IBM

IBM Systems - iSeries

Networking
Ethernet on iSeries

Version 5 Release 4

IBM

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> **Note**
>
> Before using this information and the product it supports, read the information in "Notices," on page 33.

Contents

Ethernet

Ethernet on the iSeries™ supports TCP/IP, Advanced Peer-to-Peer Networking® (APPN), advanced program-to-program communications (APPC), Retail, Finance, Host and remote workstation.

Use the following information to configure and manage TCP/IP or SNA over Ethernet on your iSeries.

What's new

Information about the changes and improvements made to Ethernet since the last release.

Support is added for the 10 Gigabit Ethernet optical fiber input/output adapters (IOAs) 573A and 576A. These IOAs do not require an input/output processor (IOP) to be installed in conjunction with the IOA. Instead the IOA can be plugged into a PCI bus slot and the IOA is controlled by the main processor. The 573A is a 10 Gigabit SR (short reach) adapter, which uses multimode fiber (MMF) and has a duplex LC connector. The 573A can transmit to lengths of 300 meters. The 576A is a 10 Gigabit LR (long reach) adapter, which uses single mode fiber (SMF) and has a duplex SC connector. The 576A can transmit to lengths of 10 kilometers. Both of these adapters support TCP/IP, 9000-byte jumbo frames, and the IEEE 802.3ae standard.

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.

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Ethernet support

Understand and use Ethernet frames, connections, and functions.

Many different factors influence the capabilities of Ethernet. Some of these influences can come from the cabling and adapter type you use. Limiting factors can be the capabilities of the hub or switch that you connect to, the frame size you are able to transmit and receive, and the type of connection you use.

For more detailed information and some explanations of the terminology and technology available to you, see the following:

Ethernet commonly used terms

Understand the terms that are used in reference to Ethernet networking.

The following terms are some common items that are referred to from time to time. Some of the terms defined can be used to represent multiple meanings. The terms and definitions used here are meant to specifically represent Ethernet networking technology, related information, and devices.

link partner
> The 10BASE-T, 100BASE-TX, 1000BASE-T, 1000BASE-SX, 10GBASE-LR, or 10GBASE-SR connection that is established between the adapter card and the hub or switch port to which it is connected. The line speed and duplex characteristics of this link can be different from other connections in the network.

hub A half duplex device that sums all of its inputs and then broadcasts that sum on all outputs to all connected adapters. The hub has a large collision domain and shared media.

switch A half or full duplex device that learns which devices are attached at each port and passes only frames addressed to those devices on that port. The switch has a small collision domain.

Ethernet capabilities

Ethernet capabilities, such as line speed and duplex mode, can enhance your server's performance.

The iSeries server is capable of transmitting and receiving data at speeds from 10 megabits per second (10 Mbps) to 10 gigabits per second (10 Gbps or 10 000 Mbps). Functions such as full duplex also enhance the communication speeds and the overall performance of Ethernet. For more specific information about these types of capabilities, see the following:

Line speed

The speed of data transfer is limited by the connection type, cabling, and maximum speeds that your server and link partner support.

These speeds can be 10, 100, 1000 Mbps (1 Gbps), or 10 000 Mbps (10 Gbps).

The cable type you use will directly limit what speed you can transmit and receive data. For more information about cabling types and their capabilities, see the Establish a physical connection to your network topic.

The maximum line speed of your server is also affected by the type of input/output adapter (IOA) that you are using. For more specific information about each supported IOA, see the Hardware requirements for Ethernet topic.

> **Related concepts**
>
> "Gigabit and 10 Gigabit Ethernet" on page 3
> The iSeries server supports Gigabit and 10 Gbps Ethernet, which requires the use of a 1 Gbps or 10 Gbps input/output adapter (IOA).
>
> **Related reference**
>
> "Establish a physical connection to your network" on page 5
> Ensure you configure the correct line speed and duplex mode for your connection.

"Hardware requirements for Ethernet" on page 7
Find out what IOAs are supported and what capabilities each one has.

Duplex mode

Depending on your server's capabilities and the duplex mode of the link partner you are attaching to, you can use either full or half duplex.

Half duplex mode will restrict the server to one way communication; it cannot transmit and receive data at the same time. Full duplex allows your server to send and receive data simultaneously. You must match your server's duplex mode to that of your link partner. If you do not, a duplex mismatch will occur.

Related concepts

"Auto-sensing" on page 5
If auto-negotiation fails, your server can match the line speed of its link partner.

Gigabit and 10 Gigabit Ethernet

The iSeries server supports Gigabit and 10 Gbps Ethernet, which requires the use of a 1 Gbps or 10 Gbps input/output adapter (IOA).

There are six IOAs that can be used to run Gigabit Ethernet, the 2760, 5701, and 5706 Unshielded Twisted Pair (UTP) adapters, which use copper wire cabling, and the 2743, 5700, and 5707 Gigabit Ethernet cards, which use fiber optics. The fiber optic 573A and 576A IOAs support 10 Gbps Ethernet. All of the adapter cards support Transmission Control Protocol/Internet Protocol (TCP/IP), 9000-byte jumbo frames, and the IEEE 802.3 standard.

i5/OS does not have integrated support for SNA over Gigabit or 10 Gbps Ethernet. Enterprise Extender or AnyNet is required to run SNA over Gigabit or 10 Gbps Ethernet.

The UTP cards have the capability of running 10BASE-T/100BASE-TX/1000BASE-T in full or half duplex mode. The recommended minimum cabling type for use between these cards and their link partner is Category 5e, which has copper twisted pair wiring. All four pairs are used when running Gigabit Ethernet. The cable and connectors must also be wired to TIA/EIA 568-B standard. Crossover cables are not supported.

The Gigabit fiber optic cards only support 1000BASE-SX in full duplex mode. The 10 Gigabit fiber optic cards only support 10Gbase-LR and 10Gbase-SR in full duplex mode. The 2743 and 576A use duplex SC connectors while the 5700, 5707, and 573A use duplex LC connectors. The recommended fiber to use with the 2743, 5700, 5707, and 573A IOAs is 50 or 62.5 micron MMF (multi mode) fiber. 9 micron SMF (single mode) fiber is recommended for the 576A.

Table 1. Summary of IOA support by release

IOA	Earliest release supported
2743	V4R5
2760	V5R1
5700	V5R2
5701	V5R2
5706	V5R3
5707	V5R3
573A	V5R3[*]
576A	V5R3[*]

| **Note:** The 573A and 567A are only supported at V5R3 for some types of the iSeries model 520. These
| adapters are supported at V5R4 for all other models.

| Ethernet frames can contain anywhere from 64 to 9000 bytes of information. All of these cards support
| the largest, 9000-byte jumbo frame size. The amount of work for the adapter card to process each frame,
| regardless of size, is nearly the same. Therefore, you want to pack the most information possible into
| each frame. The final result will be to decrease processor utilization, leaving it more available for other
| application usage.

| **Note:** Your system is limited by the switches, hubs, and devices that it connects to. Gigabit Ethernet, 10
| Gigabit Ethernet, and jumbo frames can only be used if all devices support them.

| **Related concepts**
| "Line speed" on page 2
| The speed of data transfer is limited by the connection type, cabling, and maximum speeds that your
| server and link partner support.
| **Related reference**
| "Establish a physical connection to your network" on page 5
| Ensure you configure the correct line speed and duplex mode for your connection.
| "Hardware requirements for Ethernet" on page 7
| Find out what IOAs are supported and what capabilities each one has.
| **Related information**
| APPC, APPN, and HPR

Auto-negotiation

Auto-negotiation is the preferred method of configuring your system's Ethernet connections.

It should always be tried first. In auto-negotiation, your system sends out Ethernet link pulses seeking to
transfer configuration data between your server and its link partner. Each partner shares its supported
values for line speed and duplex mode, then finds the highest common value for each. The highest
values common to both partners are selected, in this order:

| • 10 Gbps full duplex[1]
| • 1 Gbps full duplex[2]
| • 1 Gbps half duplex[2]
- 100 Mbps full duplex
- 100 Mbps half duplex
- 10 Mbps full duplex
- 10 Mbps half duplex

Note:

| 1. The fiber optic 10 Gigabit Ethernet adapter card can only run either 10 Gbase-LR (long range)
| or 10 Gbase-SR (short range), and full duplex. The fiber optic 10 Gigabit Ethernet adapter card
| does allow auto-negotiation, but the only acceptable outcome is 10 Gbps, full duplex.

| 2. For Gigabit Ethernet, the line speed is negotiable only when using the UTP card, since this card
| has 10/100/1000BASE-T and full or half duplex capabilities. The fiber optic Gigabit Ethernet
| adapter card can only run 1000BASE-SX and full duplex. The fiber optic Gigabit Ethernet
| adapter card does allow auto-negotiation, but the only acceptable outcome from the
| auto-negotiation is 1000 Mbps, full duplex.

