that are used when processing requests

Throughput
The volume of requests (per unit of time) that are being processed

Capacity
The maximum amount of throughput that is possible

Typically, response time is the critical performance issue for **users** of a server. Utilization frequently is important to the **administrators** of a server. Maximum throughput is indicative of the performance *bottleneck,* and may not be a concern. While all of these characteristics are interrelated, the following summarizes server performance:

- Every computing server has a bottleneck that governs performance: **throughput**.
- When server utilization increases, response time degrades.

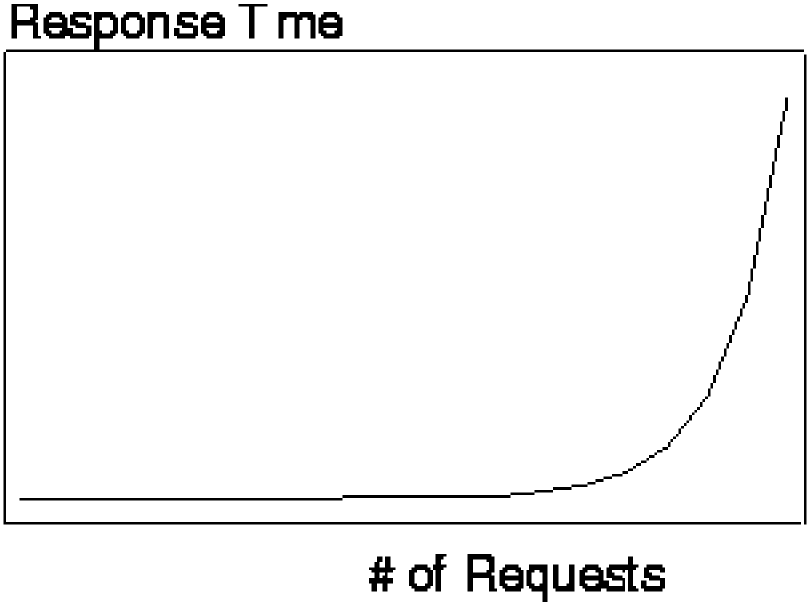
In many servers, capacity is considerable, and is not an issue with users. In others, it is the primary performance concern. Response time is critical. One of the most important questions for administrators is: *How much can the server be degraded (by adding users, increasing utilization) before users begin objecting?*

Introduction to client/server performance:

The performance characteristics of a client/server environment are different than those of centralized environments.

This is because client/server applications are split between the client and the server. The client and server communicate by sending and receiving requests and messages. This model is far different than that for a centralized environment. In that environment, a program calls the CPU, and the memory and disk drives are fully dedicated.

Instead, when a client requests processing time and data from the server, it transmits the request on the network. The request travels to the server and waits in a queue until the server is able to process it. The performance characteristics of this type of architecture degrade exponentially as the number of requests increase. In other words, response times increase gradually as more requests are made, but then increase dramatically at some point, which is known as the ″knee of the curve.″ This concept is illustrated by the following graph:



It is important to determine this point at which performance begins to degrade significantly. The point can vary with every client/server installation.

The following is a suggested guideline for client/server operations: *Communicate with the server only when necessary, and in as few data transmissions as possible.* Opening a file and reading one record at a time often results in problems for client-server projects and tools.

The performance architecture of the iSeries Access for Windows ODBC driver:

For the iSeries Access for Windows ODBC driver, all of the internal data flows between the client and the server are chained together, and transmit only when needed.

This reduces server utilization because communications-layer resources are allocated only once. Response times improve correspondingly.

These types of enhancements are transparent to the user. However, there are some enhancements which are exposed on the iSeries Access for Windows ODBC Setup dialog. Look at the online help on the **Peformance** tab of the setup GUI or refer to the Performance options on the Connection String keywords descriptions for more information. A few of these performance options are also discussed in more detail at the following links:

Select a stringent level of commitment control:

Do not use commitment control unnecessarily. The overhead that is associated with locking not only increases utilization, but also reduces concurrency. However, if your application is not read-only, commitment control *may* be required.

A common alternative is to use **optimistic locking**. Optimistic locking involves issuing explicit UPDATEs by using a WHERE clause that uniquely determines a particular record. Optimistic locking ensures that the record does not change after it is retrieved.

Many third-party tools use this approach, which is why they often require a unique index to be defined for updatable tables. This allows the record update to be made by fully qualifying the entire record contents. Consider the following example:

```
UPDATE table SET C1=new_val1, C2=new_val2, C2=new_val3
   WHERE C1=old_val1 AND C2=old_val2 AND C3=old_val3
```

This statement would guarantee that the desired row is accurately updated, but only if the table contained only three columns, and each row was unique. A better-performing alternative would be:

```
UPDATE table SET C1=new_val1, C2=new_val2, C3=CURRENT_TIMESTAMP
   WHERE C3=old_timestamp
```

This only works, however, if the table has a timestamp column that holds information on when the record was last updated. Set the new value for this column to CURRENT_TIMESTAMP to guarantee row uniqueness.

Note: This technique does not work with any object model that uses automation data types (for example, Visual Basic, Delphi, scripting languages). The variant DATE data type has a timestamp precision of approximately one millisecond. The iSeries server timestamp is either truncated or rounded off, and the WHERE clause fails.

If commitment control is required, use the lowest level of record locking possible. For example, use ***CHG:** over ***CS** when possible, and never use ***ALL** when ***CS** provides what you require.

Related information

Database Commitment control

DB2 UDB for iSeries SQL Reference

Fine-tune record-blocking:

Record-blocking is a technique that significantly reduces the number of network flows.

It does this by returning a *block* of rows from the server on the first FETCH request for a cursor. Subsequent FETCH requests are retrieved from the local block of rows, rather then going to the server each time. This technique dramatically increases performance when it is properly used. The default settings should be sufficient for most situations.

A change to one of the record-blocking parameters can make a significant difference when the performance of your environment is approaching the exponential threshold that is illustrated in "Introduction to client/server performance" on page 507. For example, assume that an environment has *n* decision-support clients doing some amount of work with large queries, typically returning 1 MB of data.

At the opposite extreme is a scenario where users consistently ask for large amounts of data, but typically never examine more than a few rows. The overhead of returning 32KB of rows when only a few are needed could degrade performance. Setting the *BLOCKSIZE* or *BlockSizeKB* connection string keyword to a lower value, setting the *BLOCKFETCH* connection string keyword to 0 (Use ODBC blocking) or disabling record blocking altogether, might actually increase performance.

It is important to note that, as always in client/server, performance results may vary. You might make changes to these parameters and not realize any difference. This may indicate that your performance bottleneck is not the client request queue at the server. This parameter gives you one more tool to use when your users start objecting.

Related reference

"Connection string keywords - Performance properties" on page 485
Use these iSeries Access ODBC driver connection string keywords to change Performance properties of the ODBC connection.

Use Extended Dynamic SQL:

Use the ODBC call level interface to dynamically run your SQL statements.

Traditional SQL interfaces used an embedded SQL approach. SQL statements were placed directly in an application's source code, along with high-level language statements written in C, COBOL, RPG, and other programming languages. The source code then was precompiled, which translated the SQL statements into code that the subsequent compile step could process. This method sometimes was referred to as **static SQL**. One performance advantage to this approach is that SQL statements were optimized in advance, rather than at runtime while the user was waiting.

ODBC, however, is a **call level interface** (CLI) that uses a different approach. Using a CLI, SQL statements are passed to the database management system (DBMS) within a parameter of a runtime API. Because the text of the SQL statement is never known until runtime, the optimization step must be performed each time an SQL statement is run. This approach commonly is referred to as **dynamic SQL**.

The use of this feature (which is enabled by default) not only can improve response times, but can improve dramatically server utilization. This is because optimizing SQL queries can be costly, and performing this step only once always is advantageous. This works well with a unique feature of DB2 UDB for iSeries. Unlike other DBMSs, it ensures that statements which are stored in packages are kept up-to-date in terms of optimization, without administrator intervention. Even if a statement was prepared for the first time weeks or months ago, DB2 UDB for iSeries automatically regenerates the access plan when it determines that sufficient database changes require reoptimization.

For more information on packages and the types of SQL statements stored in them see SQL packages.

Performance considerations of common end-user tools:

Having an ODBC driver that is optimally tuned is only part of the performance equation. The other part is the tools that are used; whether they are used simply to query the data, or to build complex programs.

Some of the more common tools include:
- Crystal Services Crystal Reports Professional
- Cognos Impromptu
- Gupta SQL Windows
- IBM Visualizer for Windows
- Lotus® Approach®
- Lotus Notes
- Notes Pump
- Microsoft Access
- Microsoft Internet Information Server
- Microsoft SQL Server
- Microsoft Visual Basic
- Powersoft PowerBuilder

There are many more tools available than are on this list, and every tool in the marketplace has its own strengths, weaknesses, and performance characteristics. But most have one thing in common: support for ODBC database servers. However, because ODBC serves as a common denominator for various database management systems, and because there are subtle differences from one ODBC driver to the next, many tool providers write to the more common ODBC and SQL interfaces. By doing this, they avoid taking advantage of a unique characteristic of a particular database server. This may ease programming efforts, but it often degrades overall performance.

Examples of ODBC performance-degrading tools:
"Examples: Common tool behaviors that degrade ODBC performance"

Examples: Common tool behaviors that degrade ODBC performance:

The following examples demonstrate performance problems that are associated with writing SQL and ODBC calls that do NOT take advantage of a unique feature of a particular ODBC driver or the server database management system.

Example: Query tool A:

This example illustrates using ODBC bound columns to retrieve information faster.

Query Tool A makes the following ODBC calls to process SELECT statements:

```
SQLExecDirect("SELECT * FROM table_name")

WHILE there_are_rows_to_fetch DO

   SQLFetch()
   FOR every_column DO
      SQLGetData( COLn )
   END FOR
   ...process the data

END WHILE
```

This tool does not make use of ODBC bound columns, which can help performance. A faster way to process this is as follows:

```
SQLExecDirect("SELECT * FROM table_name")
FOR every_column DO
   SQLBindColumn( COLn )
END FOR

WHILE there_are_rows_to_fetch DO
   SQLFetch()
   ...process the data
END WHILE
```

If a table contained one column, there would be little difference between the two approaches. But for a table with a 100 columns, you end up with 100 times as many ODBC calls in the first example, *for every row fetched*. You also can optimize the second scenario because the target data types specified by the tool will not change from one FETCH to the next, like they could change with each **SQLGetData** call.

Example: Query tool B:

This example illustrates using one allocation statement for the entire call.

Query tool B allows you to update a spreadsheet of rows and then send the updates to the database. It makes the following ODBC calls:

```
FOR every_row_updated DO

   SQLAllocHandle(SQL_HANDLE_STMT)
   SQLExecDirect("UPDATE...SET COLn='literal'...WHERE COLn='oldval'...")
   SQLFreeHandle( SQL_HANDLE_STMT )

END LOOP
```

The first thing to note is that the tool performs a statement allocation-and-drop for every row. Only one allocate statement is needed. This change would save the overhead of creating and destroying a statement handle for every operation. Another performance concern is the use of SQL with literals instead of with parameter markers. The **SQLExecDirect()** call causes an **SQLPrepare** and **SQLExecute** every time. A faster way to perform this operation would be as follows:

```
SQLAllocHandle(SQL_HANDLE_STMT)
SQLPrepare("UPDATE...SET COL1=?...WHERE COL1=?...")
SQLBindParameter( new_column_buffers )
SQLBindParameter( old_column_buffers )
FOR every_row_updated DO

   ...move each rows data into the SQLBindParameter buffers
   SQLExecute()
   SQLFreeHandle( SQL_HANDLE_STMT )

END LOOP
```

These sets of ODBC calls will outperform the original set by a large factor when you are using the iSeries Access for Windows ODBC driver. The server CPU utilization will decrease to 10 percent of what it was, which pushes the scaling threshold out a lot farther.

Example: Query tool C:

In this example, the complex decision support-type queries ended up making the query run longer.

Query tool C allows complex decision support-type queries to be made by defining complex query criteria with a point-and-click interface. You might end up with SQL that looks like this for a query:

```
SELECT A.COL1, B.COL2, C.COL3 , etc...
   FROM A, B, C, etc...
      WHERE many complex inner and outer joins are specified
```

That you did not have to write this complex query is advantageous, but beware that your tool may not actually process this statement. For example, one tool might pass this statement directly to the ODBC driver, while another splits up the query into many individual queries, and processes the results at the client, like this:

```
SQLExecDirect("SELECT * FROM A")
SQLFetch() all rows from A
SQLExecDirect("SELECT * FROM B")
SQLFetch() all rows from B

Process the first join at the client

SQLExecDirect("SELECT * FROM C")
SQLFetch() all rows from C

Process the next join at the client
.
.
.
And so on...
```

This approach can lead to excessive amounts of data being passed to the client, which will adversely affect performance. In one real-world example, a programmer thought that a 10-way inner/outer join was being passed to ODBC, with four rows being returned. What actually was passed, however, was 10 simple SELECT statements and all the FETCHes associated with them. The net result of four rows was achieved only after *81,000* ODBC calls were made by the tool. The programmer initially thought that ODBC was responsible for the slow performance, until the ODBC trace was revealed.

