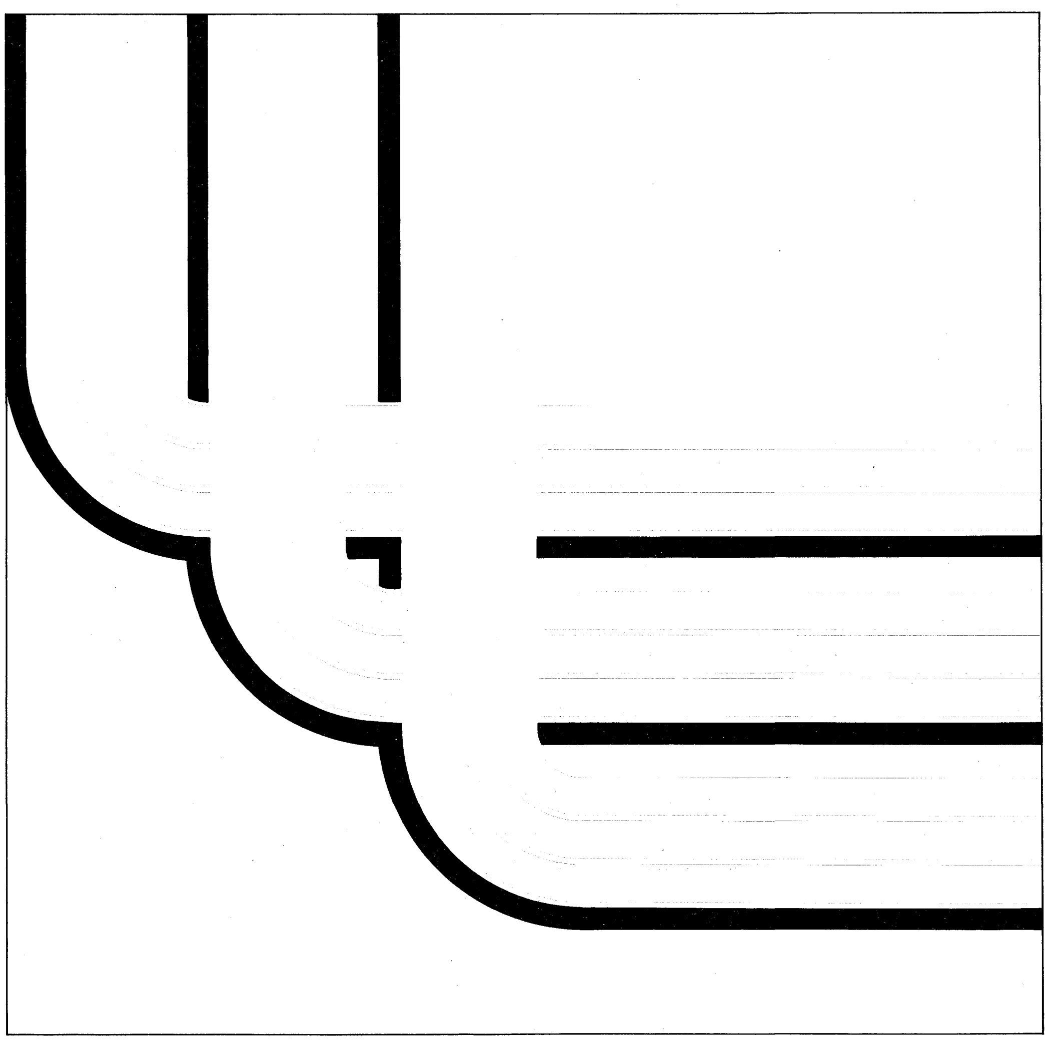
Application System/400™

SC41-8188-00

Communications: Advanced Peer-to-Peer Networking Guide

Version 2



System and Application Support

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First Edition (May 1991)

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About This Guide

This guide describes AS/400 **advanced peer-to-peer networking (APPN)**. APPN is the data communications support provided by the AS/400 system that routes data in a network between two or more APPC systems that do not need to be adjacent, in the same network or adjacent networks. **APPC** is the AS/400 implementation of the SNA LU session type 6.2 architecture.

This guide describes the APPN concepts, functions, and features as used on the AS/400 system. It provides information for configuring an APPN network and also presents considerations when using APPN.

Although this guide does contain some information about systems other than an AS/400 system, it does *not* contain all the information that the other system types may need to communicate with an AS/400 system using APPN. For complete information for a particular remote system type, refer to that system's documentation.

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For a list of related publications, see the "Bibliography."

The *Publications Guide*, GC41-9678, provides information on all the manuals in the AS/400 library.

Who Should Use This Guide

This guide is intended for the programmer responsible for defining or using advanced peer-to-peer networking (APPN). It is used for configuring APPN support.