Auto-negotiation allows your server and its link partner to quickly establish a connection. However, both
systems must support auto-negotiation. If the link partner is not configured to auto-negotiate, the system
will auto-sense a workable line speed, but not the duplex mode. The server will use the default setting of

half-duplex. If this is not the correct duplex mode, you will experience a duplex mismatch, at which point you must manually configure your server's duplex mode to match that of its link partner.

Related concepts

"Auto-sensing"
If auto-negotiation fails, your server can match the line speed of its link partner.

Auto-sensing

If auto-negotiation fails, your server can match the line speed of its link partner.

However, the adapter cannot sense the duplex mode. The server will default to half duplex, which can result in a duplex mismatch.

Duplex mismatch

The following is an example of a duplex mismatch: Your iSeries, configured for full duplex, is connecting to a hub configured for half duplex. The iSeries server begins sending information to the hub, which is waiting to receive. When the receive line is clear, the hub will then begin transmission back to the iSeries server. During this transmission, the iSeries receives the incoming data and (if it has data ready) begins transmitting to the hub. Because the hub is half duplex, it will see this unexpected receipt of data and will cancel the transmission in progress. This is called a collision. A duplex mismatch problem might be reported as a 'failure to connect' error, or it might cause a more subtle performance problem due to intermittent cancelled frames.

Related concepts

"Duplex mode" on page 3
Depending on your server's capabilities and the duplex mode of the link partner you are attaching to, you can use either full or half duplex.

"Auto-negotiation" on page 4
Auto-negotiation is the preferred method of configuring your system's Ethernet connections.

Establish a physical connection to your network

Ensure you configure the correct line speed and duplex mode for your connection.

The first step to using Ethernet for the iSeries is establishing a physical connection to your network. Having the correct settings and configurations for your server will help ensure a successful connection. The physical link includes using the correct cabling and configuring the correct line speed and duplex mode to match the capabilities of the link partner you are connecting to.

UTP cable specifications

The cabling that you use to connect to your link partner must be wired to the TIA/EIA 568–B standard (straight through, no cross-over). There are different categories of UTP cables and each one supports different speeds.

- Category 3: supports 10 Mbps
- Category 5: supports 10/100/1000 Mbps
- Category 5e: supports 10/100/1000 Mbps
- Category 6 or higher: supports 10/100/1000 Mbps

Note: Category 5e or higher is recommended if you are running Gigabit Ethernet. These cable types have tighter specifications that will help you achieve better quality connections.

Connecting your cables can be tedious work. The table below lists the pairs of wires inside the UTP cable and shows what order they are wired in the RJ-45 connector. It is crucial that the connector pins be in this order, or you will not be able to connect your link partner. You will notice that the wires are

different colors; some are solid colors and some are half solid and half white. Each half solid and half white wire is paired with the corresponding solid color wire, even though they might not sit adjacent to one another in the connector.

The pairs of wires are:
- White/green, solid green
- White/orange, solid orange
- White/blue, solid blue
- White/brown, solid brown

The pins are numbered from left to right. (Hold the connector latch down and point the contacts away from you, so that pin 1 (White/Green) is on the left.) The table below shows how the wires appear in the connector and what pins they are set into.

Connector pin	Wire color
1 2	White/Green Green
3 4	White/Orange Blue
5 6	White/Blue Orange
7 8	White/Brown Brown

Line speed and duplex mode configuration

If your link partner is capable of auto-negotiation, you can use *AUTO for both line speed and duplex mode, to auto-negotiate. If you are unsure of your link partner's capabilities, find out what line speed and duplex mode it is set to, so you can configure your server to match.

For example, the hub or switch port is set to 100 Mbps and half duplex (not capable of auto-negotiation). In CRTLINETH, set your iSeries parameters to LINESPEED = 100M, DUPLEX = *HALF. Do not use *AUTO for either of these parameters, in this case.

Do not use any of the following line speed and duplex mode configurations:
- 10/*AUTO
- 100/*AUTO
- *AUTO/Half
- *AUTO/Full

These configurations might work, but you will have frequently unsuccessful and incorrect connections.

Related concepts

"Gigabit and 10 Gigabit Ethernet" on page 3
The iSeries server supports Gigabit and 10 Gbps Ethernet, which requires the use of a 1 Gbps or 10 Gbps input/output adapter (IOA).

"Line speed" on page 2
The speed of data transfer is limited by the connection type, cabling, and maximum speeds that your server and link partner support.

Related reference

"Establish a physical connection to your network" on page 5
Ensure you configure the correct line speed and duplex mode for your connection.

"Hardware requirements for Ethernet"
Find out what IOAs are supported and what capabilities each one has.

Hardware requirements for Ethernet

Find out what IOAs are supported and what capabilities each one has.

The iSeries supports the Ethernet input/output adapter types, listed by custom card identification number (CCIN) in the following table:

Table 2. Supported Ethernet adapters

CCIN	Speed (Mbps)	Auto-negotiation supported	Jumbo frames supported	TCP/IP	i5/OS native SNA support	Duplex mode capability	
						Full	Half
576A[2]	10 000 (10 Gigabit)	Yes	Yes	Yes[5]	No	Yes	No
573A[2]	10 000 (10 Gigabit)	Yes	Yes	Yes[5]	No	Yes	No
5706[1,4]	10/100/1000 (1 Gigabit)	Yes	Yes	Yes	No	Yes	Yes
5707[2,4]	1000	Yes	Yes	Yes	No	Yes	No
2743[2]	1000	Yes	Yes	Yes	No	Yes	No
5700[2]	1000	Yes	Yes	Yes	No	Yes	No
2760[1]	10/100/1000	Yes	Yes	Yes	No	Yes	Yes
5701[1]	10/100/1000	Yes	Yes	Yes	No	Yes	Yes
2838[1,3,4]	10/100	Yes	No	Yes	Yes	Yes	Yes
2849[1,3,4]	10/100	Yes	No	Yes	Yes	Yes	Yes
6181[1]	10	No	No	Yes	Yes	Yes	Yes
2723[1]	10	No	No	Yes	Yes	Yes	Yes

Notes:

1. Unshielded Twisted Pair (UTP) card; uses copper wire cabling.

2. Uses fiber optics.

3. You can run SNA traffic with TCP/IP traffic on this IOP/IOA. TCP/IP traffic will run in the higher performance path along with SNA traffic.

4. Supports Operations Console

5. Enterprise Extender or AnyNet is required to run SNA over 1 Gbps or 10 Gbps Ethernet. For more information, see the APPC, APPN, and HPR topic.

Related concepts

"Gigabit and 10 Gigabit Ethernet" on page 3
The iSeries server supports Gigabit and 10 Gbps Ethernet, which requires the use of a 1 Gbps or 10 Gbps input/output adapter (IOA).

"Line speed" on page 2
The speed of data transfer is limited by the connection type, cabling, and maximum speeds that your server and link partner support.

Related tasks

"Select a LAN IOA and create the Ethernet line description" on page 15

"Change your line description" on page 19

"Assign your line description to a TCP/IP interface:" on page 19

"Configure TCP/IP over Ethernet" on page 15

Related reference

"Establish a physical connection to your network" on page 5
Ensure you configure the correct line speed and duplex mode for your connection.

"Hardware requirements for Ethernet" on page 7
Find out what IOAs are supported and what capabilities each one has.

Related information

APPC, APPN, and HPR

LAN IOA addresses

Learn about IOA preset addresses.

The IOA will have a preset address (also known as the burned-in address or the manufacturer-assigned address). You have the option of setting the address for each input/output adapter (IOA) to an address of your choice.

If you are using SNA, it is recommended that you use an address of your choice. For example, if you use the burned-in address of the adapter, you must configure this address into every device that communicates with the adapter. If, at a later point in time you replace the adapter, you must go back to each device and reconfigure them with the burned-in address of the new adapter. You cannot assign the burned-in address of the old adapter to the new adapter.