SQL performance:

Good application design includes the efficient use of machine resources. To run in a manner that is acceptable to the end user, an application program must be efficient in operation, and must run with adequate response time.

SQL performance general considerations:

Performance of SQL in application programs is important to ALL server users, because inefficient usage of SQL can waste server resources.

The primary goal in using SQL is to obtain the correct results for your database request, and in a timely manner.

Before you start designing for performance, review the following considerations:

When to consider performance:

- Database with over 10,000 rows - Performance impact: **noticeable**
- Database with over 100,000 rows - Performance impact: **concern**
- When repetitively using complex queries
- When using multiple work stations with high transaction rates

What resource to optimize:

- I/O usage
- CPU usage
- Effective usage of indexes
- OPEN/CLOSE performance
- Concurrency (COMMIT)

How to design for performance:

- **Database design:**
  - Table structure
  - Indexes
  - Table data management
  - Journal management
- **Application design:**
  - Structure of programs involved
- **Program design:**
  - Coding practices
  - Performance monitoring

The *SQL Reference* book contains additional information. You can view an HTML online version of the book, or print a PDF version, from the DB2 Universal Database for iSeries SQL Reference iSeries Information Center topic.

Database design:

Use the following topics to determine what tables you require in your database and to understand the relationship between those tables.

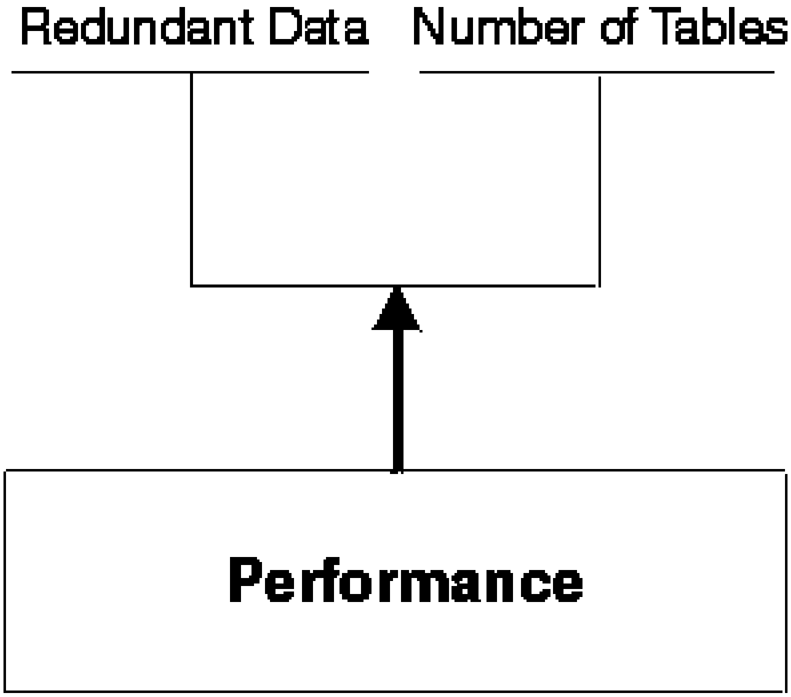
Normalization:

Several available design methods allow you to design technically correct databases, and effective relational database structure. Some of these methods are based on a design approach called normalization. Normalization refers to the reduction or elimination of storing redundant data.

The primary objective of normalization is to avoid problems that are associated with updating redundant data.

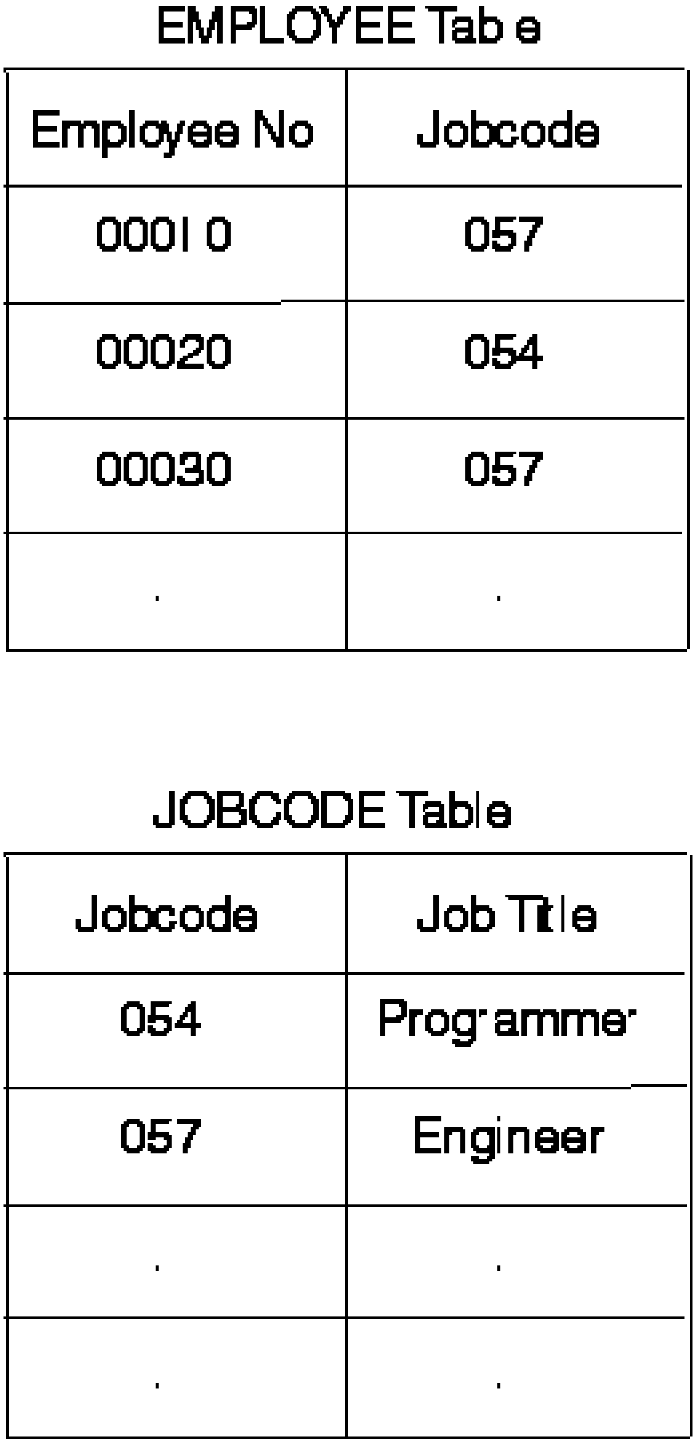
However, this design approach of normalization (for example, 3NF–3rd Normal Form), may result in large numbers of tables. If there are numerous table join operations, SQL performance may be reduced. Consider overall SQL performance when you design databases. Balance® the amount of redundant data with the number of tables that are not fully normalized.

The following graphic illustrates that the proportion of redundant data to the number of tables affects performance:



Minimize the use of code tables when little is gained from their use. For example, an employee table contains a JOBCODE column, with data values 054, 057, and so forth. This table must be joined with another table to translate the codes to Programmer, Engineer, and so on. The cost of this join could be quite high compared to the savings in storage and potential update errors resulting from redundant data.

For example:



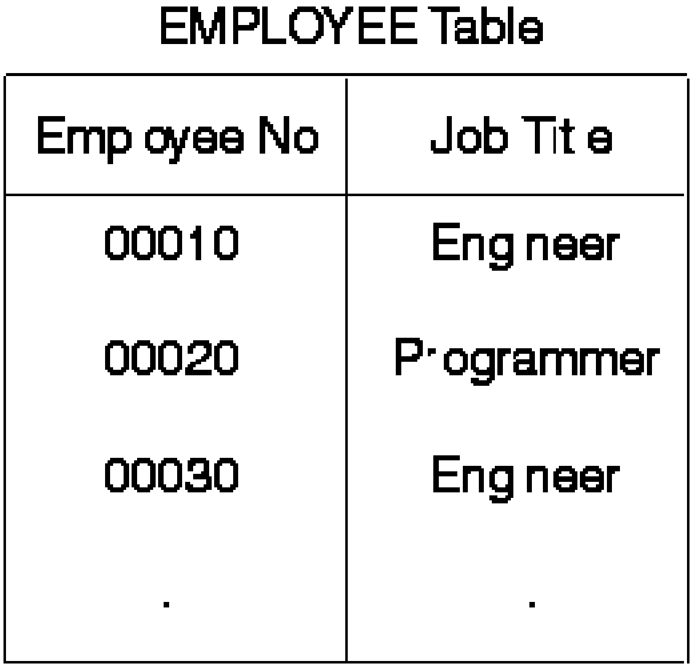
EMPLOYEE Tab e

Employee No	Jobcode
0001 0	057
00020	054
00030	057
.	.

JOBCODE Table

Jobcode	Job Tit e
054	Prog amme
057	Engineer
.	.
.	.

Figure 2. Normalized data form:



EMPLOYEE Table

Emp oyee No	Job Tit e
00010	Eng neer
00020	P·ogrammer
00030	Eng neer
.	.

Figure 3. Redundant data form:

The set level (or mass operation) nature of SQL significantly lessens the danger of a certain redundant data form. For example, the ability to update a set of rows with a single SQL statement greatly reduces this risk. In the following example, the job title **Engineer** must be changed to **Technician** for all rows that match this condition.

Use SQL to update JOBTITLE:

```
UPDATE EMPLOYEE
  SET JOBTITLE = "Technician"
  WHERE JOBTITLE = "Engineer"
```

Table size:

The size of the tables that your application program accesses has a significant impact on the performance of the application program.

Consider the following:

Large row length:
For sequentially accessed tables that have a large row length because of many columns (100 or more), you may improve performance by dividing the tables into several smaller ones, or by creating a view. This assumes that your application is not accessing all of the columns. The main reason for the better performance is that I/O may be reduced because you will get more rows per page. Splitting the table will affect applications that access all of the columns because they will incur the overhead of joining the table back together again. You must decide where to split the table based on the nature of the application and frequency of access to various columns.

Large number of rows:
If a table has a large number of rows, construct your SQL statements so that the “Optimizer” on page 518 uses an index to access the table. The use of indexes is very important for achieving the best possible performance.

Use indexes:

The use of indexes can improve significantly the performance of your applications.

This is because the “Optimizer” on page 518 uses them for performance optimization. Indexes are created in five different ways:

- CREATE INDEX (in SQL)
- CRTPF, with key
- CRTLF, with key
- CRTLF, as join logical file
- CRTLF, with select/omit specifications, without a key, and without dynamic selection (DYNSLT).

Indexes are used to enable row selection by means of index-versus-table scanning, which is usually slower. Table scanning sequentially processes all rows in a table. If a permanent index is available, building a temporary index can be avoided. Indexes are required for:

- Join tables
- ORDER BY
- GROUP BY

Indexes will be created, if no permanent index exists.

Manage the number of indexes to minimize the extra server cost of maintaining the indexes during update operations. Below are general rules for particular types of tables:

Primarily read-only tables:
Create indexes over columns as needed. Consider creating an index only if a table is greater than approximately 1,000 rows or is going to be used with ORDER BY, GROUP BY, or join processing. Index maintenance could be costlier than occasionally scanning the entire table.

Primarily read-only table, with low update rate:
Create indexes over columns as needed. Avoid building indexes over columns that are updated frequently. INSERT, UPDATE, and DELETE will cause maintenance to all indexes related to the table.

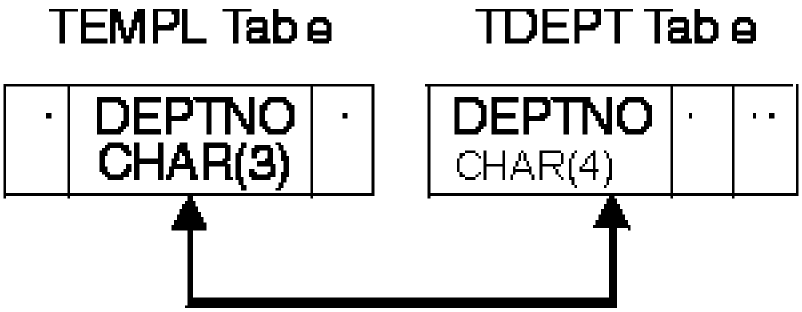
High update-rate tables:
Avoid creating many indexes. An example of a table that has a high update rate is a logging or a history table.

Match attributes of join fields:

Columns in tables that are joined should have identical attributes: the same column length, same data type (character, numeric), and so forth. Nonidentical attributes result in temporary indexes being built, even though indexes over corresponding columns may exist.

In the following example, **join** will build a temporary index and ignore an existing one:

```
SELECT EMPNO, LASTNAME, DEPTNAME
  FROM TEMPL, TDEPT
  WHERE TEMPL.DEPTNO = TDEPT.DEPTNO
```



Optimizer:

Optimizer is an important module of the i5/OS Query component because it makes the key decisions for good database performance. Its main objective is to find the most efficient access path to the data.