You should have knowledge of general communications concepts. AS/400 communications concepts are covered in the *System Concepts* manual. In addition, specific communications topics are discussed in the online index search. For more information on basic communications, you can also refer to the Discover/IBM AS/400 course in the communications module. This course is separately orderable.

You should be familiar with the information contained in the following manuals:

- *System Operator's Guide*
- *Communications: Advanced Program-to-Program Communications Programmer's Guide*
- *Communications: Intersystem Communications Function Programmer's Guide*
- *OS/400* Communications Configuration Reference*
- *Remote Work Station Guide*
- *X.25 Network Guide*
- *Local Area Network Guide*
- *Communications Management Guide*

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Note: Throughout this guide, the term personal computer is used to mean any of the following:

- IBM 5160 Personal Computer
- IBM 5162 Personal Computer
- IBM 5170 Personal Computer XT*
- IBM 5180 Personal Computer AT*
- IBM 8525 Personal System/2* Model 25
- IBM 8530 Personal System/2 Model 30
- IBM 8550 Personal System/2 Model 50
- IBM 8560 Personal System/2 Model 60
- IBM 8570 Personal System/2 Model 70
- IBM 8580 Personal System/2 Model 80

Chapter 1. Introduction to AS/400 APPN Support

In IBM* networks, **Systems Network Architecture (SNA)** is the description of the layered logical structure, formats, protocols, and operational sequences that are used for transmitting information units, as well as controlling the configuration and operation of the networks.

The AS/400* advanced program-to-program communications (APPC) and advanced peer-to-peer networking (APPN) support are the AS/400 system implementations of and extensions to the SNA logical unit (LU) session type 6.2 and node type 2.1 architectures. Throughout this publication, APPC is used to generically refer to the application program interface and general support supplied by the AS/400 system to these architectures.

APPN is used to refer to the AS/400 system extensions to these architectures and the networking support provided by the AS/400 system.

For more information about APPC, see the *Communications: Advanced Program-to-Program Communications Programmer's Guide*.

Support Provided by APPC/APPN

The APPC/APPN support handles all of the SNA protocol requirements when your system is communicating with a remote system using the LU session type 6.2 and node type 2.1 architectures. The remote system can be any of the following systems:

- AS/400 system
- System/36
- System/38
- IBM personal computer
- Displaywriter
- Series/1*
- 5520 Administrative System
- RISC System/6000* (Reduced Instruction Set Computer)
- One of the following host systems:
  - System/370*
  - System/390*
  - 30XX processor
  - 43XX processor
  - 9370 system

  Note: The host system must be running with:

    - Customer Information Control System (CICS) Version 1.6 or later
    - Advanced Communications Facility/Network Control Program (ACF/NCP) Version 4 Release 2 or later and Virtual Telecommunications Access Method (VTAM) Version 3 Release 1.1 or later
- Another system that supports the appropriate level of architecture

Each system must have the appropriate level of support installed and configured. Refer to the appropriate documentation for that system for information on installing and configuring communications.

User-Written Applications

APPC/APPN provides both an interactive and batch communications interface between user-written application programs on local and remote systems. An AS/400 system can start programs on a remote system or a remote system can start programs on an AS/400 system.

An AS/400 application using the APPC/APPN support can either write to or read from an ICF file, or it can access the CPI-Communications call interface (which is part of the Systems Application Architecture*, or SAA*, framework).

If you use ICF, you can write application programs using C/400*, COBOL/400*, SAA FORTRAN/400* (FORTRAN/400), or RPG/400*. The *Communications: Advanced Program-to-Program Communications Programmer's Guide*, and the *ICF Programmer's Guide* contain information about writing applications using ICF files.

If you use CPI Communications, you can write application programs in SAA C/400, COBOL/400, FORTRAN/400, Procedures Language 400/REXX (an SAA Procedures Language), RPG/400, and Cross System Product (CSP), an SAA application generator. The *Communications: Advanced Program-to-Program Communications Programmer's Guide*, and the *SAA CPI Communications Reference* manual contain information about writing applications using the CPI-Communications call interface.