However, you can avoid the excess reconfiguration work by associating a locally administered address with the adapter. Since the other devices will already have the locally administered address configured, you will not need to reconfigure them when you replace the IOA. Instead, you can associate the existing locally administered address with the new adapter.

Note: No two adapters in the same network can have the same address.

Related tasks

"Select a LAN IOA and create the Ethernet line description" on page 15

Ethernet frame format

Know how to interpret the data contained in your Ethernet frames by understanding the frame formatting.

While tracing LAN communications, you might need to look at the transmitted frames. To understand the data that is contained in the frame, you must know how it is formatted. The figures below show the frame format of two Ethernet standards: IEEE 802.3 and Ethernet version 2.

The Frame Check Sequence (FCS) is a part of the frame put in place to verify that the information each frame contains is not damaged during transmission. If a frame is corrupted during transmission, the FCS on the frame will not match with the recipient's calculated FCS. Any frames that do not match the calculated FCS will be discarded.

IEEE 802.3 frame format

Starting Delimiter (1 byte)	Destination Address (6 bytes)	Source Address (6 bytes)	Length (2 bytes)	LLC header and Information field (46 - 1500 bytes)	Frame Check Sequence (4 bytes)

Ethernet version 2 frame format

Starting Delimiter (1 byte)	Destination Address (6 bytes)	Source Address (6 bytes)	Type (2 bytes)	Information field (46 - 1500 bytes)	Frame Check Sequence (4 bytes)

Ethernet version 2 supports SNA by placing the IEEE 802.2 LLC header and data into the information field. It also puts value X'80D5' into the Type field. This shows the frame format.

Starting Delimiter	Destination Address	Source Address	Type (80D5)	Information field (Length, Padding, LLC header, Data)	Frame Check Sequence

Note: i5/OS™ does not have integrated support for SNA over Gigabit Ethernet or 10 Gbps Ethernet. Enterprise Extender or AnyNet is required to run SNA over 1 Gpbs or 10 Gbps Ethernet. For more information, see the "APPC, APPN, and HPR" topic.

Related information

APPC, APPN, and HPR

Types of Ethernet frames sent

Understand the different types of Ethernet frames that can be sent.

The Ethernet frame that your server receives and the Ethernet standard that you select in the line description govern the type of frame that your server sends. As noted in the table below, your server will not send a frame in some cases. In the line description, you select the standard through the Ethernet standard (ETHSTD) field. In an SNA environment, if you have the option to use Ethernet standard IEEE 802.3 or Ethernet version 2, use *ALL.

The following table shows what Ethernet frame your server sends according to the frame type the server receives and the value of the ETHSTD field.

Frame type received	ETHSTD value	Frame type sent
IEEE 802.3 with SNA or non-SNA data	*IEEE8023[1]	IEEE 802.3
	*ETHV2[2]	No frame sent
	*ALL[3]	IEEE 802.3
Ethernet version 2 with non-SNA data	*IEEE8023	No frame
	*ETHV2	Ethernet version 2
	*ALL	Ethernet version 2
Ethernet version 2 with SNA data	*IEEE8023	IEEE 802.3
	*ETHV2	Ethernet version 2, encapsulated SNA[4]
	*ALL	IEEE 802.3

Notes:

1. The network uses Ethernet standard IEEE 802.3.

2. The network uses Ethernet version 2. In an SNA environment, you use this protocol for only iSeries-to-iSeries communications.

3. The network uses both Ethernet standards (IEEE 802.3 and Ethernet version 2). All TCP/IP multicast packets are sent as 802.3 and Ethernet version 2 frames.

4. The type field of the Ethernet version 2 frame to indicate the information field contains the SNA data.

Maximum Ethernet frame sizes

Understand the maximum Ethernet frame sizes.

The largest frame size used during the connection process is controlled by the maximum frame size configurations of multiple items. The maximum frame size for the connection is also influenced by exchange identifier negotiations and bridge considerations. Note that TCP/IP and SNA connections are limited by slightly different sets of items.

TCP/IP connections

The maximum frame size is associated with:
- the Ethernet standard that you select
- the line description (Gigabit Ethernet only)
- each service access point (SAP)
- the TCP/IP interface

SNA connections

The maximum frame size is associated with:
- the controller
- the Ethernet standard that you select
- each service access point (SSAP)

During the connection process, your server selects the smallest common value of the maximum frame values. As stated above, the actual maximum frame size used can become even smaller, if the bridge cannot support the value selected by the server.

The following table shows the maximum frame sizes that are associated with the Ethernet standard that you select through the Ethernet standard (ETHSTD) field.

ETHSTD parameter value	Frame type used	Maximum frame size in bytes	
		SNA[4]	TCP/IP
*IEEE8023 [1]	IEEE 802.3	1496	8992 (1 Gbps/10 Gbps Ethernet) 1492 (all others)
*ETHV2[2]	Ethernet version 2	1493	9000 8992 (1 Gbps/10 Gbps Ethernet) 1500 (all others)
*ALL[3]	IEEE 802.3	1496	8992 (1 Gbps/10 Gbps Ethernet) 1492 (all others)
	Ethernet version 2	1493	9000 8992 (1 Gbps/10 Gbps Ethernet) 1500 (all others)

ETHSTD parameter value	Frame type used	Maximum frame size in bytes	
		SNA[4]	TCP/IP
Notes:			
1. IEEE 802.3 standard.			
2. Ethernet version 2 standard.			
3. Network uses both Ethernet standards (IEEE 802.3 and Ethernet version 2).			
4. For 1 Gbps and 10 Gbps cards, Enterprise Extender orAnyNet® is required to use SNA. For more information, see the APPC, APPN, and HPR topic in the iSeries information center.			

Related reference

"SNA service access points (SAPs)" on page 14

"Remote bridges dropping frames" on page 22

"Increase Gigabit and 10 Gigabit Ethernet performance" on page 23

Related information

APPC, APPN, and HPR

Maximum LAN frame sizes

Learn about frame size configuration and troubleshooting.

The larger your frame size, the more data your server can pack into it. Hence, you can increase your data throughput. Typically you set the maximum frame size to the largest size that is supported by your input/output adapter (IOA). However, a device along the way will drop the frame if it cannot support the larger size.

For example, if frames are being sent to a remote system on a different LAN, the frame must be go through a bridge to be retransmitted to the remote LAN. If the bridge cannot support the frame size that your LAN is using, the frame will be dropped or discarded. In the Ethernet environment, no indication of the smaller frame size of the bridge is received. The problem will be detected when a connection with the remote system is established and a CPA57A1 message is sent to the configured message queue.

If you cannot configure the device to support your frame size, you must decrease your maximum frame size to a size that the device can support. You can change one or more of the following maximum frame size fields (location of the field in parentheses):
- SSAP maximum frame parameter (line description)
- Maximum frame size (line descriptions for token ring, Gigabit and 10 Gigabit Ethernet networks)
- Maximum frame size (controller description)

If any adjustments are made, it is recommended that the MAXFRAME value on the controller description be adjusted as well.

Connect LAN devices

The correct line and controller descriptions will help you achieve successful connections.

If you use SNA with a LAN protocol, this information will help you to successfully connect to a remote system. The correct relationship between a line description and a controller description helps to ensure connection establishment. A controller description determines which line descriptions your server uses. Therefore, you must ensure that the controller description refers to the correct line description.

A line description also governs the number of active controllers that can access it. By setting the MAXACT parameter number too small, you might prevent the controller from accessing the server over the specific line description. Therefore, you should set a large enough value to ensure the controller access to the line.

The descriptions must also contain the correct information to ensure connection establishment. The following information discusses further details on choosing connections and identifying information:

> **Related tasks**
>
> "Create the SNA controller description" on page 17
>
> **Related reference**
>
> "Connection failure and controller descriptions" on page 29

LAN device identification

Learn about the types of verification used during the connection process.

To begin a connection, your server sends information to the remote device you are connecting to. The device identifies the server using this information. The device then sends information back to the server, which the server uses to identify the device. The server compares that information against the information that is contained in the line and controller descriptions. If a match occurs and other connection values are correct, the connection process continues. In the meantime, the remote device performs a similar process.