Query optimization is a trade-off between the time spent to select a query implementation and the time spent to run it. Query optimization must handle the following distinct user needs:

- Quick interactive response
- Efficient use of total-machine resources

In deciding how to access data, Optimizer does the following:

- Determines possible implementations
- Picks the optimal implementation for the i5/OS Query component to execute

Cost estimation:

At runtime, the Optimizer chooses an optimal access method for the query by calculating an implementation cost based on the current state of the database.

The Optimizer models the access cost of each of the following:

- Reading rows directly from the table (dataspace scan processing)
- Reading rows through an access path (using either key selection or key positioning)
- Creating an access path directly from the dataspace
- Creating an access path from an existing access path (index-from-index)
- Using the query sort routine (if conditions are satisfied)

The cost of a particular method is the sum of:

- The start-up cost
- The cost associated with the given optimization mode. The OPTIMIZE FOR n ROWS clause indicates to the query Optimizer the optimization goal to be achieved. The Optimizer can optimize SQL queries with one of two goals:
  1. Minimize the time required to retrieve the first buffer of rows from the table. This goal biases the optimization towards not creating an index.

     Note: This is the default if you do not use OPTIMIZE FOR n ROWS.

     Either a data scan or an existing index is preferred. This mode can be specified by:
     - The OPTIMIZE FOR n ROWS allowing the users to specify the number of rows they expect to retrieve from the query.

       The Optimizer using this value to determine the percentage of rows that will be returned and optimizes accordingly. A small value instructs the Optimizer to minimize the time required to retrieve the first n rows.
  2. Minimize the time to process the whole query assuming that all selected rows are returned to the application. This does not bias the Optimizer to any particular access method. Specify this mode by using OPTIMIZE FOR n ROWS, which allows the users to specify the number of rows they expect to retrieve from the query.

     The Optimizer uses this value to determine the percentage of rows that will be returned and optimizes accordingly. A value greater than or equal to the expected number of resulting rows instructs the Optimizer to minimize the time required to run the entire query.
- The cost of any access path creations.
- The cost of the expected number of page faults to read the rows and the cost of processing the expected number of rows.

Page faults and number of rows processed may be predicted by statistics the Optimizer obtains from the database objects, including:

- Table size
- Row size
- Index size
- Key size

A weighted measure of the expected number of rows to process. This is based on what the relational operators in the row selection predicates (default filter factors) are likely to retrieve:

- 10% for equal
- 33% for less-than, greater-than, less-than-equal-to, or greater-than-equal-to
- 90% for not equal
- 25% for BETWEEN range
- 10% for each IN list value

Key range estimate is a method that the Optimizer uses to gain more accurate estimates of the number of expected rows that are selected from one or more selection predicates. The Optimizer estimates by applying the selection predicates against the left-most keys of an existing index. The **default filter factors** then can be further refined by the estimate based on the key range. If the left-most keys in an index match columns that are used in row-selection predicates, use that index to estimate the number of keys that match the selection criteria. The estimate of the number of keys is based on the number of pages and key density of the machine index. It is performed without actually accessing the keys. Full indexes over columns that are used in selection predicates can significantly help optimization.

Optimizer decision-making rules:

In performing its function, Optimizer uses a general set of guidelines to choose the best method for accessing data.

Optimizer does the following:

- Determines the default filter factor for each predicate in the selection clause.
- Extracts attributes of the table from internally stored information.
- Performs an estimate key range to determine the true filter factor of the predicates when the selection predicates match the left-most keys of an index.
- Determines the cost of creating an index over a table if an index is required.
- Determines the cost of using a sort routine if selection conditions apply and an index is required.
- Determines the cost of dataspace scan processing if an index is not required.
- For each index available, in the order of most recently created to oldest, Optimizer does the following until its time limit is exceeded:
  - Extracts attributes of the index from internally stored statistics.
  - Determines if the index meets the selection criteria.
  - Determines the cost of using the index using the estimated page faults and the predicate filter factors to help determine the cost.
  - Compares the cost of using this index with the previous cost (current best).
  - Selects the cheapest one.
  - Continues to search for best index until time out or no more indexes.

The time limit factor controls how much time is spent choosing an implementation. It is based on how much time has been spent and the current best implementation cost found. Dynamic SQL queries are subject to Optimizer time restrictions. Static SQL queries optimization time is not limited.

For small tables, the query Optimizer spends little time in query optimization. For large tables, the query Optimizer considers more indexes. Generally, Optimizer considers five or six indexes (for each table of a join) before running out of optimization time.

ODBC blocked insert statement:

The blocked **INSERT** statement provides a means to insert multiple rows with a single **SQLExecute** request. For performance, it provides the one of the best ways to populate a table, at times providing a tenfold performance improvement over the next best method.

The three forms of INSERT statements that can be executed from ODBC are:

- INSERT with VALUES using constants
- INSERT with VALUES using parameter markers
- blocked INSERT

The INSERT with VALUES using constants statement is the least efficient method of performing inserts. For each request, a single INSERT statement is sent to the server where it is prepared, the underlying table is opened, and the record is written.

Example:

```
INSERT INTO TEST.TABLE1 VALUES('ENGINEERING',10,'JONES','BOB')
```

The INSERT with VALUES using parameter markers statement performs better than the statement that uses constants. This form of the INSERT statement allows for the statement to be prepared only once and then reused on subsequent executions of the statement. It also allows the table on the server to remain open, thus removing the overhead of opening and closing the file for each insert.

Example:

```
INSERT INTO TEST.TABLE1 VALUES (?, ?, ?, ?)
```

The blocked INSERT statement most efficiently performs inserts into a table when multiple records can be cached on the client and sent at once. The advantages with blocked INSERT are:

- The data for multiple rows is sent in one communication request rather than one request per row.
- The server has an optimized path built into the database support for blocked INSERT statements.

Example:

```
INSERT INTO TEST.TABLE1 ? ROWS VALUES (?, ?, ?, ?)
```

The INSERT statement has additional syntax that identifies it as a blocked INSERT. The ″? ROWS″ clause indicates that an additional parameter will be specified for this INSERT statement. It also indicates that the parameter will contain a row count that determines how many rows will be sent for that execution of the statement. The number of rows must be specified by means of the **SQLSetStmtAttr** API.

Note: With the V5R1 driver, you do not need to specify the ″? ROWS″ clause to iSeries servers. V4R5 iSeries servers added this support via PTFs SF64146 and SF64149.

To view examples of blocked insert calls from C:
See “Block insert and block fetch C example” on page 454

Catalog functions:

Catalog functions return information about the DB2 UDB for iSeries database with which you are working.

To process ODBC **SQLTables** requests, logical files are built over the server cross reference file QADBXREF in library QSYS. QADBXREF is a database file for database-maintained cross-reference information that is part of the dictionary function for the server.

The following are the actions for **SQLTables** when **TableType** is set to the following:

NULL Selects all LOGICAL and PHYSICAL files and SQL TABLES and VIEWS.

TABLE
Selects all PHYSICAL files, and SQL TABLES that are not server files (cross reference or data dictionary).

VIEW Selects all LOGICAL files and SQL VIEWS that are not server files (cross reference or data dictionary).

SYSTEM TABLE
Selects all PHYSICAL and LOGICAL files and SQL VIEWS that are either server files or data dictionary files.

TABLE, VIEW
Selects all LOGICAL and PHYSICAL files and all SQL TABLES and VIEWS that are not server files or data dictionary files.

Non-relational files (files with more than one format) are not selected. Also not selected are indexes, flat files and IDDU-defined files.

The result sets returned by the catalog functions are ordered by table type. In addition to the TABLE and VIEW types, the iSeries server has the data source-specific type identifiers of PHYSICAL and LOGICAL files. The PHYSICAL type is handled as a TABLE, and the LOGICAL type is handled as a VIEW.

To process ODBC **SQLColumns** requests, a logical file is built over the server cross-reference file QADBIFLD in the QSYS library. This logical file selects all relational database files except for indexes. QADBIFLD is a database file for database-maintained cross-reference information that is part of the dictionary function for the server. Specifically, this includes database file column and field information.

For additional information:
The Appendix of the *SQL Reference* book contains additional information. View an HTML online version of the book, or print a PDF version, from the DB2 Universal Database for iSeries SQL Reference iSeries Information Center topic.

Exit programs:

An exit program is a program to which control is passed from a calling program.

When you specify an **exit program**, the servers pass the following two parameters to the exit program before running your request:

- A 1-byte return code value.
- A structure containing information about your request. This structure is different for each of the exit points.

These two parameters allow the exit program to determine whether your request is allowed. If the exit program sets the return code to X’F0’, the server rejects the request. If the return code is set to anything else, the server allows the request.

The same program can be used for multiple exit points. The program can determine what function is being called by looking at the data in the second parameter structure.

Use the Work with Registration Information (WRKREGINF) command to add your exit programs to the database exit points.

The database server has five different exit points defined:

QIBM_QZDA_INIT
called at server initiation

QIBM_QZDA_NDB1
called for native database requests

QIBM_QZDA_SQL1
called for SQL requests

QIBM_QZDA_SQL2
called for SQL requests

QIBM_QZDA_ROI1
called for retrieving object information requests and SQL catalog functions

Note: This exit point is called less often than in V5R1 and earlier Client Access ODBC drivers. If you have an exit program that uses this exit point, verify that it still works as intended.

Examples: User exit programs:

The following examples do not show all of the programming considerations or techniques. Review the examples before you begin application design and coding.

Example: ILE C/400 user exit program for exit point QIBM_QZDA_INIT:

The following ILE C/400® program handles ODBC security by rejecting requests from certain users. It can be used as a shell for developing exit programs tailored for your operating environment.

```
/*--------------------------------------------------------------------------
 *               @@ss1s@@ Servers - Sample Exit Program
 *
 *    Exit Point Name         : QIBM_QZDA_INIT
 *
 *    Description             : The following ILE C/400 program handles
 *                              ODBC security by rejecting requests from
 *                              certain users.
 *                              It can be used as a shell for developing
 *                              exit programs tailored for your
 *                              operating environment.
 *
 *    Input                   : A 1-byte return code value
 *                                 X'F0' server rejects the request
 *                                 anything else server allows the request
 *                              Structure containing information about the
 *                                request.  The format used by this program
 *                                is ZDAI0100.
 *------------------------------------------------------------------------*/
/*------------------------------------------------------------------------
 *     Includes
 *------------------------------------------------------------------------*/
#include <string.h>                 /* string functions                   */
/*------------------------------------------------------------------------
 *    User Types
 *------------------------------------------------------------------------*/
typedef struct {             /* Exit Point QIBM_QZDA_INIT format ZDAI0100 */
    char User_profile_name[10];     /* Name of user profile calling server*/
    char Server_identifier[10];     /* database server value (*SQL)       */
    char Exit_format_name[8];       /* User exit format name (ZDAI0100)   */
    long Requested_function;        /* function being preformed (0)       */
} ZDAI0100_fmt_t;

 /*-----------------------------------------------------------------------
   -----------------------------------------------------------------------*/
```

```
/*========================================================================
 *    Start of mainline executable code
 *========================================================================*/
int main (int argc, char *argv[])
{
    ZDAI0100_fmt_t input;           /* input format record                */

    /* copy input parm into structure                                     */
    memcpy(&input, (ZDAI0100_fmt_t *)argv[2], 32);

    if /* if user name is GUEST                                           */
        ( memcmp(input.User_profile_name, "GUEST     ", 10)==0 )
    {
        /* set return code to reject the request.                         */
        memcpy( argv[1], "0", 1);
    }
    else /* else user is someone else                                     */
    {
        /* set return code to allow the request.                          */
        memcpy( argv[1], "1", 1);
    }
}  /* End of mainline executable code                                     */
```

Example: CL user exit program for exit point QIBM_QZDA_INIT:

The following Control Language program handles ODBC security by rejecting requests from certain users. It can be used as a shell for developing exit programs tailored for your operating environment.

```
/* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * */
/*                @@ss1s@@ Servers - Sample Exit Program                   */
/*                                                                       */
/*    Exit Point Name         : QIBM_QZDA_INIT                           */
/*                                                                       */
/*    Description             : The following Control Language program   */
/*                              handles ODBC security by rejecting       */
/*                              requests from certain users.             */
/*                              It can be used as a shell for developing */
/*                              exit programs tailored for your          */
/*                              operating environment.                   */
/* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * */
PGM PARM(&STATUS &REQUEST)

/* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * */
/*  Program call parameter declarations                                  */
/* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * */
  DCL VAR(&STATUS) TYPE(*CHAR) LEN(1)  /* Accept/Reject indicator        */
  DCL VAR(&REQUEST) TYPE(*CHAR) LEN(34) /* Parameter structure           */

/* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * */
/*  Parameter declares                                                   */
/* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * */
  DCL VAR(&USER) TYPE(*CHAR) LEN(10)  /* User profile name calling server*/
  DCL VAR(&SRVID) TYPE(*CHAR) LEN(10) /* database server value (*SQL)    */
  DCL VAR(&FORMAT) TYPE(*CHAR) LEN(8) /* Format name (ZDAI0100)          */
  DCL VAR(&FUNC) TYPE(*CHAR) LEN(4)   /* function being preformed (0)    */

/* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * */
/*  Extract the various parameters from the structure                    */
/* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * */
  CHGVAR VAR(&USER)   VALUE(%SST(&REQUEST  1 10))
  CHGVAR VAR(&SRVID)  VALUE(%SST(&REQUEST 11 10))
  CHGVAR VAR(&FORMAT) VALUE(%SST(&REQUEST 21  8))
  CHGVAR VAR(&FUNC)   VALUE(%SST(&REQUEST 28  4))

/*------------------------------------------------------------------------
   ------------------------------------------------------------------------*/
```

```
/* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * */
/*  Begin main program                                                    */
/* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * */

  /* set return code to allow the request.                                */
  CHGVAR VAR(&STATUS) VALUE('1')

  /* if user name is GUEST set return code to reject the request.         */
  IF (&USER *EQ 'GUEST') THEN( +
      CHGVAR VAR(&STATUS) VALUE('0') )

EXIT:
ENDPGM
```