IBM-Supplied Applications

APPC/APPN also provides the communications capabilities for the following:

- **Distributed data management (DDM)**, a function of the operating system that allows an application program or user on one system to use database files stored on remote systems. For additional information, see the *Distributed Data Management Guide*.
- **SNA Distribution Services (SNADS)**, an asynchronous distribution service that defines a set of rules to receive, route, and send electronic mail in a network of systems. For additional information, see the *Distribution Services Network Guide*.
- **Display station pass-through**, a function that allows a user to sign on to one system (an AS/400 system, System/38, or System/36) from another system (an AS/400 system, System/38, or System 36) and use that system's programs and data. For additional information, see the *Remote Work Station Guide*.
- **File transfer support**, a function of the operating system that moves file members from one system to another by using asynchronous, APPC, or BSCEL communications support. For additional information, see the *ICF Programmer's Guide*.
- **PC Support/400**, which provides system functions to an attached personal computer. For additional information, see the Bibliography for the *Installation and Administration Guide* that pertains to your personal computer.
- **Alert support**, which provides the support for handling alerts on the AS/400 system. Alerts, which the system detects, are used to report a problem or an impending problem to the network operator. For additional information, see the *Alerts and DSNX Guide*.

- **Electronic customer support**, a function of the operating system that allows a customer to access the question-and-answer (Q & A) function; problem analysis, reporting, and management; IBM product information; and technical information exchange. For additional information, see the *Device Configuration Guide*.

For each of these IBM-supplied applications you must configure the APPC/APPN support on each of the systems in the network. For additional information concerning configuration, see Chapter 4 and the *OS/400* Communications Configuration Reference*.

Networking Support Provided

The AS/400 APPN support is an enhancement to the Node Type 2.1 architecture that supplies networking functions that are easy to use, are dynamic, and give control of the network to the peer systems that make up the network. While maintaining the ease-of-use characteristics of the AS/400 system, APPN provides the user with advanced functions, such as distributed directory searches, dynamic route selection based on user-specified values, intermediate session routing, and routing of data using transmission priorities. Chapter 2 provides additional information concerning APPN support.

Network Management

Along with typical error recovery support, the Operating System/400* licensed program also provides tools to perform network problem analysis and management. This support is provided by the OS/400* management services alert support and the APPN information support.

Network problem management is performed using the management services support. The management services support sends SNA-architected alerts to a problem management focal point when the AS/400 system detects a hardware or program problem. The problem management focal point, which is one or more nodes in the network, can be an AS/400 system or a host system running a licensed program such as NetView*. The problem management focal point can be monitored by a network operator.

For a complete description of the OS/400 management services (including alerts), see the *Alerts and DSNX Guide*.

The OS/400 APPC/APPN support provides a tool for network problem management. This tool, APPN information, is provided by using the Display APPN Information (DSPAPPNINF) command. Refer to Chapter 9 for additional information about APPN information.

The IBM SAA SystemView System Manager/400 is an optional licensed program that enhances network management on the AS/400 system. System Manager/400 makes it possible for an AS/400 system to act as service provider for other AS/400 systems in a network. This licensed program uses APPC/APPN to receive and process service requests to ensure proper network configuration, communications, and problem handling. For more information on System Manager/400, contact your IBM marketing representative or IBM-approved remarketer.

Configuration Requirements

You configure your system to use the APPC/APPN support with the configuration menus or the control language commands supplied with the AS/400 system. These configuration requirements are discussed in Chapter 4 and in the *OS/400* Communications Configuration Reference*.

Note: For a description of the menu-driven communications configuration process, see the *OS/400* Communications Configuration Reference*.

Information about the communications equipment and programs necessary for APPC/APPN can be found in the *Network Planning Guide*.

Communications Lines Supported

The number of configurations that can be varied on at the same time is dependent on the size of your system and the type of communications adapters attached. Each line used by APPC/APPN support can be one of the following (all the lines on your system and throughout the network do not have to be the same type):

- ISDN data link control (IDLC)
- SDLC point-to-point switched (manual answer, automatic answer, manual call, or automatic call)
- SDLC point-to-point nonswitched
- SDLC multipoint nonswitched
- X.25 packet switched data network supporting both **permanent virtual circuit (PVC)** and **switched virtual circuit (SVC)** connections[1]
- Local area networks:
  - IBM Token-Ring Network
  - Ethernet network

In addition to supporting the line types mentioned, APPC/APPN allows the sharing of these lines as follows:

- If an APPC communications type is configured to use *primary* SDLC support, it can also share a multipoint line with finance support, retail support, and remote work station support. They can all be active on the multipoint line at the same time.
- If an APPC communications type is configured to use *secondary* SDLC support, it can share a line with:
  - Distributed host command facility (DHCF) support
  - Distributed systems node executive (DSNX) support
  - SNA upline facility (SNUF)
  - The SNA version of remote job entry (RJE)
  - The SNA version of 3270 device emulation

  They can all be active on the line at the same time.
- If an APPC communications type is configured to use X.25 support, then multiple remote systems can be active at the same time. The APPC support can share the X.25 line with:

[1] A permanent virtual circuit (PVC) is a virtual circuit that has a logical channel permanently assigned to it at each data terminal equipment (DTE). A switched virtual circuit (SVC) is a virtual circuit that is requested by a virtual call and is released when the virtual circuit is cleared.