Your server and the remote device use two types of verification during the connection process. The first type (required), matches the line and controller description information with the connection information that the remote device sent. Once the information has been verified, your server continues the process.

The remote device sends the following information:
- The MAC address associated with the input/output adapter (IOA) on the remote device (either preset or locally administered)
- The source service access point (SSAP) on the remote device
- The destination service access point (DSAP)

The other type of verification matches the SNA exchange identifier values. SNA hosts that use parallel connections require this verification. This verification is optional for advanced program-to-program communications (APPC).

> **Related reference**
>
> "SNA service access points (SAPs)" on page 14
>
> "Connection failure and controller descriptions" on page 29

SNA exchange identifiers (XIDs)

To establish a connection, your server and the remote device both send an XID.

The exchange identifier is defined in the controller description for your server. SNA hosts that use parallel connections require the XIDs. Your server conducts an initial poll with NULL XIDs during the connection process, to determine whether the remote device is active. If the device responds to the poll, your server and the remote device exchange XIDs and establish the connection.

The controller description for an SNA host names the XID value as the local exchange identifier. The APPC controller description names the XID value as the exchange identifier. Other controller types, such as CTRL, FNC, and RWS, also use the exchange identifier.

LAN device connection initiation

In an SNA environment you can determine which server initiates the connection request and which server waits for an incoming connection request.

To have your server initiate the connection, you can configure the controller description to dial the destination. If no connection is established, your controller description automatically switches to answer mode.

To have your server wait for incoming calls, you can configure the controller description to answer the incoming calls. You specify the mode through the Initial connection (INLCNN) field of the controller description:

Dial mode (SNA)

SNA controller descriptions use dial mode to send a connection request to a remote device. Dial mode typically starts when varying on the controller description. However, if the DIALINIT parameter is set to *DELAY, dial mode will not begin until an application opens a file that uses the connection. During the dialing process, the server polls the remote device to determine if the device is available. If the remote device is available, the connection process continues. Successful connection is still possible even if the local and remote devices dial each other simultaneously.

The controller description fields below set the frequency and duration of the poll:
- LAN connection retry (LANCNNRTY) determines the number of times your server polls the remote device.
- LAN connection timer (LANCNNTMR) determines the length of time between each poll.

If the remote device answers the poll within the time specified by the parameters, your server proceeds with establishing the connection. If not, your server sends an inquiry message (CPA58E0 or CPA57EF) to the configured message queue. This message indicates that a connection attempt failed and that the controller description is now in answer mode.

Answer mode (SNA)

If you specify answer mode, the input/output adapter (IOA) does not originate connection requests, but will respond to incoming connection requests. Servers with controller descriptions that are configured with dial mode will initiate and accept connection requests. However, APPC controllers that are user owned (CTLOWN = *USER) must be varied on before the server can respond to connection requests.

> **Related reference**
> "LANCNNTMR and LANCNNRTY" on page 23
> The LAN connection timer (LANCNNTMR) and LAN connection retry (LANCNNRTY) parameters of your controller description define the frequency and persistence of polling the remote station to establish a connection
> "Connection failure and controller descriptions" on page 29

SNA connections to LAN protocols

You can connect your server to a LAN using SNA, and can have multiple service access points.

The server can connect SNA to a LAN protocol by using service access points (SAPs). Multiple SAPs allow you to have multiple connections between SNA and a LAN protocol, thus permitting multiple communication paths between independent applications.

You or the server specifies the SAPs to use in the line and controller descriptions. For SNA, the server can automatically create one SAP value (the default value). You might want to change this value or have additional SAPs if any of the following conditions apply:
- The remote system does not use the default source service access point (SSAP)
- You want parallel station-to-station connections between adapters (This might be desirable if you link two applications that require different controller descriptions.)

- You want station-to-station connections to the same adapters (You might want to do this to configure multiple SAPs to test an application on a single system.)

If you plan to change the SAP defaults, see the following for guidelines and other information:

Related tasks

"Select a LAN IOA and create the Ethernet line description" on page 15

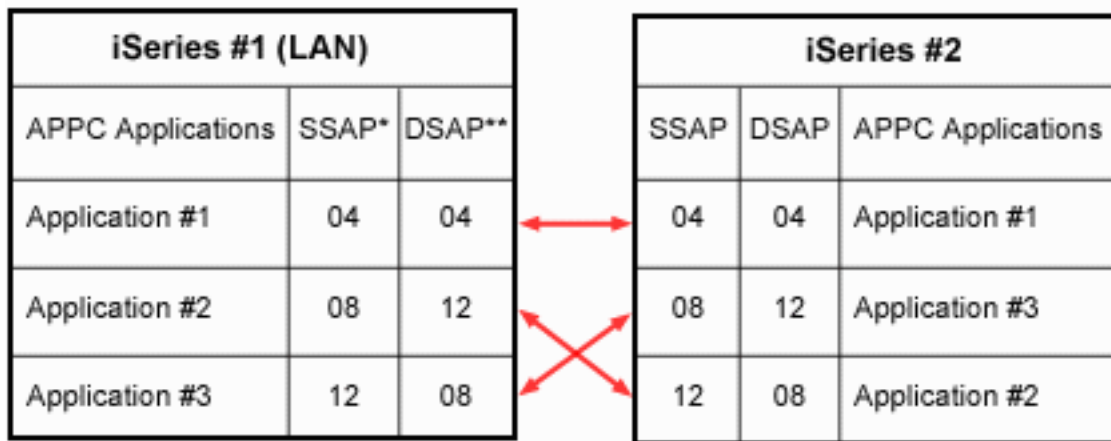"Create the SNA controller description" on page 17

SNA service access points (SAPs)

On the server, you define the source SAPs (SSAP). If you decide to change the default SAPs or add more SAPs, you must define them in the line and controller descriptions. You can specify up to 24 SSAPs per line description when you define the SAPs. The SSAPs that your controller description uses must also be defined in the line description associated with the controller description. Your controller description also specifies the destination service access point (DSAP).

Local SAPs are known as source service access points (SSAPs). The remote SAPs are known as destination service access points (DSAPs). Your server sends data from an SSAP to a DSAP.

The following figure portrays the physical connection between the source service access points of your iSeries and the destination service access points of the remote system. For example, on your server, the SSAP 08 will have a DSAP of 12. On the remote system, the SSAP is 12 and the DSAP is 08.

Example of SSAP and DSAP Pairs

iSeries #1 (LAN)				iSeries #2		
APPC Applications	SSAP*	DSAP**		SSAP	DSAP	APPC Applications
Application #1	04	04	←→	04	04	Application #1
Application #2	08	12		08	12	Application #3
Application #3	12	08		12	08	Application #2

* The LAN source service access point (SSAP) is the logical address that this server sends with any data to a remote system. This value must match the DSAP of the remote controller.

**The LAN destination service access point (DSAP) is the logical address with which this controller communicates. This value must equal the LAN SSAP in the remote controller configuration.

For SNA, you must use certain SSAP values. You can find the help for selecting these values by pressing F1 (Help) while your cursor is on the SSAP list field of the line description.

Related concepts

"LAN device identification" on page 12

Learn about the types of verification used during the connection process.

Related tasks

"Select a LAN IOA and create the Ethernet line description"

"Create the SNA controller description" on page 17

"Change your line description" on page 19

"Assign your line description to a TCP/IP interface:" on page 19

"Configure TCP/IP over Ethernet"

Related reference

"Maximum Ethernet frame sizes" on page 10
Understand the maximum Ethernet frame sizes.

Related information

Match iSeries system line description parameters for a remote iSeries system

Configure Ethernet support

Procedures for setting up Ethernet connections with TCP/IP and SNA.

Configure TCP/IP over Ethernet

Use iSeries Navigator to configure Ethernet support for TCP/IP. To configure your server, complete the following steps:

1. Install iSeries Navigator. (If this has previously been installed, skip to step 2.)

2. In the iSeries Navigator window, expand the iSeries server that will provide Ethernet support for TCP/IP. Log onto the server if you are prompted to do so.

3. To use the EZ-Setup Wizard to configure a new TCP/IP interface that will be used with Ethernet:

    a. Click on **Network**.

    b. Click on **TCP/IP**. Click on **IPv4** or **IPv6**.

    c. Right click on **interface** and select **New Interface**.

    d. Click on **Local Area Network**. This will take you to the Configuration Wizard.