Example: ILE C/400 Program for exit point QIBM_QZDA_SQL1:

The following ILE C/400 program will reject any UPDATE request for user GUEST. It can be used as a shell for developing exit programs tailored for your operating environment.

```
/*--------------------------------------------------------------------------
 *                @@ss1s@@ Servers - Sample Exit Program
 *
 *    Exit Point Name         : QIBM_QZDA_SQL1
 *
 *    Description             : The following ILE C/400 program will
 *                                reject any UPDATE request for user GUEST.
 *                                It can be used as a shell for developing
 *                                exit programs tailored for your
 *                                operating environment.
 *
 *    Input                   : A 1-byte return code value
 *                                   X'F0' server rejects the request
 *                                   anything else server allows the request
 *                                Structure containing information about the
 *                                  request.  The format used by this program
 *                                  is ZDAQ0100.
 *------------------------------------------------------------------------*/
/*------------------------------------------------------------------------
 *     Includes
 *------------------------------------------------------------------------*/
#include <string.h>                 /* string functions                    */
#include <stdio.h>                  /* standard IO functions               */
#include <ctype.h>                  /* type conversion functions           */
/*========================================================================
 *    Start of mainline executable code
 *========================================================================*/
main(int argc, char *argv[])
{
    long i;
    _Packed struct zdaq0100 {
        char name[10];
        char servid[10];
        char fmtid[8];
        long funcid;
        char stmtname[18];
        char cursname[18];
        char prepopt[2];
        char opnattr[2];
        char pkgname[10];
        char pkglib[10];
        short drdaind;
        char commitf;
        char stmttxt[512];
    } *sptr, stx;

/*------------------------------------------------------------------------
```

```
   -------------------------------------------------------------------------*/
    /* initialize return variable to indicate ok status                   */
    strncpy(argv[1],"1",1);

    /**********************************************************************/
    /*  Address parameter structure for @@sqll@@ exit program and move local   */
    /*  parameters into local variables.                                  */
    /* (note : this is not necessary to evaluate the arguments passed in). */
    /**********************************************************************/
    sptr = (_Packed struct zdaq0100 *) argv[2];

    strncpy(stx.name, sptr->name, 10);
    strncpy(stx.servid, sptr->servid, 10);
    strncpy(stx.fmtid, sptr->fmtid, 8);
    stx.funcid = sptr->funcid;
    strncpy(stx.stmtname, sptr->stmtname, 18);
    strncpy(stx.cursname, sptr->cursname, 18);
    strncpy(stx.opnattr, sptr->opnattr, 2);
    strncpy(stx.prepopt, sptr->prepopt, 2);
    strncpy(stx.pkglib, sptr->pkglib, 10);
    strncpy(stx.pkgname, sptr->pkgname, 10);
    stx.drdaind = sptr->drdaind;
    stx.commitf = sptr->commitf;
    strncpy(stx.stmttxt, sptr->stmttxt, 512);

    /**********************************************************************/
    /* check for user GUEST and an UPDATE statement                       */
    /* if found return an error                                           */
    /**********************************************************************/
    if (! (strncmp(stx.name, "GUEST     ", 10)) )
    {
        for (i=0; i<6; i++)
            stx.stmttxt[i] = toupper(stx.stmttxt[i]);

        if (! strncmp(stx.stmttxt, "UPDATE", 6) )
            /* Force error out of  @@sqll@@ user exit pgm                      */
            strncpy(argv[1], "0", 1);
        else;
    }
    return;
}  /* End of mainline executable code                                     */

/*------------------------------------------------------------------------
   -------------------------------------------------------------------------*/

    /* initialize return variable to indicate ok status                   */
    strncpy(argv[1],"1",1);

    /**********************************************************************/
    /*  Address parameter structure for @@sqll@@ exit program and move local   */
    /*  parameters into local variables.                                  */
    /* (note : this is not necessary to evaluate the arguments passed in). */
    /**********************************************************************/
    sptr = (_Packed struct zdaq0100 *) argv[2];

    strncpy(stx.name, sptr->name, 10);
    strncpy(stx.servid, sptr->servid, 10);
    strncpy(stx.fmtid, sptr->fmtid, 8);
    stx.funcid = sptr->funcid;
    strncpy(stx.stmtname, sptr->stmtname, 18);
    strncpy(stx.cursname, sptr->cursname, 18);
    strncpy(stx.opnattr, sptr->opnattr, 2);
    strncpy(stx.prepopt, sptr->prepopt, 2);
    strncpy(stx.pkglib, sptr->pkglib, 10);
    strncpy(stx.pkgname, sptr->pkgname, 10);
    stx.drdaind = sptr->drdaind;
    stx.commitf = sptr->commitf;
    strncpy(stx.stmttxt, sptr->stmttxt, 512);

    /**********************************************************************/
    /* check for user GUEST and an UPDATE statement                       */
    /* if found return an error                                           */
    /**********************************************************************/
    if (! (strncmp(stx.name, "GUEST     ", 10)) )
    {
        for (i=0; i<6; i++)
            stx.stmttxt[i] = toupper(stx.stmttxt[i]);

        if (! strncmp(stx.stmttxt, "UPDATE", 6) )
            /* Force error out of  @@sqll@@ user exit pgm                       */
            strncpy(argv[1], "0", 1);
        else;
    }
    return;
}  /* End of mainline executable code                                     */
```

Example: ILE C/400 program for exit point QIBM_QZDA_ROI1:

The following ILE C/400 program logs all requests for catalog functions to the ZDALOG file in QGPL. It can be used as a shell for developing exit programs tailored for your operating environment.

```
/*--------------------------------------------------------------------------
 *                @@ss1s@@ Servers - Sample Exit Program
 *
 *    Exit Point Name         : QIBM_QZDA_ROI1
 *
 *    Description             : The following ILE C/400 program logs all
 *                              requests for catalog functions to the
 *                              ZDALOG file in QGPL.
 *                              It can be used as a shell for developing
 *                              exit programs tailored for your
 *                              operating environment.
 *
 *    Input                   : A 1-byte return code value
 *                                 X'F0' server rejects the request
 *                                 anything else server allows the request
 *                              Structure containing information about the
 *                                request.  The format used by this program
 *                                is ZDAR0100.
 *
 *    Dependencies            : The log file must be created using the
 *                              following command:
 *                              CRTPF FILE(QGPL/ZDALOG) RCDLEN(132)
 *------------------------------------------------------------------------*/
/*------------------------------------------------------------------------
 *     Includes
 *------------------------------------------------------------------------*/
#include <recio.h>                  /* record IO functions                */
#include <string.h>                 /* string functions                   */
/*------------------------------------------------------------------------
 *    User Types
 *------------------------------------------------------------------------*/
typedef struct {             /* Exit Point QIBM_QZDA_ROI1 format ZDAR0100 */
    char User_profile_name[10];     /* Name of user profile calling server*/
    char Server_identifier[10];     /* database server value (*RTVOBJINF) */
    char Exit_format_name[8];       /* User exit format name (ZDAR0100)   */
    long Requested_function;        /* function being preformed           */
    char Library_name[20];          /* Name of library                    */
    char Database_name[36];         /* Name of relational database        */
    char Package_name[20];          /* Name of package                    */
    char File_name[256];            /* Name of file                       */
    char Member_name[20];           /* Name of member                     */
    char Format_name[20];           /* Name of format                     */
} ZDAR0100_fmt_t;
```

```
/*------------------------------------------------------------------------
   ------------------------------------------------------------------------*/

/*========================================================================
 *    Start of mainline executable code
 *========================================================================*/
int main (int argc, char *argv[])
{
    _RFILE *file_ptr;               /* pointer to log file                */
    char output_record[132];        /* output log file record             */
    ZDAR0100_fmt_t input;           /* input format record                */
    /* set return code to allow the request.                              */
    memcpy( argv[1], "1", 1);

    /* open the log file for writing to the end of the file               */
    if (( file_ptr = _Ropen("QGPL/ZDALOG", "ar") ) == NULL)
    {
        /* open failed                                                    */
        return;
    }

    /* copy input parm into structure                                     */
    memcpy(&input, (ZDAR0100_fmt_t *)argv[2], 404);

    switch /* Create the output record based on requested function        */
        (input.Requested_function)
    {
        case 0X1800:  /* Retrieve library information                     */
            sprintf(output_record,
              "%10.10s retrieved library %20.20s",
              input.User_profile_name, input.Library_name);
            break;
        case 0X1801:  /* Retrieve relational database information         */
            sprintf(output_record,
              "%10.10s retrieved database %36.36s",
              input.User_profile_name, input.Database_name);
            break;
        case 0X1802:  /* Retrieve @@sqll@@ package information                 */
            sprintf(output_record,
              "%10.10s retrieved library %20.20s package %20.20s",
              input.User_profile_name, input.Library_name,
              input.Package_name);
            break;
        case 0X1803:  /* Retrieve @@sqll@@ package statement information       */
            sprintf(output_record,
         "%10.10s retrieved library %20.20s package %20.20s statement info",
              input.User_profile_name, input.Library_name,
              input.Package_name);
            break;
/*------------------------------------------------------------------------
   ------------------------------------------------------------------------*/

        case 0X1804:  /* Retrieve file information                        */
            sprintf(output_record,
              "%10.10s retrieved library %20.20s file %40.40s",
              input.User_profile_name, input.Library_name, input.File_name);
            break;
        case 0X1805:  /* Retrieve file member information                 */
            sprintf(output_record,
            "%10.10s retrieved library %20.20s member %20.20s file %40.40s",
              input.User_profile_name, input.Library_name,
              input.Member_name, input.File_name);
            break;
        case 0X1806:  /* Retrieve record format information               */
            sprintf(output_record,
            "%10.10s retrieved library %20.20s format %20.20s file %40.40s",
              input.User_profile_name, input.Library_name,
              input.Format_name, input.File_name);
            break;
        case 0X1807:  /* Retrieve field information                    */
            sprintf(output_record,
              "%10.10s retrieved field info library %20.20s file %40.40s",
              input.User_profile_name, input.Library_name, input.File_name);
            break;
        case 0X1808:  /* Retrieve index information                    */
            sprintf(output_record,
              "%10.10s retrieved index info library %20.20s file %40.40s",
              input.User_profile_name, input.Library_name, input.File_name);
            break;
        case 0X180B:  /* Retrieve special column information            */
            sprintf(output_record,
              "%10.10s retrieved column info library %20.20s file %40.40s",
              input.User_profile_name, input.Library_name, input.File_name);
            break;
        default : /* Unknown requested function                        */
            sprintf(output_record, "Unknown requested function");
            break;
    }  /* end switch statement                                         */

    /* write the output record to the file                             */
    _Rwrite(file_ptr, &output_record, 132);

    /* close the log file                                              */
    _Rclose ( file_ptr );

}  /* End of mainline executable code                                  */
```

Exit program parameter formats:

The exit points for native database and retrieving object information have two formats that are defined: QIBM_QZDA_SQL1 and QIBM_QZDA_SQL2. Depending on the type of function that is requested, one of the formats is used.

The QIBM_QZDA_SQL2 exit point is defined to run an exit point for certain SQL requests that are received for the database server. This exit point takes precedence over the QIBM_QZDA_SQL1 exit point. If a program is registered for the QIBM_QZDA_SQL2 exit point, it will be called, and a program for the QIBM_QZDA_SQL1 exit point will not be called.

Functions that cause the exit program to be called

- Prepare
- Open
- Execute
- Connect
- Create package
- Clear package
- Delete package
- Return package information
- Stream fetch
- Execute immediate
- Prepare and describe
- Prepare and execute or prepare and open
- Open and fetch
- Execute or open

Parameter fields for exit point QIBM_QZDA_SQL2 format ZDAQ0200:

The following table shows parameter fields and their descriptions for the exit program called at exit point QIBM_QZDA_SQL2 with the ZDAQ0200 format.