    Remember: You can choose to use an existing line description or have a new one created by iSeries Navigator.

4. If you did not choose to turn on the TCP/IP interface, you can do so now. Follow the instructions in "Start the TCP/IP interface" on page 20.

    Related tasks

    "Change your line description" on page 19

    Related reference

    "Hardware requirements for Ethernet" on page 7
    Find out what IOAs are supported and what capabilities each one has.

    "SNA service access points (SAPs)" on page 14

Configure SNA over Ethernet

To configure Ethernet support for SNA complete the following from an interactive job:

Select a LAN IOA and create the Ethernet line description

Note: The steps below describe only the fields that require additional information. If you need help with the fields that are not discussed here, press F1 (Help) when your cursor is on the field in question.

1. Type `WRKHDWRSC *CMN` and press Enter. A list will appear that shows the attached iSeries communications resources, and their type numbers, operational statuses, and descriptive text.

2. Locate an IOA by looking in the descriptive text column for a phrase that describes the port for your LAN type. For example, if you use Ethernet, look for "Ethernet Port."

3. Once you find an IOA, move your cursor to its **Opt** field.

4. Type 5 (Work with configuration descriptions) and press `Enter`.

5. Type 1 (Create) and press `Enter`.

   You are now in the Create Line Description (Ethernet) (CRTLINETH) screen.

   Note: The server enters the IOA you selected into the **Resource** name field.
   To move from field to field, move your cursor or press the tab key. Do not press Enter while you are in this screen unless instructed to do so; otherwise you will exit the command.

6. Type a name for your line description into the **Line description** field.

7. Indicate the address to use with the IOA in the **Local adapter** address field. You can use either the preset address or a locally administered address. If you are unsure which address to use, see the LAN IOA addresses topic.

   To use the preset address, accept the default value of ***ADPT**. To specify a locally administered address, enter a valid address into the field. For guidelines on creating a valid address, move your cursor to the address field and press F1 (Help).

8. If the server uses this line description to communicate with an SNA host through a parallel connection, specify a value other than *LIND in the **SNA Exchange identifier** field.

9. In the **Ethernet standard** field, specify the standard to use. If you can use SNA over IEEE 802.3 or Ethernet version 2, use the *ALL value on the **ETHSTD** parameter.

   For information about how the selected standard influences the type of Ethernet frame your server sends, see the Types of Ethernet frames sent topic.

   Note: You cannot change this field after exiting the command.

10. In the **Line speed** field, indicate the line speed to use. If you do not know the capabilities of the IOA, see the Hardware requirements for Ethernet topic.

    Note: Line speed automatic negotiation occurs when you specify `*AUTO`.

11. Select the duplex mode to use with your IOA. If you do not know the capabilities of the IOA, see the Hardware requirements for Ethernet topic.

    Note: Duplex mode automatic negotiation occurs when you specify *AUTO. Remember that your Ethernet switch or hub must support automatic negotiation before you can successfully use this function. If the device does not support it, a duplex mismatch can occur, causing connection problems. For more information see the Auto-sensing topic.

12. Press `F10` (Additional fields).

13. List all the source service access points (SSAP) that your controller description can use in the **SSAP** field. Accept the default value *SYSGEN or specify your SSAPs. To define the SSAP values, move your cursor to the field and press F1 (Help) for help to determine what values to use. For more information on whether you or the server should define the service access points (SAPs), see the SNA connections to LAN protocols topic.

14. Leave the **SSAP maximum frame** field blank.

15. **Optional:** In the **Autocreate** controller field, specify `*YES` if you use APPN and want the server to create a controller description. (The server will create the description when a call comes in.) If you specified `*YES`, you do not need to create a device description.

16. Press `Enter` to create the line description. Your line description will appear at the bottom of the list.

17. Press `Enter` twice.

    Related concepts

    "LAN IOA addresses" on page 8
    Learn about IOA preset addresses.

"SNA connections to LAN protocols" on page 13
You can connect your server to a LAN using SNA, and can have multiple service access points.

Related reference

"SNA service access points (SAPs)" on page 14

"Types of Ethernet frames sent" on page 9
Understand the different types of Ethernet frames that can be sent.

"Hardware requirements for Ethernet" on page 7
Find out what IOAs are supported and what capabilities each one has.

Create the SNA controller description

The controller description identifies the remote devices to which the server connects.

Note: If you are running APPN, your server can automatically create the controller description (suggested method) or you can create it manually. Autocreate cannot be used with APPC.

To create a controller description to use with your LAN adapter, complete the following steps:

1. **Optional:** Type GO CMDCTL to find a list of controller creation commands.
2. Type the name of the command to use and press F4 (Prompt).
3. Type the name of the controller description into the **Controller description** field.
4. Specify *LAN in the **Link Type** field.
5. Press Enter three times. The server displays more fields that might require the following information:
   - **Switched line list:** specifies one or more line descriptions that your controller description can use. Enter the name of your Ethernet Line Description. For more information about the relationship between the line and controller descriptions, see Connect LAN devices.
   - **Initial connection:** determines whether the controller description initiates connection requests (*DIAL), or waits for incoming connection requests (*ANS).

     If you specify *DIAL and want to adjust the polling duration or frequency, you can change the **LAN connection retry** (LANCNNRTY) or **LAN connection timer** (LANCNNTMR) field. See LANCNNTMR and LANCNNRTY for more information.
   - **LAN remote adapter address:** contains the address of the remote input/output adapter (IOA). To locate this address, see "View the LAN IOA address" on page 20. If you are using the preset address of the adapter, consider using your own LAN IOA addresses to minimize your reconfiguration work.
   - **LAN DSAP:** contains the source service access point (SSAP) value from the controller description that is for the remote device. For more information about service access points (SAPs), see SNA connections to LAN protocols.
   - **LAN SSAP:** contains a value from the SSAP listing of the line description that is associated with this controller description.

   For detailed information about all the parameters and their dependencies, see the chapter about communications controller descriptions in Communications Configuration.
6. Fill in all of the required fields. Press Enter until you reach a required field.
7. Press Enter again to create the description.

For more information on creating controller descriptions with APPC, APPN, or HPR, see Configuring APPC, APPN, and HPR.

Related concepts

"Connect LAN devices" on page 11
The correct line and controller descriptions will help you achieve successful connections.

"SNA connections to LAN protocols" on page 13
You can connect your server to a LAN using SNA, and can have multiple service access points.

The LAN connection timer (LANCNNTMR) and LAN connection retry (LANCNNRTY) parameters of your controller description define the frequency and persistence of polling the remote station to establish a connection

Related information

Communications Configuration (on the V5R1 Supplemental Manuals Web site)

Configure APPC, APPN, and HPR

Create the SNA device description

The device description identifies the communications device that is used by the remote device. There are no LAN-specific parameters in the device description. To create the SNA device description, complete the following steps:

1. Find the create command to use. Use the GO CMDDEV command to view of list of available commands.
2. Type the name of the command and press F4 (Prompt).
3. Type the name of the device description into the corresponding field.

   For detailed information about all the parameters and their dependencies, see the chapter about communications device descriptions in Communications Configuration.
4. Press Enter twice to create the description.

   Related information

   Communications Configuration (on the V5R1 Supplemental Manuals Web site)

Vary on configuration objects for SNA

To accept connections, you must vary on the configuration objects by using the Work with Configuration Status (WRKCFGSTS) command:

1. Type WRKCFGSTS *LIN and press Enter.
2. Locate your line description.
3. Move your cursor to the **Opt** field of the line description, type 1 (Vary on), and press Enter.
4. If the line description does not vary on successfully, press F3 (Exit). Read Display message queues to understand how to view the error messages and to find possible solutions.
5. Press F3 (Exit).

If the line description varied on successfully, you should do the same for the controller description if you created one. Vary on the description by using the same instructions for varying on the line description. Instead of specifying *LIN for the WRKCFGSTS command, you must specify *CTL.

Manage Ethernet support

You can use existing line descriptions with iSeries Navigator by assigning it to a TCP/IP interface.

Managing Ethernet support requires many tasks. The following links provide information about some basic steps in Ethernet management

Use existing line descriptions with iSeries Navigator

Change settings in the line description and assign it to a TCP/IP interface.

You can use an existing Ethernet line description with iSeries Navigator by changing the description through any interactive job. However, you should ensure that all configuration objects (for example, TCP/IP interfaces) that currently use the line description are still able to work with it after you have changed it.

Use the Change Line Description (Ethernet) (CHGLINETH) command to change your line description. Then use iSeries Navigator to assign your line description to a TCP/IP interface:

Change your line description

1. Vary off the line description:
    a. Type WRKLIND and press Enter.
    b. Locate your line description, and place your cursor in its **Opt** field.
    c. Type 8 (Work with status) and press Enter.
    d. Type 2 (Vary off) and press Enter. If your line description does not vary off, place your cursor on the error message and press F1 (Help) to view more information about the error. If you need help with the error, see iSeries troubleshooting.
    e. Press Enter.
2. Type CHGLINETH description_name (where **description_name** is the line description being changed) and press F4 (Prompt).
3. Specify the correct values for the **Line speed** field and the **Duplex** field. If you are not familiar with the input/output adapter (IOA), see Hardware requirements for Ethernet.
4. If you are using this line description with TCP/IP, ensure that source service access point (SSAP) X'AA' and its associated information are in the **SSAP list** field.
5. If you want to use the larger frame sizes of Gigabit or 10 Gigabit Ethernet, ensure that all the nodes along the communications path can support the frame sizes.
6. Press Enter to save your changes.

    Related tasks

    "Assign your line description to a TCP/IP interface:"

    "Configure TCP/IP over Ethernet" on page 15

    Related reference

    "Hardware requirements for Ethernet" on page 7
    Find out what IOAs are supported and what capabilities each one has.

    "SNA service access points (SAPs)" on page 14

Assign your line description to a TCP/IP interface:

To use your line description with TCP/IP, you must associate the line description with a new or existing TCP/IP interface.

To associate the line description with a *new interface*, follow the procedures in Configure TCP/IP over Ethernet. During the interface creation process, you will choose the line description that you have just changed from the list of line descriptions.

To associate your line description with an *existing interface*, complete the following steps:

You must have iSeries Navigator installed to do the following steps.

1. If this is the first time you are using iSeries Navigator to access your iSeries, use the wizard to configure TCP/IP on the server.
2. Expand the iSeries that has the line description that you have just changed.
3. Select **Network** → **Protocol**.
4. Right click **TCP/IP** and select **Interface**.
5. Double click the interface that you will associate your line description with.

6. Click the **Resource** tab and select your line description from the **Line name** option.
7. Click **OK** twice.

   Related tasks

   "Change your line description" on page 19

   Related reference

   "Hardware requirements for Ethernet" on page 7
   Find out what IOAs are supported and what capabilities each one has.

   "SNA service access points (SAPs)" on page 14

Enable objects to accept connections

After configuring LAN support, you are ready to enable your configuration objects to accept connections.
For SNA, you vary on the line and controller descriptions. For TCP/IP, you start the interface.

Vary on configuration objects for SNA

To accept connections, you must vary on the configuration objects by using the Work with Configuration
Status (WRKCFGSTS) command:

1. Type WRKCFGSTS *LIN and press Enter.
2. Locate your line description.
3. Move your cursor to the **Opt** field of the line description, type 1 (Vary on), and press Enter.
4. If the line description does not vary on successfully, press F3 (Exit). Read Display message queues to
   understand how to view the error messages and to find possible solutions.
5. Press F3 (Exit).

If the line description varied on successfully, you should do the same for the controller description if you
created one. Vary on the description by using the same instructions for varying on the line description.
Instead of specifying *LIN for the WRKCFGSTS command, you must specify *CTL.

Start the TCP/IP interface

Use iSeries Navigator to enable to TCP/IP interface.

1. In iSeries Navigator, expand the iSeries that contains the TCP/IP interface to start.
2. Select **Network** → **Protocol**.
3. Right-click **TCP/IP** and select **Interface**.
4. Start the interface now, or every time TCP/IP starts.

   To start the interface now:

   a. Select an inactive interface.
   b. Click **Start**.
   c. Click **OK** to close the dialog box.

   To start the interface every time TCP/IP starts:

   a. Double-click the interface.
   b. Select **Start interface when TCP/IP is started**.
   c. Click **OK**.

View the LAN IOA address

When configuring a controller description, you must specify the address of the remote input/output
adapter (IOA).

To view the locally administered address or the preset address on the remote system, follow these steps:

View the locally administered address

1. Type DSPLIND description_name (where **description_name** is the name of the description to be displayed) and press Enter.
2. Locate the **Local adapter address** field to view the address of the adapter.
3. Press F3 (Exit).

View the pre-set address

1. Locate a line description that uses the IOA. This description must specify *ADPT in the **Adapter address** field. If you cannot find such a line description, create it, and then return here to continue the steps.
2. Use the Work with Configuration Status (WRKCFGSTS) command to vary on the line description:
   a. Type WRKCFGSTS *LIN and press Enter.
   b. Locate your line description and look for a status of varied on or active.
   c. If it is varied on or active, press F3 (Exit) and skip to step 3
   d. If it is not varied on or active, place your cursor on the **Opt** field of the line description, type 1 (Vary on), and press Enter.
   e. If your line description does not vary on, place your cursor on the error message and press F1 (Help) to view more information about the error. If you need help to understand the error message or to resolve it, see iSeries troubleshooting.
   f. Press F3 (Exit).
3. Type DSPLIND description_name (where **description_name** is the name of your line description), and press Enter.
4. Locate the **Local adapter address** field to view the preset address of the adapter.
5. Press Enter.

Configuration object commands

View and use commands that affect your line, controller, or device descriptions.

You can view and use other commands that affect your line, controller, or device descriptions by using the GO command. To view a subset of the commands use the following GO commands:
- To view line description commands, type GO CMDLIND and press Enter.
- To view controller description commands, type GO CMDCTLD and press Enter.
- To view device description commands, type GO CMDDEVD and press Enter.

To view a more complete list of commands, use the following:
- To view line description commands, type GO CMDLIN and press Enter.
- To view controller description commands, type GO CMDCTL and press Enter.
- To view device description commands, type GO CMDDEV and press Enter.

The list below shows other related commands that you can use with your descriptions. To use one of these commands, type the name of the command (shown in parentheses) and press F4 (Prompt):
- Retrieve Configuration Status (RTVCFGSTS)
- Vary Configuration (VRYCFG)
- Save Configuration (SAVCFG)
- Restore Configuration (RSTCFG)
- Work with Configuration Status (WRKCFGSTS)

Tune Ethernet performance

You can tune an Ethernet network's performance by adjusting the parameters that control its behavior.

For guidelines and tips about adjusting these parameters, see the following:

Related information

iSeries Performance Capabilities Reference

Improve local area network performance

Adjust your LAN-frame size

Ethernet networks break data up into many little chunks called frames. These frames are sent individually across the network and reconstructed by the receiving computer. Changing the size of the frames can alter the behavior of the network. Changing the frame size is possible for both TCP/IP over Ethernet networks and SNA over Ethernet networks.

Your frame size might need adjusting if the remote bridge drops your frames. For more information about remote bridges dropping frames, see Remote bridges dropping frames.

To change your frame size do the following:

1. Determine the new frame size. If you do not know what your frame size should be, you might find that the frame size is contained within the QSYSOPR message queue in message CPF 5908. For information on viewing QSYSOPR messages, see View QSYSOPR or other message queues.
2. Determine which configuration object and MAXFRAME parameter to change. See "Remote bridges dropping frames" for information on which configuration object to change.
3. To change the parameter, do one of the following:
   - Change the line description using the CHGLINETH CL command.
   - Change the controller description. Type `GO CMDCTL` and press `Enter` to display a list of commands. Select the appropriate command for your controller type.
4. Press `F9` to show all parameters.
5. Locate the MAXFRAME parameter that you chose in step 2.
6. Specify the value that you found in step 1.
7. Press `Enter` to save your changes and exit the command.

   Related tasks

   "View QSYSOPR or other message queues" on page 28

   Related reference

   "Remote bridges dropping frames"

Remote bridges dropping frames

A remote bridge discards your frame if it does not support your frame size. Also, the network can discard your frame if it does not support your frame size.

If you cannot configure the bridge to support your frame size or a larger frame size, adjust the MAXFRAME parameter to a value that is acceptable to the bridge. The system has these MAXFRAME parameters that are shown in order of precedence:

1. The source service access point (SSAP) MAXFRAME parameter in the line description.
2. The MAXFRAME parameter in the line description (except Ethernet line descriptions).
3. The MAXFRAME parameter in the controller description.