Table 17. Exit point QIBM_QZDA_SQL2 format ZDAQ0200

Offset				
Dec	**Hex**	**Type**	**Field**	**Description**
0	0	CHAR(10)	User profile name	The name of the user profile that is calling the server.
10	A	CHAR(10)	Server identifier	The value is *SQLSRV for this exit point.
20	14	CHAR(8)	Format name	The user exit format name being used. For QIBM_QZDA_SQL1, the format name is ZDAQ0100.
28	1C	BINARY(4)	Requested function	The function being performed. This field contains one of the following: • X’1800’ - Prepare • X’1803’ - Prepare and describe • X’1804’ - Open/describe • X’1805’ - Execute • X’1806’ - Execute immediate • X’1809’ - Connect • X’180C’ - Stream fetch • X’180D’ - Prepare and execute • X’180E’ - Open and fetch • X’180F’ - Create package • X’1810’ - Clear package • X’1811’ - Delete package • X’1812’ - Execute or open • X’1815’ - Return package information
32	20	CHAR(18)	Statement name	Name of the statement used for the prepare or execute functions.
50	32	CHAR(18)	Cursor name	Name of the cursor used for the open function.
68	44	CHAR(2)	Prepare option	Option used for the prepare function.
70	46	CHAR(2)	Open attributes	Option used for the open function.
72	48	CHAR(10)	Extended dynamic package name	Name of the extended dynamic package.
82	52	CHAR(10)	Package library name	Name of the library for extended dyanmic SQL package.
92	5C	BINARY(2)	DRDA indicator	• 0 - Connected to local RDB • 1 - Connected to remote RDB
94	5E	CHAR(1)	Commitment control level	• ’A’ - Commit *ALL • ’C’ - Commit *CHANGE • ’N’ - Commit *NONE • ’S’ - Commit *CS (cursor stability)

Table 17. Exit point QIBM_QZDA_SQL2 format ZDAQ0200 (continued)

Offset				
Dec	**Hex**	**Type**	**Field**	**Description**
95	5F	CHAR(10)	Default SQL collection	Name of the default SQL collection used by the iSeries Database Server.
105	69	CHAR(129)	Reserved	Reserved for future parameters.
234	EA	BINARY(4)	SQL statement text length	Length of SQL statement text in the field that follows. The length can be a maximum of 32K.
238	EE	CHAR(*)	SQL statement text	Entire SQL statement.
Note: This format is defined by member EZDAEP in files H, QRPGSRC, QRPGLESRC, QCBLSRC and QCBLLESRC in library QSYSINC.				

The QIBM_QZDA_INIT exit point is defined to run an exit program at server initiation. If a program is defined for this exit point, it is called each time the database server is initiated.

Parameter fields for exit point QIBM_QZDA_INIT format ZDAI0100:

The following table shows parameter fields and their descriptions for the exit program called at exit point QIBM_QZDA_INIT using the ZDAI0100 format.

Table 18. Exit point QIBM_QZDA_INIT format ZDAI0100

Offset				
Dec	**Hex**	**Type**	**Field**	**Description**
0	0	CHAR(10)	User profile name	The name of the user profile that is calling the server.
10	A	CHAR(10)	Server identifier	The value is *SQL for this exit point.
20	14	CHAR(8)	Format name	The user exit format name being used. For QIBM_QZDA_INIT the format name is ZDAI0100.
28	1C	BINARY(4)	Requested function	The function being performed. The only valid value for this exit point is 0.
Note: This format is defined by member EZDAEP in files H, QRPGSRC, QRPGLESRC, QCBLSRC and QCBLLESRC in library QSYSINC.				

The QIBM_QZDA_NDB1 exit point is defined to run an exit program for native database requests for the database server. Two formats are defined for this exit point.

Functions that use format ZDAD0100:

- Create source physical file
- Create database file, based on existing file
- Add, clear, delete database file member
- Override database file
- Delete database file override
- Delete file

Note: Format ZDAD0200 is used when a request is received to add libraries to the library list.

Parameter fields for exit point QIBM_QZDA_NDB1 format ZDAD0100:

The following table shows parameter fields and their descriptions for the exit program called at exit point QIBM_QZDA_NDB1 using the ZDAD0100 format.

Table 19. Exit point QIBM_QZDA_NDB1 format ZDAD0100

Offset				
Dec	**Hex**	**Type**	**Field**	**Description**
0	0	CHAR(10)	User profile name	The name of the user profile that is calling the server.
10	A	CHAR(10)	Server identifier	For this exit point the value is *NDB.
20	14	CHAR(8)	Format name	The user exit format name being used. For the following functions, the format name is ZDAD0100.
28	1C	BINARY(4)	Requested function	The function being performed. This field contains one of the following: • **X'1800'** - Create source physical file • **X'1801'** - Create database file, based on existing file • **X'1802'** - Add database file member • **X'1803'** - Clear database file member • **X'1804'** - Delete database file member • **X'1805'** - Override database file • **X'1806'** - Delete database file override • **X'1807'** - Create save file • **X'1808'** - Clear save file • **X'1809'** - Delete file
32	20	CHAR(128)	File name	Name of the file used for the requested function.
160	A0	CHAR(10)	Library name	Name of the library that contains the file.
170	AA	CHAR(10)	Member name	Name of the member to be added, cleared, or deleted.
180	B4	CHAR(10)	Authority	Authority to the created file
190	BE	CHAR(128)	Based on file name	Name of the file to use when creating a file based on an existing file.
318	13E	CHAR(10)	Based on library name	Name of the library containing the based on file
328	148	CHAR(10)	Override file name	Name of the file to be overridden
338	152	CHAR(10)	Override library name	Name of the library that contains the file to be overridden
348	15C	CHAR(10)	Override member name	Name of the member to be overridden
Note: This format is defined by member EZDAEP in files H, QRPGSRC, QRPGLESRC, QCBLSRC and QCBLLESRC in library QSYSINC.				

Parameter fields for exit point QIBM_QZDA_NDB1 format ZDAD0200:

The following table shows parameter fields and their descriptions for the exit program called at exit point QIBM_QZDA_NDB1 by using the ZDAD0200 format.

Table 20. Exit point QIBM_QZDA_NDB1 format ZDAD0200

Offset				
Dec	**Hex**	**Type**	**Field**	**Description**
0	0	CHAR(10)	User profile name	The name of the user profile that is calling the server.
10	A	CHAR(10)	Server identifier	For this exit point the value is *NDB.
20	14	CHAR(8)	Format name	The user exit format name being used. For the add to library list function the format name is ZDAD0200.
28	1C	BINARY(4)	Requested function	The function being performed. • **X'180C'** - Add library list
32	20	BINARY(4)	Number of libraries	The number of libraries (the next field)
36	24	CHAR(10)	Library name	The library names for each library
Note: This format is defined by member EZDAEP in files H, QRPGSRC, QRPGLESRC, QCBLSRC and QCBLLESRC in library QSYSINC.				

The QIBM_QZDA_SQL1 exit point is defined to run an exit point for certain SQL requests that are received for the database server. Only one format is defined for this exit point.

Functions that use format ZDAD0200:

- Prepare
- Open
- Execute
- Connect
- Create package
- Clear package
- Delete package
- Execute immediate
- Prepare and describe
- Prepare and execute or prepare and open
- Open and fetch
- Execute or open

Parameter fields for exit point QIBM_QZDA_SQL1 format ZDAQ0100:

The following table shows parameter fields and their descriptions for the exit program called at exit point QIBM_QZDA_SQL1 using the ZDAQ0100 format.

Table 21. Exit point QIBM_QZDA_SQL1 format ZDAQ0100

Offset				
Dec	**Hex**	**Type**	**Field**	**Description**
0	0	CHAR(10)	User profile name	The name of the user profile that is calling the server.
10	A	CHAR(10)	Server identifier	For this exit point the value is *SQLSRV.
20	14	CHAR(8)	Format name	The user exit format name being used. For QIBM_QZDA_SQL1 the format name is ZDAQ0100.

Table 21. Exit point QIBM_QZDA_SQL1 format ZDAQ0100 (continued)

Offset				
Dec	**Hex**	**Type**	**Field**	**Description**
28	1C	BINARY(4)	Requested function	The function being performed. This field contains one of the following: • **X'1800'** - Prepare • **X'1803'** - Prepare and describe • **X'1804'** - Open/Describe • **X'1805'** - Execute • **X'1806'** - Execute immediate • **X'1809'** - Connect • **X'180D'** - Prepare and execute or prepare and open • **X'180E'** - Open and fetch • **X'180F'** - Create package • **X'1810'** - Clear package • **X'1811'** - Delete package • **X'1812'** - Execute or open • **X'1815'** - Return package information
32	20	CHAR(18)	Statement name	Name of the statement used for the prepare or execute functions.
50	32	CHAR(18)	Cursor name	Name of the cursor used for the open function.
68	44	CHAR(2)	Prepare option	Option used for the prepare function.
70	46	CHAR(2)	Open attributes	Option used for the open function.
72	48	CHAR(10)	Extended dynamic package name	Name of the extended dynamic SQL package.
82	52	CHAR(10)	Package library name	Name of the library for extended dynamic SQL package.
92	5C	BINARY(2)	DRDA indicator	• **0** - Connected to local RDB • **1** - Connected to remote RDB
94	5E	CHAR(1)	Commitment control level	• **'A'** - Commit *ALL • **'C'** - Commit *CHANGE • **'N'** - Commit *NONE • **'S'** - Commit *CS (cursor stability)
95	5F	CHAR(512)	First 512 bytes of the SQL statement text	First 512 bytes of the SQL statement
Note: This format is defined by member EZDAEP in files H, QRPGSRC, QRPGLESRC, QCBLSRC and QCBLLESRC in library QSYSINC.				

The QIBM_QZDA_ROI1 exit point is defined to run an exit program for the requests that retrieve information about certain objects for the database server. It is also used for SQL catalog functions.

This exit point has two formats defined.

Objects for which format ZDAR0100 is used to retrieve information:

- Field (or column)

- File (or table)
- File member
- Index
- Library (or collection)
- Record format
- Relational database (or RDB)
- Special columns
- SQL package
- SQL package statement

Objects for which format ZDAR0200 is used to retrieve information:

- Foreign keys
- Primary keys

Parameter fields for exit point QIBM_QZDA_ROI1 format ZDAR0100:

The following table shows parameter fields and their descriptions for the exit program called at exit point QIBM_QZDA_ROI1 using the ZDAR0100 format.

Table 22. Exit point QIBM_QZDA_ROI1 format ZDAR0100

Offset				
Dec	**Hex**	**Type**	**Field**	**Description**
0	0	CHAR(10)	User profile name	The name of the user profile that is calling the server.
10	A	CHAR(10)	Server identifier	For the database server the value is *RTVOBJINF.
20	14	CHAR(8)	Format name	The user exit format name being used. For the following functions, the format name is ZDAR0100.
28	1C	BINARY(4)	Requested function	The function being performed. This field contains one of the following: • **X'1800'** - Retrieve library information • **X'1801'** - Retrieve relational database information • **X'1802'** - Retrieve SQL package information • **X'1803'** - Retrieve SQL package statement information • **X'1804'** - Retrieve file information • **X'1805'** - Retrieve file member information • **X'1806'** - Retrieve record format information • **X'1807'** - Retrieve field information • **X'1808'** - Retrieve index information • **X'180B'** - Retrieve special column information

Table 22. Exit point QIBM_QZDA_ROI1 format ZDAR0100 (continued)

Offset				
Dec	**Hex**	**Type**	**Field**	**Description**
32	20	CHAR(20)	Library name	The library or search pattern used when retrieving information about libraries, packages, package statements, files, members, record formats, fields, indexes, and special columns.
52	34	CHAR(36)	Relational database name	The relational database name or search pattern used to retrieve RDB information.
88	58	CHAR(20)	Package name	The package name or search pattern used to retrieve package or package statement information.
108	6C	CHAR(256)	File name (SQL alias name)	The file name or search pattern used to retrieve file, member, record format, field, index, or special column information.
364	16C	CHAR(20)	Member name	The member name or search pattern used to retrieve file member information.
384	180	CHAR(20)	Format name	The format name or search pattern used to retrieve record format information.
Note: This format is defined by member EZDAEP in files H, QRPGSRC, QRPGLESRC, QCBLSRC and QCBLLESRC in library QSYSINC.				

Parameter fields for exit point QIBM_QZDA_ROI1 format ZDAR0200:

The following table shows parameter fields and their descriptions for the exit program called at exit point QIBM_QZDA_ROI1 using the ZDAR0200 format.

Table 23. Exit point QIBM_QZDA_ROI1 format ZDAR0200

Offset				
Dec	**Hex**	**Type**	**Field**	**Description**
0	0	CHAR(10)	User profile name	The name of the user profile that is calling the server.
10	A	CHAR(10)	Server identifier	For the database server the value is *RTVOBJINF.
20	14	CHAR(8)	Format name	The user exit format name being used. For the following functions, the format name is ZDAR0200.
28	1C	BINARY(4)	Requested function	The function being performed. This field contains one of the following: • **X’1809’** - Retrieve foreign key information • **X’180A’** - Retrieve primary key information
32	20	CHAR(10)	Primary key table library name	The name of the library that contains the primary key table used when retrieving primary and foreign key information.
42	2A	CHAR(128)	Primary key table name (alias name)	The name of the table that contains the primary key used when retrieving primary or foreign key information.