The SSAP MAXFRAME parameter affects only one device. That is, only that device will use a frame size of SSAP MAXFRAME.

The MAXFRAME parameter that is in the line description affects all devices that use that description.

The MAXFRAME parameter that is in the controller description affects all lines and devices that use that description.

You set the precedence when specifying a MAXFRAME value. If you define a value for the first parameter (SSAP MAXFRAME) and then the second parameter, your system uses the value of the first parameter. To use the value of the second parameter, you should not specify a value for the first parameter.

Related tasks

"Adjust your LAN-frame size" on page 22

Related reference

"Maximum Ethernet frame sizes" on page 10
Understand the maximum Ethernet frame sizes.

Related information

Match iSeries system line description parameters for a remote iSeries system

Increase Gigabit and 10 Gigabit Ethernet performance

You can improve the performance of the server by using these tips:

- Increase your maximum frame size. You must ensure that all devices along the communications path support the frame size. For more information about frame sizes, see Maximum Ethernet frame sizes.
- Monitor the performance of your LAN by using the monitors feature of iSeries Navigator. See Track performance in the Performance topic for more information.
- See the communication performance chapter in the iSeries Performance Capabilities Reference.

Related reference

"Maximum Ethernet frame sizes" on page 10
Understand the maximum Ethernet frame sizes.

Related information

Track performance

iSeries Performance Capabilities Reference

SNA over Ethernet timing parameters

SNA over Ethernet networks have parameters that control timing. You can make the adjustments through the parameters of the SNA controller description.

SNA controller descriptions (advanced program-to-program communications (APPC), SNA host, remote workstation, finance, and retail) have parameters that describe the behavior of the station. The parameters can be used with all LAN protocols. The names of these parameters begin with the letters LAN.

The following is a list of the LAN parameters. See the LAN parameters to find how it affects your connection's performance. You can view all parameter values with the Display Controller Description (DSPCTLD) command when the controller is varied on.

Note: Reducing a parameter's value gives you quicker error detection, but it also reduces the time for error recovery.

To learn about these parameters and how to change them, see the following information:

LANCNNTMR and LANCNNRTY:

The LAN connection timer (LANCNNTMR) and LAN connection retry (LANCNNRTY) parameters of your controller description define the frequency and persistence of polling the remote station to establish a connection

LANCNNTMR specifies how long to wait before polling again. LANCNNRTY specifies how many times to poll. If the system receives no response from the remote station after polling LANCNNRTY times, the following occurs:

- The user is notified that contact with the station was unsuccessful.
- The system places the controller description in answer mode.
- If the remote station signals your system to retry your connection inquiry, your system attempts to establish connection again.

The default *CALC value for LANCNNTMR is 7 seconds. The default *CALC value for LANCNNRTY is 10.

Performance considerations

The default values of the parameters are designed for a single LAN and might cause a connection failure when you access a remote station through a remote bridge. The bridge might slow data traffic enough that the connection timer expires before the remote station's response reaches you. If this is the case, you should increase the values of LANCNNTMR and LANCNNRTY.

Related concepts

"LAN device connection initiation" on page 12
In an SNA environment you can determine which server initiates the connection request and which server waits for an incoming connection request.

Related tasks

"Create the SNA controller description" on page 17

"Changing timing parameters" on page 27
Do these steps to change the LAN timing parameters.

LANRSPTMR and LANFRMRTY:

The LAN response timer (LANRSPTMR) and the LAN frame retry (LANFRMRTY) parameters in your controller description determine how soon and how often the system retransmits a frame.

LANRSPTMR defines how long to wait before retransmitting a frame to the remote station. LANFRMRTY specifies how many times to retransmit a frame. A system retransmits a frame when one of the following occurs:

- A frame was lost or damaged.
- The remote station does not respond because it is busy.
- The remote station is waiting to acknowledge the frame with an information frame of its own. (See LANACKTMR and LANACKFRQ for more information about the acknowledge timer).

After your system retransmits a frame a number of times (based on the number that is indicated by the LANFRMRTY parameter), the system notifies the user that an error occurred and disconnects itself from the remote station.

The default *CALC value for LANRSPTMR is 1 second. The default *CALC value for LANFRMRTY is 10.

Performance considerations:

The default values of the parameters are designed for a single LAN and can cause too many frame retransmissions when accessing a remote station through a remote bridge. The bridge might slow data

traffic enough that your retransmit timer expires before the remote station's acknowledgment reaches you. Eventually, your system will automatically disconnect itself because it retransmitted a frame too many times. If this is the case, you should increase the values of LANRSPTMR and LANFRMRTY.

Note: If you make the parameter values too large, your connection failure notices can be delayed.

Related tasks

"Changing timing parameters" on page 27
Do these steps to change the LAN timing parameters.

LANACKTMR and LANACKFRQ:

Your SNA controller description includes the LAN acknowledgment timer (LANACKTMR) and the LAN acknowledgment frequency (LANACKFRQ) parameters. They work together to determine how often to send an acknowledgment to the remote station.

LANACKTMR specifies how long the system waits before sending an acknowledgment for the frames that it received. LANACKFRQ specifies the maximum number of frames that your system receives before sending an acknowledgment to the remote station (independent of timers or having data to send). Your system has a greater chance of sending the acknowledgment in a data frame (rather than the acknowledgment by itself) if the LANACKFRQ value is large.

The default *CALC value for LANACKTMR is 0.1 second. The default *CALC value for LANACKFRQ is 1.

Performance issues

Large values for LANACKTMR and LANACKFRQ might be desirable because smaller values can cause unnecessary acknowledgments and contribute to heavier LAN traffic. If you are connected to a network with traffic problems, you can increase the values of either parameters or both parameters.

However, in most cases where LAN traffic is not a problem and data tends to flow one way, large parameter values can cause this to happen:
- Introduce unnecessary delays when sending acknowledgments.
- Slow response times.

LANACKTMR considerations

You should choose values for the LANACKTMR parameter by carefully considering the remote station's response timer (LANRSPTMR) and maximum outstanding frame count (LANMAXOUT).

For example, assume that your system cannot send an acknowledgment before the remote station's response timer expires. The remote station will retransmit its frame because it did not receive your acknowledgment. To solve this problem, you must either shorten your system's timer or lengthen the remote system's timer.

LANACKFRQ considerations

Similarly, you should choose values for LANACKFRQ by carefully considering the remote station's maximum outstanding frame count (LANMAXOUT). If you do not correctly adjust the counters, your system will wait for more frames. However, the remote station will not transmit them because it is waiting for an acknowledgment from your system.

Related tasks

"Changing timing parameters" on page 27
Do these steps to change the LAN timing parameters.

LANINACTMR:

The LAN inactivity timer (LANINACTMR) parameter of your SNA controller description determines how long your system waits before requesting a response from the remote station. Your system uses the request to test if the remote station is still accessible.

The default *CALC value for LANINACTMR is 10 seconds.

Performance considerations

Unnecessary traffic is created if the value that you specify for the LANINACTMR parameter is too small. This might lead to a performance throughput problem. If it is too large, your system might not find out as quickly that the remote station is inaccessible.

LANINACTMR is sensitive to whether the remote station is on the same LAN or not. If the station is across a bridge, you might need to increase this value. If the value is 0 (no time out), you will not be informed if the connection fails until your system attempts a data transfer.

> **Related tasks**
> "Changing timing parameters" on page 27
> Do these steps to change the LAN timing parameters.

LANMAXOUT:

The Maximum outstanding data frames (LANMAXOUT) parameter of your SNA controller description specifies how many frames your system sends before waiting to receive an acknowledgment.

This parameter is highly sensitive to the remote station's speed to copy and acknowledge frames (speed is based on buffering capabilities and processing resource).

Note: The LAN window step (LANWDWSTP) parameter can influence the number of outstanding frames.

The default *CALC value for LANMAXOUT is 2.

Performance considerations

For optimal performance, you must choose appropriate values for the LANMAXOUT and LANACKFRQ parameters on both the sending and receiving stations.

These variables affect which LANMAXOUT and LANACKFRQ values provide the best performance:
* The characteristics of the application.
* The amount of data sent.
* The rate that the application can present and accept data.
* The data blocking characteristics.
* The LAN adapter type.
* The processing unit model.
* The utilization of the line, the adapter, and the processing unit.
* The internal buffering capabilities.