Table 23. Exit point QIBM_QZDA_ROI1 format ZDAR0200 (continued)

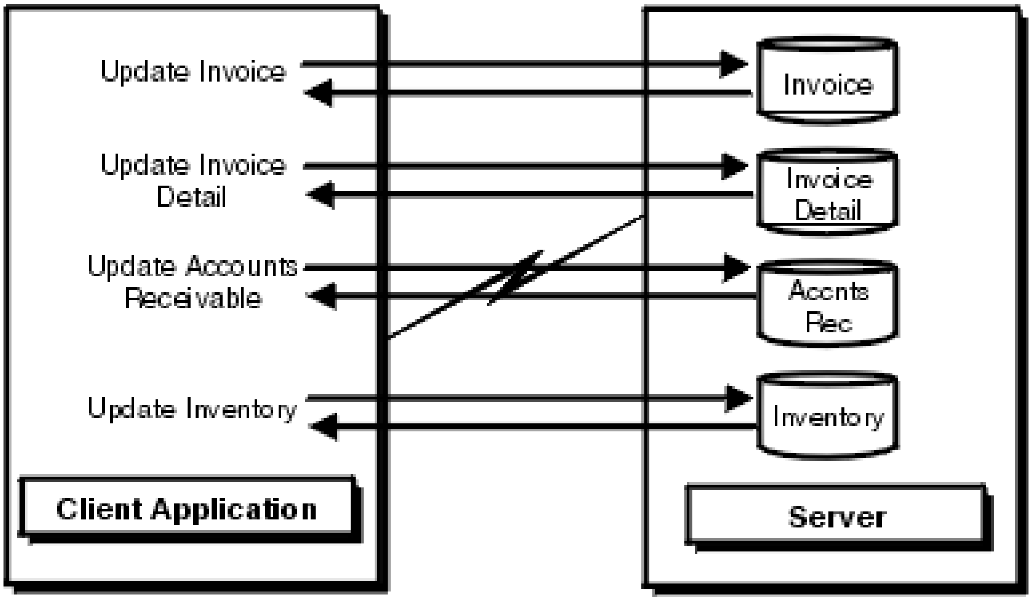
Offset				
Dec	**Hex**	**Type**	**Field**	**Description**
170	AA	CHAR(10)	Foreign key table library name	The name of the library that contains the foreign key table used when retrieving foreign key information.
180	64	CHAR(128)	Foreign key table name (alias name)	The name of the table that contains the foreign key used when retrieving foreign key information.
Note: This format is defined by member EZDAEP in files H, QRPGSRC, QRPGLESRC, QCBLSRC and QCBLLESRC in library QSYSINC.				

Stored procedures:

Stored procedures commonly are used in client/server applications, especially in the area of online transaction processing (OLTP), since they can provide performance, transaction-integrity and security benefits.

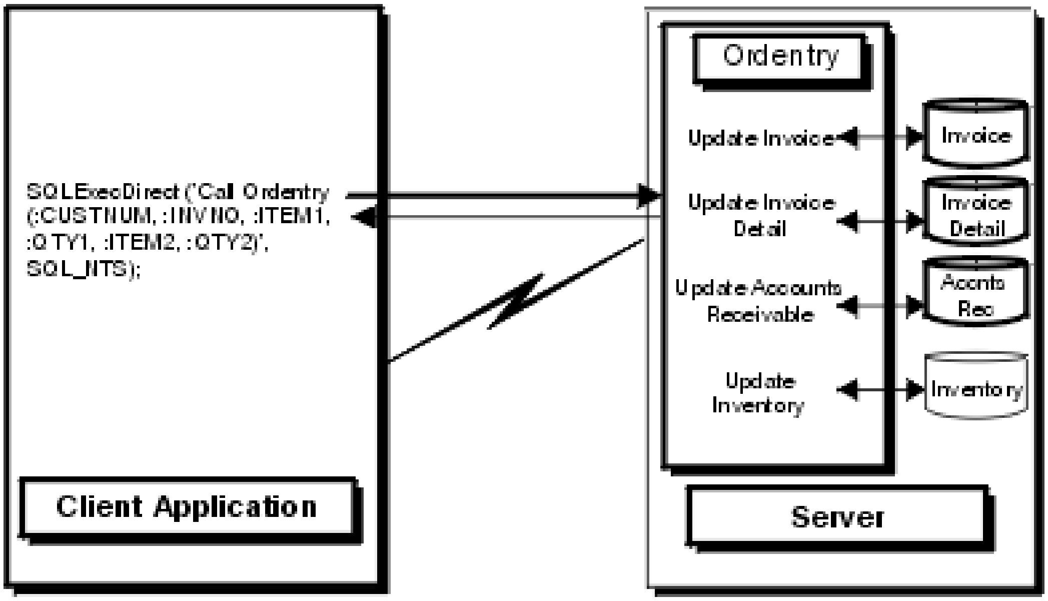
For information regarding specific SQL commands that are used in the examples of stored procedures, see the *SQL Reference* book. View an HTML online version of the book, or print a PDF version, from the DB2 Universal Database for iSeries SQL Reference iSeries Information Center topic.

The illustration below shows an application where one transaction consists of four separate I/O operations, each that requires an SQL statement to be processed. In the client/server environment, this requires a minimum of eight messages between the server and the client, as shown. This can represent significant overhead, especially where the communication speed is slow (for example over a dial-up line), or where the turnaround speed for the connection is slow (for example over a satellite link).



Client/Server Application Without Stored Procedures

The following illustration shows the same transaction by a stored procedure on the server. As illustrated, the communications traffic has been reduced to a single message pair. There are additional benefits. For example, the procedure can arrange to send back only the data that is absolutely required (for example, just a few characters from a long column). A DB2 for i5/OS stored procedure can be any iSeries program, and does not have to use SQL for data access.



Client/Server Application With Stored Procedure

Stored procedure result sets:

Define scrollable SQL stored procedure result sets.

An application can now have scrollable SQL stored procedure result sets when running to a V5R3 (or later) iSeries server. To take advantage of this support, make the following two changes.

1. Create the stored procedure with the cursor defined as scrollable.
   a. This is done by adding the SCROLL keyword into the CREATE PROCEDURE. In the following two examples, the first stored procedure returns a scrollable result set while the second one does not.

      -
        ```
        CREATE PROCEDURE MYLIB.SCROLLSP ( ) RESULT SETS 1 LANGUAGE SQL
        sqlproc: begin
        DECLARE CUR1 SCROLL CURSOR FOR
        SELECT * FROM QIWS.QCUSTCDT;
        OPEN CUR1;
        SET RESULT SETS CURSOR CUR1;
        end
        ```

      -
        ```
        CREATE PROCEDURE MYLIB.NOSCROLLSP ( ) RESULT SETS 1 LANGUAGE SQL
        sqlproc: begin
        DECLARE CUR1 CURSOR FOR
        SELECT * FROM QIWS.QCUSTCDT;
        OPEN CUR1;
        SET RESULT SETS CURSOR CUR1;
        end
        ```
2. Code the application using ODBC to ask for a scrollable cursor type.
   a. Call the SQLSetStmtAttr API.
   b. Set the SQL_ATTR_CURSOR_TYPE option to SQL_CURSOR_DYNAMIC.

      If an attempt is made to scroll backwards with a stored procedure that did not specify a scrollable cursor, several different problems can occur. In most cases an error is returned from the server indicating scrolling is invalid, and in some cases incorrect data is returned.

Even if the stored procedure returns multiple result sets, you can only use one cursor type. ODBC either returns an error or ignores the cursor type when a different cursor type is specified for the second result set. To use a scrollable result set as one of the result sets, the application needs to set the cursor type to be scrollable as defined above.

Any attempts to use an updateable cursor with a stored procedure is ignored. Stored procedure result sets are read-only.

Cursor sensitivity may not be honored with stored procedure result sets. Cursor sensitivity is controlled by the way the server cursor is defined when creating the procedure.

Examples: Stored procedures:

View examples of stored procedures.

Example: Run CL commands that use SQL stored procedures and ODBC:

Stored procedure support provides a means to run iSeries server Control Language (CL) commands by using the SQL CALL statement.

Use CL commands when:

- Performing an override for files
- Initiating debug
- Using other commands that can affect the performance of subsequent SQL statements

The following examples show cases where a CL command is run on the iSeries server by using the CALL statement, which calls the program that processes CL commands. That program (QCMDEXC in library QSYS) expects two parameters:

1. A string that contains the command text to execute
2. A decimal (15,5) field that contains the length of the command text

The parameters must include these attributes for the command to be interpreted properly. The second parameter on the CALL statement must have characters explicitly specified for all places of the decimal (15,5) field.

In the following example, a C program on the PC is going to run an OVRDBF command that is 65 characters long (including embedded blanks). The text of the OVRDBF command is as follows:

```
 OVRDBF FILE(TESTER) TOFILE(JMBLIB/TESTER) MBR(NO2) OVRSCOPE(*JOB)
```

The code for performing this command by using ODBC APIs is as follows:

```
 HSTMT hstmt;
SQLCHAR stmt[301];

rc = SQLAllocHandle(SQL_HANDLE_STMT, hdbc, &hstmt);
strcpy(stmt,"CALL QSYS.QCMDEXC('OVRDBF FILE(TESTER) TOFILE(MYLIB/");
strcat(stmt,"TESTER) MBR(NO2) OVRSCOPE(*JOB)',0000000064.00000)");
rc = SQLExecDirect(hstmt, stmt, SQL_NTS);
```

Statements now run against file MYLIB/TESTER will reference member number 2 rather than the first member.

Another CL command that is useful to run against a database server job is the STRDBG command. You do not have to call a stored procedure to run this command, though. There is an option on the Diagnostic tab of the DSN setup GUI on the Diagnostic tab that will automatically run the STRDBG command during the connection attempt.

Related concepts

“Implementation issues of ODBC APIs” on page 470
Learn about implementations issues when using ODBC APIs.

Example: Stored procedure calls from Visual Basic with return values:

The following example of Visual Basic source code shows how to call an iSeries server stored procedure and then retrieve the returned values into Visual Basic variables.

Visual Basic is able to call external functions that are found in a DLL. Since all ODBC drivers are DLLs, Visual Basic can be used to code directly to the ODBC APIs. By coding directly to the ODBC APIs a Visual Basic application can call an iSeries server stored procedure and return result values. See “Code directly to ODBC APIs” on page 452 for more information.

```
'***********************************************************************
'*                                                                     *
'* Because of the way Visual Basic stores and manages the String data  *
'* type, it is recommended that you use an array of Byte data type     *
'* instead of a String variable on the SQLBindParameter API.           *
'*                                                                     *
'***********************************************************************

Dim sTemp As String
Custnum As Integer
Dim abCustname(34) As Byte
Dim abAddress(34) As Byte
Dim abCity(24) As Byte
Dim abState(1) As Byte
Dim abPhone(14) As Byte
Dim abStatus As Byte
Dim RC As Integer
Dim nullx As Long        'Used to pass null pointer, not pointer to null
Dim lpSQL_NTS As Long    'Used to pass far pointer to SQL_NTS
Static link(7) As Long   'Used as an array of long pointers to the size
                         'each parameter which will be bound


 '***********************************************************************
 '*                                                                     *
 '* Initialize the variables needed on the API calls                    *
 '*                                                                     *
 '***********************************************************************

link(1) = 6
link(2) = Ubound(abCustname) +1
link(3) = Ubound(abAddress) +1
link(4) = Ubound(abCity) +1
link(5) = Ubound(abState) +1
link(6) = Ubound(abPhone) +1
link(7) = 1

RC = 0
nullx = 0
lpSQL_NTS = SQL_NTS      ' -3 means passed as sz string

'***********************************************************************
'*                                                                     *
'* Create the procedure on the iSeries. This will define the           *
'* procedure's name, parameters, and how each parameter is passed.     *
'* Note: This information is stored in the server catalog tables and   *
'* and only needs to be executed one time for the life of the stored   *
'* procedure.  It normally would not be run in the client application. *
'*                                                                     *
'***********************************************************************

sTemp = "Create Procedure Storedp2 (:Custnum in integer, "
sTemp = sTemp & ":Custname out char(35), :Address out char(35),"
sTemp = sTemp & ":City out char(25), :State out char(2),"
sTemp = sTemp & ":Phone out char(15), :Status out char(1))
sTemp = sTemp & "(External name rastest.storedp2 language cobol General)"

RC = SQLExecDirect(Connection.hstmt, sTemp, Len(sTemp))

'Ignore error assuming that any error would be from procedure already
'created.



'************************************************************************
'*                                                                      *
'* Prepare the call of the procedure to the iSeries.                    *
'* For best performance, prepare the statement only one time and
'* execute many times.
'*                                                                      *
'************************************************************************

sTemp = "Call storedp2(?, ?, ?, ?, ?, ?, ?)"
RC = SQLPrepare(Connection.hstmt, sTemp, Len(sTemp))

If (RC <> SQL_SUCCESS) Then
   DescribeError Connection.hdbc, Connection.hstmt
   frmMain.Status.Caption = "Error on SQL_Prepare " & RTrim$(Tag)
End If

'************************************************************************
'*                                                                      *
'* Bind all of the columns passed to the stored procedure. This will    *
'* set up the variable's data type, input/output characteristics,       *
'* length, and initial value.                                           *
'* The SQLDescribeParam API can optionally be used to retrieve the
'* parameter types.
'*                                                                      *
'* To properly pass an array of byte to a stored procedure and receive *
'* an output value back, you must pass the first byte ByRef.            *
'*                                                                      *
'************************************************************************

RC = SQLBindParameter(Connection.hstmt, 1, SQL_PARAM_INPUT, SQL_C_SHORT, _
 SQL_NUMERIC, 6, 0, Custnum, 6, link(1))

RC = SQLBindParameter(Connection.hstmt, 2, SQL_PARAM_OUTPUT, SQL_C_CHAR, _
 SQL_CHAR, 35, 0, abCustname(0), UBound(abCustname)+1, link(2))
RC = SQLBindParameter(Connection.hstmt, 3, SQL_PARAM_OUTPUT, SQL_C_CHAR, _
 SQL_CHAR, 35, 0, abAddress(0), UBound(abAddress)+1, link(3))
RC = SQLBindParameter(Connection.hstmt, 4, SQL_PARAM_OUTPUT, SQL_C_CHAR, _
 SQL_CHAR, 25, 0, abCity(0), UBound(abCity)+1, link(4))
RC = SQLBindParameter(Connection.hstmt, 5, SQL_PARAM_OUTPUT, SQL_C_CHAR, _
 SQL_CHAR, 2, 0, abState(0), UBound(abState)+1, link(5))
RC = SQLBindParameter(Connection.hstmt, 6, SQL_PARAM_OUTPUT, SQL_C_CHAR, _
 SQL_CHAR, 15, 0, abPhone(0), UBound(abPhone)+1, link(6))
RC = SQLBindParameter(Connection.hstmt, 7, SQL_PARAM_OUTPUT, SQL_C_CHAR, _
 SQL_CHAR, 1, 0, abStatus, 1, link(7))


'************************************************************************
'*                                                                      *
'* The Prepare and Bind only needs to be execute once.  The Stored
'* procedure can now be called multiple times by just changing the data
'*                                                                      *
'************************************************************************
Do While

'************************************************************************
'* Read in a customer number                                            *
'*                                                                    *
'**********************************************************************

Custnum = Val(input.text)


'**********************************************************************
'*                                                                    *
'* Execute the call of the procedure to the iSeries.                 *
'*                                                                    *
'**********************************************************************

RC = SQLExecute(Connection.hstmt)
frmMain.Status.Caption = "Ran Stored Proc" & RTrim$(Tag)

If (RC <> SQL_SUCCESS) Then
   DescribeError Connection.hdbc, Connection.hstmt
   frmMain.Status.Caption = "Error on Stored Proc Execute " & RTrim$(Tag
End If

'**********************************************************************
'*                                                                    *
'* Set text labels to display the output data                        *
'* You must convert the array of Byte back to a String
'*                                                                    *
'**********************************************************************


lblCustname = StrConv(abCustname(), vbUnicode)
lblAddress = StrConv(abAddress(), vbUnicode)
lblCity = StrConv(abCity(), vbUnicode)
lblState = StrConv(abState(), vbUnicode)
lblPhone = StrConv(abPhone(), vbUnicode)
lblStatus = StrConv(abStatus(), vbUnicode)

Loop
```

Example: Call an iSeries stored procedure by using Visual Basic:

The Visual Basic programming examples listed below show a stored procedure call being prepared.

Two statements are shown:

1. A statement for the creation of the stored procedure
2. A statement to prepare the call

Create the stored procedure only once. The definition that it provides is available to ODBC applications, as well as to integrated i5/OS applications.

Because of the way Visual Basic stores and manages the String data type, using an array of Byte data type instead of a String variable is recommended for the following parameter types:

- Input/output parameters
- Output parameters
- Any parameter that contains binary data (rather then standard ANSI characters)
- Any input parameter that has a variable address which is set once, but referred to many times

The last case would be true for the if the application made multiple calls to **SQLExecute**, while modifying **Parm1** between each call. The following Visual Basic functions assist in converting strings and arrays of byte:

```
Public Sub Byte2String(InByte() As Byte, OutString As String)
  'Convert array of byte to string
   OutString = StrConv(InByte(), vbUnicode)
```

```
End Sub

Public Function String2Byte(InString As String, OutByte() As Byte) As Boolean
    'vb byte-array / string coercion assumes Unicode string
    'so must convert String to Byte one character at a time
    'or by direct memory access
    'This function assumes Lower Bound of array is 0

    Dim I As Integer
    Dim SizeOutByte As Integer
    Dim SizeInString As Integer

    SizeOutByte = UBound(OutByte) + 1
    SizeInString = Len(InString)

    'Verify sizes if desired

    'Convert the string
    For I = 0 To SizeInString - 1
      OutByte(I) = AscB(Mid(InString, I + 1, 1))
    Next I
    'If size byte array > len of string pad with Nulls for szString
    If SizeOutByte > SizeInString Then           'Pad with Nulls
       For I = SizeInString To UBound(OutByte)
          OutByte(I) = 0
       Next I
    End If

   String2Byte = True
End Function

Public Sub ViewByteArray(Data() As Byte, Title As String)
   'Display message box showing hex values of byte array

   Dim S As String
   Dim I As Integer
   On Error GoTo VBANext

   S = "Length: " & Str(UBound(Data) - LBound(Data) + 1) & "  Data (in hex):"
   For I = LBound(Data) To UBound(Data)
      If (I Mod 8) = 0 Then
         S = S & "  "        'add extra space every 8th byte
      End If
      S = S & Hex(Data(I)) & " "
   VBANext:
   Next I
   MsgBox S, , Title

End Sub
```

Example: Call CL command stored procedures:

It is possible to run iSeries server commands by using stored procedures. The two examples that are provided here apply to ODBC programs.

Simply call Execute Command (QCMDEXC) to run the command. The process is relatively simple, but ensure that you include all of the zeros in the length parameter. Use the Remote Command API as an alternative.

The first example enables the powerful SQL tracing facility that writes data into the joblog for the job running the SQL (in this case, the server job).

The second example overcomes a restriction in SQL: its limited ability to work with multi-member files. You cannot create a multi-member file through CREATE TABLE. However, the following example shows you how to access with ODBC anything but the first member of a file that is created through DDS:

```
Dim hStmt                  As Long

rc = SQLAllocHandle(SQL_HANDLE_STMT, ghDbc, hStmt)
 If rc <> SQL_SUCCESS Then
 Call DspSQLError(SQL_HANDLE_DBC, ghDbc, "Problem: Allocating Debug Statement Handle")
End If

' Note that the string within single quotes 'STRDBG UPDPROD(*YES)' is exactly 20 bytes
cmd = "call qsys.qcmdexc('STRDBG UPDPROD(*YES)',0000000020.00000)"

' Put the iSeries job in debug mode
rc = SQLExecDirect(hStmt, cmd, SQL_NTS)
If rc <> SQL_SUCCESS Then
 Call DspSQLError(SQL_HANDLE_STMT, hStmt, "Problem: Start Debug")
End If

rc = SQLAllocHandle(SQL_HANDLE_STMT, ghDbc, ovrhstmt)
If rc <> SQL_SUCCESS Then
 Call DspSQLError(SQL_HANDLE_DBC, ghDbc, "Problem: Allocating Override Statement Handle")
End If

' Note that the string within single quotes 'OVRDBF FILE(BRANCH)... OVRSCOPE(*JOB)'
   is exactly 68 bytes
 cmd = "call qsys.qcmdexc('OVRDBF FILE(BRANCH) TOFILE(HOALIB/BRANCH) MBR(FRANCE)
                                          OVRSCOPE(*JOB)',0000000068.00000)"

' Override the iSeries file to point to the 'france' member
rc = SQLExecDirect(hStmt, cmd, SQL_NTS)
If rc <> SQL_SUCCESS Then
 Call DspSQLError(SQL_HANDLE_STMT, hStmt, "File Override")
End If
```

Tips: Run and call iSeries stored procedures:

Use these tips for running and calling iSeries stored procedures.

Running a stored procedure on the iSeries server:

ODBC provides a standard interface for calling stored procedures. The implementation of stored procedures differs significantly across various databases. This simple example follows the recommended approach for running a stored procedure on the iSeries server:

1. Set up a **create procedure** statement for the stored procedure and create it. The creation of the stored procedure only needs to be done once and it does not have to be done through ODBC. The definition that it provides is available to all ODBC as well as integrated i5/OS applications.
2. Prepare the stored procedure call.
3. Bind the parameters of the procedure, indicating whether each parameter is to be used for input to the procedure, output from the procedure, or input/output.
4. Call the stored procedure.

Calling iSeries stored procedures using Visual Basic:

Use care in coding the **SQLBindParameter** functions. Never use Visual Basic strings as a buffer when binding either columns (**SQLBindCol**) or parameters (**SQLBindParameter**). Instead, use byte arrays, which–unlike strings–will not be moved around in memory. See “Example: Call an iSeries stored procedure by using Visual Basic” on page 541 for more information.

Pay careful attention to the data types that are involved. There may be subtle differences with those that you use with, for instance, a select statement. Also, ensure that you have an adequately sized buffer for output and input/output parameters. The way that you code the stored procedure on the iSeries server can affect performance significantly. Whenever possible, avoid closing the program with exit() in C language and with SETON LR in RPG language. Preferably, use RETRN or return, but you may need to re-initialize variables on each call, and by-pass file opens.

ODBC program examples

The following ODBC programming examples demonstrate simple queries, and accessing and returning data by calling stored procedures. C/C++, Visual Basic and RPG programming language versions are provided.

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Note that many of the C/C++ samples are not complete programs. For complete discussions and programming samples, refer to the following locations:

- To access ODBC programming samples (Visual Basic, C++, and Lotus Script programming environments), link to the IBM ftp site on the Web. Select **index.txt** to see what programming examples are available and to download to your PC).
- For information on Stored Procedures and examples on how to call them see "Stored procedures" on page 536.
- Search for ODBC samples in Microsoft's MSDN library or ODBC webpage. Examples can be found for Visual Basic, ADO, and C/C++.
- The C programming example in the Programmer's Toolkit

Example: Visual C++ - Access and return data by a call to a stored procedure:

This example illustrates using Visual C++ to access and return data by a call to a stored procedure.

Only the code relevant to the stored procedure call has been included here. This code assumes the connection has already been established. See "Examples: RPG - Host code for ODBC stored procedures" on page 547 for the source code for the stored procedure.

Creating the stored procedure

```
 //* Drop the old Procedure
 strcpy(szDropProc,"drop procedure apilib.partqry2");

 rc = SQLExecDirect(m_hstmt, (unsigned char *)szDropProc, SQL_NTS);

 // This statement is used to create a  stored procedure
 // Unless the
 // procedure is destroyed, this statement need never be re-created
 strcpy(szCreateProc,"CREATE PROCEDURE APILIB.PARTQRY2 (INOUT P1 INTEGER," );
 strcat(szCreateProc,"INOUT P2 INTEGER)");
 strcat(szCreateProc,"EXTERNAL NAME APILIB.SPROC2 LANGUAGE RPG GENERAL")

 //' Create the new Procedure
 rc = SQLExecDirect(m_hstmt, (unsigned char *)szCreateProc, SQL_NTS);
 if (rc != SQL_SUCCESS &&; rc != SQL_SUCCESS_WITH_INFO) {
  DspSQLError(m_henv, m_hdbc, SQL_NULL_HSTMT);
  return APIS_INIT_ERROR;
 }
 if(rc != SQL_SUCCESS) {
  DspSQLError(m_henv, m_hdbc, SQL_NULL_HSTMT);
        return APIS_INIT_ERROR;
    }
```

Preparing the statements

```
// Prepare the procedure call
  strcpy(szStoredProc, "call partqry2(?, ?)");
 // Prepare the stored procedure statement
    rc = SQLPrepare(m_hstmt, (unsigned char *) szStoredProc, strlen(szStoredProc));
    if(rc != SQL_SUCCESS &&; rc != SQL_SUCCESS_WITH_INFO) {
  DspSQLError(m_henv, m_hdbc, m_hstmt);
        return APIS_INIT_ERROR;
    }
```

Binding the parameters

```
 // Bind the parameters for the stored procedure

rc = SQLBindParameter(m_hstmt, 1, SQL_PARAM_INPUT_OUTPUT, SQL_C_LONG,
   SQL_INTEGER, sizeof(m_lOption), 0, &m_lOption, sizeof(m_lOption), &lcbon),
   &lcbOption);
rc |= SQLBindParameter(m_hstmt, 2, SQL_PARAM_INPUT_OUTPUT, SQL_C_LONG,
   SQL_INTEGER, sizeof(m_lPartNo), 0, &m_lPartNo, sizeof(m_lPartNo), &lcbon),
   &lcbOption);

    // Bind the Columns
 rc = SQLBindCol(m_hstmt, 1, SQL_C_SLONG, &m_lSPartNo,
   sizeof(m_lSPartNo), &lcbBuffer);
 rc |= SQLBindCol(m_hstmt, 2, SQL_C_CHAR, &m_szSPartDesc,
   26, &lcbBuffer);
 rc |= SQLBindCol(m_hstmt, 3, SQL_C_SLONG, &m_lSPartQty,
   sizeof(m_lSPartQty), &lcbBuffer);
 rc |= SQLBindCol(m_hstmt, 4, SQL_C_DOUBLE, &m_dSPartPrice,
   sizeof(m_dSPartPrice), &lcbBuffer);
 rc |= SQLBindCol(m_hstmt, 5, SQL_C_DATE, &m_dsSPartDate,
   10, &lcbBuffer);
```

Calling the stored procedure

```
 // Request a single record
 m_lOption = ONE_RECORD;
 m_lPartNo = PartNo;

 // Run the stored procedure
 rc = SQLExecute(m_hstmt);
    if (rc != SQL_SUCCESS) {
        DspSQLError(m_henv, m_hdbc, m_hstmt);
        return APIS_SEND_ERROR;
    }

 // (Try to) fetch a record
 rc = SQLFetch(m_hstmt);
 if (rc == SQL_NO_DATA_FOUND) {
  // Close the cursor for repeated processing
      rc = SQLCloseCursor(m_hstmt);
      return APIS_PART_NOT_FOUND;
 }
 else if (rc != SQL_SUCCESS) {
        DspSQLError(m_henv, m_hdbc, m_hstmt);
        return APIS_RECEIVE_ERROR;
    }

 // If we are still here we have some data, so map it back
 // Format and display the data
      .
      .
      .
```

Example: Visual Basic - Access and return data by a call to a stored procedure:

Visual Basic is able to call external functions that are found in DLLs. Since all ODBC drivers are DLLs, Visual Basic can be used to code directly to the ODBC APIs. By coding directly to the ODBC APIs a Visual Basic application can call an iSeries server stored procedure and return result values.