In most environments, the default value (*CALC) for LANACKFRQ and LANMAXOUT offer the best performance. However, for some environments, changing the values can improve performance significantly.

> **Related tasks**

"Changing timing parameters"
Do these steps to change the LAN timing parameters.

LANWDWSTP:

The LAN window step (LANWDWSTP) parameter of your SNA controller description determines whether the number of outstanding frames are reduced during network congestion.

Parameter LANMAXOUT determines the initial value for the number of outstanding frames.

The default *CALC value for LANWDWSTP is *NONE.

Performance considerations

If the value for LANWDWSTP parameter is too small or is *NONE, the network congestion takes longer to subside. For more information about network congestion, see the discussion of the dynamic window algorithm in book *Token-Ring Network Architecture Reference* (SC30–3374).

   Related tasks
   "Changing timing parameters"
   Do these steps to change the LAN timing parameters.

LANACCPTY:

The LAN access priority (LANACCPTY) parameter of your SNA controller description determines a token's priority.

The larger the number the higher the priority. (Used for token-ring only).

The default *CALC value for LANACCPTY is 0.

Performance considerations

The higher the priority, the greater the chances are that the remote station will quickly receive the token. The greater the access priority value, the more tokens the remote station receives. The greater value also increases your system's chances for sending its frame. These considerations are important if your system accesses a heavily used ring (not many free tokens available) and your application program needs priority treatment.

   Related tasks
   "Changing timing parameters"
   Do these steps to change the LAN timing parameters.

Changing timing parameters:

Do these steps to change the LAN timing parameters.
1. To view a list of commands that can change your controller description, type GO CMDCHG and press Enter.
2. From the displayed list of commands, choose a command to change your SNA controller description.
3. Type the command and press Enter.
4. Change the LAN parameters that you have chosen.
5. Press Enter to save your changes.

Troubleshoot Ethernet

Having problems with your server and connections? Get tips on why connections might fail, why frames are dropped, or why PCs cannot connect to your system.

To find the available troubleshooting tools or troubleshooting help, see the following information:

View QSYSOPR or other message queues

Use the DSPMSG CL command to view the QSYSOPR and other message queues which might contain messages that describe an error and might contain possible solutions for the error. These messages are typically a good place to begin troubleshooting. To view the message queues, do the following:

1. Type `DSPMSG MSGQ(message_queue)` on the command line and press Enter. **message_queue** is QSYSOPR or the configured message queue name. For example, `DSPMSG MSQ(QSYSOPR)`

2. Locate the error messages created around the time the error occurred.

3. Move your cursor to the error message of interest and press F1. The system displays more information about the error.

4. You should note the cause code, the error's description, and possible solutions. Also, record any message IDs, error codes, reference codes, or reason codes.

   Related tasks

   "Adjust your LAN-frame size" on page 22

   Related information

   Display Messages (DSPMSG)

Troubleshoot LANs

Your iSeries has tools to help you quickly find the problem and possible solutions. For an overview of the tools of your server and instructions on how to use them, see the iSeries troubleshooting topic.

See Communications Trace in the TCP/IP Troubleshooting topic collection to trace network data to locate a problem.

   Related information

   Troubleshooting

   Communications trace

Physical network problems

If your adapter card cannot make a connection to the network, and the Product Activity Log points to a physical network problem, check the following problem areas:

Cabling problems
- Check that your cable type is appropriate for the line speed you are using. For example, category 3 cable cannot be used for 100 Mbps.
- Is the cable wired correctly?
- Do all cables, patch cables, and patch panels between the iSeries and the network, switch or hub support your line speed? For example, if the line speed is configured at 100 Mbps, the cable must be category 5 to support the speed.

Possible solutions
- If the cables have been excessively bent or stretched, the wiring inside the cable might have been untwisted, damaged, or even broken. Try reseating the cable or temporarily replacing it with a functional one.

- Make sure that you are not using crossover cable.
- Route the cable away from electrically noisy devices, such as fluorescent lights, printers, copiers, or electric motors. These items can cause interference with data transmissions.
- Try plugging the cable into a different switch or hub port.
- Check that the switch or hub has the latest software from the vendor.
- You might want to add lightning protection to your network cabling and switch or hub power lines, if you live in a lightning prone area. A direct strike can cause a large power surge, which can severely damage your networking equipment and cabling.

Configuration problem checks and solutions

- Check that the line speed and duplex mode chosen in CRTLINETH are the same as the parameters programmed into the switch or hub port. One frequent cause of problems is a duplex or line speed mismatch

  Note: To use the *AUTO configuration for line speed or duplex mode, you must configure both of the parameters to *AUTO. Do not use line speed and duplex configurations of 10/AUTO, 100/AUTO, AUTO/Half, or AUTO/Full. These configurations might work, but you will have frequently unsuccessful and incorrect connections.

- Try varying the line off and then on again with *RESET. Do not use *RESET if an MFIOP is the IOP! This might shut down the entire machine because other devices that share the MFIOP will not be able to access the line.
- If you suspect the adapter might be faulty, run VFYCMN with an external wrap plug attached. If this test is passed, the adapter card is not likely to be the problem.
- Connect a LAN analyzer to verify that the actual line speed and duplex mode being used on the link between the iSeries and the hub or switch is accurate.

Connection failure and controller descriptions

Sometimes an incorrectly configured controller description can cause a connection failure. The problem source could involve the incorrect configuration of the adapter address, source service access point (SSAP), or destination service access point (DSAP) parameters.

For more information about how these parameters influence a successful connection, see LAN device identification. For other causes of a connection failure, see LAN device connection initiation.

The remote system does not connect

If your controller description uses dial mode, it is not unusual for the system to receive message CPA58E0 (Controller not replying) or CPA57EF (Contact not successful). Remote systems or controller descriptions that do not vary on can cause one of these messages to appear.

Your server does not connect

If your controller description uses answer mode, you might receive the message CPI591A (Controller is varied off or not recognized by local system). The following situations can cause this message to appear:

- The connection requested by the remote system does not exist on the local server. The local server searches for this connection (that is indicated by combining the local adapter address, the DSAP, and the SSAP) in all varied on controller descriptions.
- The controller description does not refer to the line description that could answer the call.

Solutions

- On either side of the connection, verify that the controller description has the correct combination of adapter address, SSAP, and DSAP.

- In the Switched line list field of the controller description, enter the line description that can accept the incoming call. .
- Vary on the correct controller description (use the Work with Configuration Status (WRKCFGSTS) command to vary on the controller).
- Verify that the local and remote adapters are wired into the network correctly.

For information about the relationship between line descriptions and controller descriptions, see Connect LAN devices.

Related concepts

"LAN device identification" on page 12
Learn about the types of verification used during the connection process.

"LAN device connection initiation" on page 12
In an SNA environment you can determine which server initiates the connection request and which server waits for an incoming connection request.

"Connect LAN devices" on page 11
The correct line and controller descriptions will help you achieve successful connections.

Remote system connection failure

If a remote system cannot connect to your iSeries, there are several areas you need to check. If the remote device is polling your server, but the system operator message queue does not contain a message regarding your system being polled, check the Product Activity Log for messages regarding line descriptions and system reference code AF06.

See Display the Product Activity Log in the Get started with communications topic collection for complete instructions and links to more information.

A connection failure can occur if the remote system uses a destination service access point (DSAP) that your line description does not refer to. Another possible cause might be that the line description that contains the correct DSAP is not in the Switched line list field of the correct controller description. If the AF06 system reference code is absent, the error might still have occurred. Verify that the adapter address, SSAP, and DSAP values for both your server and the remote system are correct.

Related information

Display the Product Activity Log to solve communication problems

Related information for Ethernet

Listed below are the product manuals and IBM® Redbooks™ (in PDF format), Web sites, and information center topics that relate to the Ethernet topic. You can view or print any of the PDFs.

Manuals

- Communications Configuration (2.9 MB) on the V5R1 Supplemental Manuals Web site

- iSeries Performance Capabilities Reference (977 KB)

Other information
- AnyNet communications for the iSeries system
- Communications Trace
- Configuring APPC, APPN, and HPR
- Display message queues
- Display the Product Activity Log

| • Improve local area network performance
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| • Track performance

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