See “Code directly to ODBC APIs” on page 452 for more information. See “Examples: RPG - Host code for ODBC stored procedures” on page 547 for the source code for the stored procedure.

Creating the stored procedure

```
   ' This statement will drop an existing stored procedure
szDropProc = "drop procedure apilib.partqry2"


   '* This statement is used to create a  stored procedure
   '* Unless the
   '* procedure is destroyed, this statement need never be re-created
szCreateProc = "CREATE PROCEDURE APILIB.PARTQRY2 (INOUT P1 INTEGER,"
szCreateProc = szCreateProc & "INOUT P2 INTEGER)"
szCreateProc = szCreateProc & "EXTERNAL NAME APILIB.SPROC2 LANGUAGE RPG GENERAL"


   '*  Allocate statement handle
rc = SQLAllocHandle(SQL_HANDLE_STMT, ghDbc, hStmt)
If rc <> SQL_SUCCESS Then
     Call DisplayError(rc, "SQLAllocStmt failed.")
     Call DspSQLError(henv, SQL_NULL_HDBC, SQL_NULL_HSTMT)
End If
  '* Drop the old Procedure
rc = SQLExecDirect(hstmt, szDropProc, SQL_NTS)

   ' Create the new Procedure
rc = SQLExecDirect(hstmt, szCreateProc, SQL_NTS)
If rc <> SQL_SUCCESS And rc <> SQL_SUCCESS_WITH_INFO Then
     Call DisplayError(rc, "SQLCreate failed.")
     Call DspSQLError(henv, hdbc, hstmt)
End If
```

Preparing the statements

```
   '* This statement will be used to call the stored procedure
   szStoredProc = "call partqry2(?, ?)"
  '* Prepare the stored procedure call statement
```

```
    rc = SQLPrepare(hstmt, szStoredProc, Len(szStoredProc))
    If rc <> SQL_SUCCESS And rc <> SQL_SUCCESS_WITH_INFO Then
        Call DisplayError(rc, "SQLPrepare failed.")
        Call DspSQLError(henv, hdbc, hstmt)
    End If
```

Binding the parameters

```
  'Bind the parameters for the stored procedure
     rc = SQLBindParameter(hstmt, 1, SQL_PARAM_INPUT, SQL_C_LONG, _
                SQL_INTEGER, lLen1, 0, sFlag, lLen1, lCbValue)

     If rc <> SQL_SUCCESS Then
        Call DisplayError(rc, "Problem binding parameter ")
     End If

     rc = SQLBindParameter(hstmt, 2, SQL_PARAM_INPUT, SQL_C_SLONG, _
                        SQL_INTEGER, 4, 0, lPartNumber, lLen2, lCbValue)

     If rc <> SQL_SUCCESS Then
        Call DisplayError(rc, "Problem binding parameter ")
     End If
```

Calling the stored procedure

```
   rc = SQLExecute(hstmt)
   If lRc <> SQL_SUCCESS Then
          ' Free the statement handle for repeated processing
               rc = SQLFreeHandle(
           Call DspSQLError(henv, hdbc, hstmt)
   End If
   rc = SQLFetch(hstmt)
   If rc = SQL_NO_DATA_FOUND Then
          mnuClear_Click               'Clear screen
          txtPartNumber = lPartNumber 'Show the part number not found
          Call DisplayMessage("RECORD NOT FOUND")
          .
          .
        Else
      'Get Description
            rc = SQLGetData(hstmt, 2, SQL_C_CHAR, sSDescription, _
                            25, lcbBuffer)
            'Get Quantity. SQLGetLongData uses alias SQLGetData
            rc = SQLGetLongData(hstmt, 3, SQL_C_SLONG, lSQuantity, _
                                Len(lSQuantity), lcbBuffer)
            'Get Price. SQLGetDoubleData uses alias SQLGetData
            rc = SQLGetDoubleData(hstmt, 4, SQL_C_DOUBLE, dSPrice, _
                                    Len(dSPrice), lcbBuffer)
            'Get Received date
            rc = SQLGetData(hstmt, 5, SQL_C_CHAR, sSReceivedDate, _
                            10, lcbBuffer)
            txtDescription = sSDescription   'Show description
            txtQuantity = lSQuantity          'Show quantity
            txtPrice = Format(dSPrice, "currency")    'Convert dSPrice to
            txtReceivedDate = CDate(sSReceivedDate)   'Convert string to d
            Call DisplayMessage("Record found")
      End If
```

Examples: RPG - Host code for ODBC stored procedures:

In this example, the program, **SPROC2**, is called from the client as a stored procedure via ODBC. It returns data to the client from the PARTS database file.

RPG/400® (non-ILE) example:

```
 * THIS EXAMPLE IS WRITTEN IN RPG/400 (NON-ILE)
 *
 *  DEFINES PART AS AN INTEGER (BINARY 4.0)
 *
I#OPTDS      DS
I                                    B   1   40#OPT
I#PRTDS      DS
I                                    B   1   40#PART
C           *ENTRY    PLIST
C                     PARM           #OPTDS
C                     PARM           #PRTDS
 *  COPY PART NUMBER TO RPG NATIVE VARIABLE WITH SAME
 *  ATTRIBUTES OF FIELD IN PARTS MASTER FILE (PACKED DECIMAL 5,0)
C                     Z-ADD#PART     PART    50
C           #OPT      CASEQ1         ONEREC
C           #OPT      CASEQ2         ALLREC
C                     ENDCS
C                     SETON                     LR
C                     RETRN
 *
 ****************************
C           ONEREC    BEGSR
 ****************************
 * PROCESS REQUEST FOR A SINGLE RECORD.
C/EXEC SQL DECLARE C1 CURSOR FOR
C+   SELECT
C+   PARTNO,
C+   PARTDS,
C+   PARTQY,
C+   PARTPR,
C+   PARTDT
C+
C+   FROM PARTS               -- FROM PART MASTER FILE
C+
C+   WHERE PARTNO  = :PART
C+
C+
C+  FOR FETCH ONLY            -- READ ONLY CURSOR
C/END-EXEC
C*
C/EXEC SQL
C+  OPEN C1
C/END-EXEC
C*
C/EXEC SQL
C+  SET RESULT SETS CURSOR C1
C/END-EXEC
C                     ENDSR
 ****************************
C           ALLREC    BEGSR
 ****************************
 * PROCESS REQUEST TO RETURN ALL RECORDS
C/EXEC SQL DECLARE C2 CURSOR FOR
C+   SELECT
C+   PARTNO,
C+   PARTDS,
C+   PARTQY,
C+   PARTPR,
C+   PARTDT
C+
C+   FROM PARTS       -- FROM PART MASTER FILE
C+
C+
C+  ORDER BY PARTNO   -- SORT BY PARTNO
C+
C+  FOR FETCH ONLY    -- READ ONLY CURSOR
```

```
C/END-EXEC
C*
C/EXEC SQL
C+  OPEN C2
C/END-EXEC
C*
C/EXEC SQL
C+  SET RESULT SETS CURSOR C2
C/END-EXEC
C                     ENDSR
```

ILE-RPG example:

```
 * This example is written in ILE-RPG
 *
 * Define option and part as integer
D#opt             s             10i 0
D#part            s             10i 0
 * Define part as packed 5/0
Dpart             s              5p 0

C     *entry        plist
C                   parm                    #opt
C     part          parm                    #part

C     #opt          caseq     1             onerec
C     #opt          caseq     2             allrec
C                   endcs

C                   eval      *inlr = *on
C                   return
 *
 ****************************
C     onerec        begsr
 ****************************
 * Process request for a single record.
C/EXEC SQL DECLARE C1 CURSOR FOR
C+   SELECT
C+   PARTNO,
C+   PARTDS,
C+   PARTQY,
C+   PARTPR,
C+   PARTDT
C+
C+   FROM PARTS               -- FROM PART MASTER FILE
C+
C+   WHERE PARTNO  = :PART
C+
C+
C+  FOR FETCH ONLY            -- READ ONLY CURSOR
C/END-EXEC
C*
C/EXEC SQL
C+  OPEN C1
C/END-EXEC
C*
C/EXEC SQL
C+  SET RESULT SETS CURSOR C1
C/END-EXEC
C                   endsr
 ****************************
C     allrec        begsr
 ****************************
 * Process request to return all records
C/EXEC SQL DECLARE C2 CURSOR FOR
C+   SELECT
C+   PARTNO,
C+   PARTDS,
C+   PARTQY,
C+   PARTPR,
C+   PARTDT
C+
C+   FROM PARTS       -- FROM PART MASTER FILE
C+
C+
C+  ORDER BY PARTNO   -- SORT BY PARTNO
C+
C+  FOR FETCH ONLY    -- READ ONLY CURSOR
C/END-EXEC
C*
C/EXEC SQL
C+  OPEN C2
C/END-EXEC
C*
C/EXEC SQL
C+  SET RESULT SETS CURSOR C2
C/END-EXEC
C                   endsr
```

iSeries Access for Windows database APIs

The iSeries Access for Windows proprietary C/C++ Database APIs provide support for iSeries database and catalog functions, in addition to SQL access to iSeries database files. Choose this link for important information regarding these APIs.

Important: Enhancements to the C/C++ APIs (Optimized SQL APIs) were discontinued, starting with V5R3. It is strongly recommended that you use one of the other technologies for database access. See the iSeries Access for Windows database programming topic collection for details on the other technologies, which include:

- NET Framework Classes
- ADO/OLE DB
- ODBC
- JDBC
- Database Transfer
- ActiveX automation objects

Related reference

"Database APIs return codes" on page 20

Java programming

The **Java** programming language, which was defined by Sun, enables the development of portable Web-based applications.

Note: By using the code examples, you agree to the terms of the "Code license and disclaimer information" on page 552.

See the IBM Toolbox for Java

The IBM Toolbox for Java, which is shipped with iSeries Access for Windows, provides Java classes for accessing iSeries resources. IBM Toolbox for Java uses the iSeries Access for Windows Host Servers as access points to the system. However, you do not need iSeries Access for Windows to use IBM Toolbox for Java. Use the Toolbox to write applications that run independent of iSeries Access for Windows.

Note: IBM Toolbox for Java interface behaviors such as security and tracing may differ from those of other iSeries Access for Windows interfaces.

ActiveX programming

ActiveX automation is a programming technology that is defined by Microsoft.

Note: By using the code examples, you agree to the terms of the "Code license and disclaimer information" on page 552.

iSeries Access for Windows provides the following methods for accessing iSeries resources by using ActiveX automation:

Automation objects:
These objects provide support for:

- Accessing iSeries data queues
- Calling iSeries system application programming interfaces and user programs
- Managing iSeries connections and validating security
- Running CL commands on the iSeries server
- Performing data-type and code-page conversions
- Performing database transfers
- Interfacing with host emulation sessions

"iSeries Access for Windows OLE DB provider" on page 448:
Call the iSeries Access for Windows OLE DB Provider, by using Microsoft's ActiveX Data Objects (ADO), to access the following iSeries server resources:

- The iSeries database, through record-level access
- The iSeries database, through SQL
- SQL stored procedures
- Data queues
- Programs
- CL commands

Custom controls:
ActiveX custom controls are provided for:

- iSeries data queues
- iSeries CL commands
- iSeries system names for previously connected systems
- iSeries Navigator

Programmer's Toolkit:
For detailed information on ActiveX support for iSeries Access for Windows, see the **ActiveX** topic in the **Programmer's Toolkit** component of iSeries Access for Windows. It includes complete documentation of ADO and ActiveX automation objects, and links to ActiveX information resources.

How to access the ActiveX topic:

1. Ensure that the **Programmer's Toolkit** is installed (see "Install the Programmer's Toolkit" on page 5).
2. Launch the **Programmer's Toolkit** (see "Launch the Programmer's Toolkit" on page 5).
3. Select the **Overview** topic.
4. Select **Programming Technologies**.
5. Select **ActiveX**.

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