- Distributed host command facility (DHCF) support
- Distributed systems node executive (DSNX) support
- Finance support
- Remote work station support
- Retail support
- SNA upline facility (SNUF)
- The SNA version of remote job entry (RJE)
- The SNA version of 3270 device emulation

• If an APPC communications type is configured to use a local area network (token-ring network or Ethernet network), then multiple remote systems can be active at the same time. APPC support can share the local area network with:

  - Distributed host command facility (DHCF) support
  - Distributed systems node executive (DSNX) support
  - Finance support
  - Remote work station support
  - SNA upline facility (SNUF)
  - The SNA version of remote job entry (RJE)
  - The SNA version of 3270 device emulation
  - Transmission control protocol/Internet protocol (TCP/IP)

Some of the terms used in this section are:

- **Distributed host command facility (DHCF)**, a function of the operating system that supports the data link between a System/370-type terminal using an AS/400 application in an HCF (Host Command Facility) environment.
- **Distributed systems node executive (DSNX)**, a function of the operating system that receives and analyzes requests from the NetView Distribution Manager licensed program on a host system.
- **Ethernet**, a type of local area network that is supported by the Operating System/400 licensed program.
- **SNA upline facility (SNUF)**, the support that allows the AS/400 system to communicate with CICS/VS and IMS/VS application programs on a host system.
- **Remote job entry (RJE)**, a function of the Communications Utilities/400 licensed program that allows a user to submit a job from a display station on the AS/400 system to a System/370-type host system.
- **Session**, the logical connection by which a program or device can communicate with a program or device at a remote location. A **half-session** is one of the locations in a logical connection.
- **Transmission Control Protocol/Internet Protocol (TCP/IP)**, a set of vendor-independent communications protocols that support peer-to-peer connectivity functions for both local and wide area networks.
- **3270 Device emulation**, the operating system support that allows an AS/400 system to appear as a 3274 Control Unit in a BSC multipoint network or an SNA network.

Chapter 2. AS/400 APPN Support

The AS/400 advanced peer-to-peer networking (APPN) support is an enhancement to the SNA node type 2.1 architecture. APPN provides the following support:

- It allows peer systems to participate in and control a network of systems without requiring the networking support traditionally provided by a host (System/370 type) system.
- It allows routing of data by intermediate systems in the network so that all systems are logically adjacent, even if they are not physically adjacent.
- It allows APPN network nodes to link together adjacent APPN networks that have different network IDs, so that network node directory and routing services can be used between networks.

What is an APPN Network?

As an introduction to APPN, consider the example in Figure 2-1 which draws an analogy between a peer system's view of SNA and a worldwide cargo shipment.

- **SNA**

  SNA can be compared to the laws to which ships transporting cargo between ports around the world must adhere.

- **Peer systems**

  Imagine different shipping ports around the world as different peer systems in an SNA environment.

- **APPC**

  Consider the cranes on the docks; these are tools used by operators to load and unload ship cargoes in much the same way that APPC is used by a program to enable data to be sent and received from the local system. The cranes represent APPC.

- **Program**

  The crane operator is analogous to the program, using the APPC verb set (the crane) to 'PUT' and 'GET' cargo from the ship or dock in much the same way that the program sends and receives data.

- **End user or enterprise**

  The end user or enterprise is analogous to the person or business who uses the unloaded cargo brought in from other ports much in the same way users use the accessible data from the peer systems of APPC programs.

- **Data**

  Data is the cargo to be transported.

- **SNA transport layer**

  The ships that transport the cargoes are analogous to the SNA transport layers that transport data from APPC programs to a different peer system in the network.

- **Prior to APPN...**

  Prior to APPN, because of various customs and trading route regulations more suited for larger trading nations, ships were required to do the following:

  1. Travel to the nearest cargo port (peer system), regardless of the destination of any cargo (data).

Figure 2-1 (Part 1 of 2). An Analogy of SNA

2. Have the cargo checked by various customs officials in that port. This required that cranes (APPC) unload and reload the data in much the same way that APPC programs in intermediate systems must provide the routing between systems.
3. Continue in this way until the cargo arrived at its final destination. Then the cargo could be unloaded and a new cargo loaded for a return trip.

- **APPN**

  APPN can be compared to a new set of customs and trading route regulations. Ships (SNA transport layers) must still travel within well-defined shipping lanes between various ports (peer systems), but the route regulations have been eased and ships may now travel by whichever route is most appropriate at a given time.

  Although ships must still travel within well-defined shipping lanes directly between ports, customs no longer require that the cargoes be unloaded and reloaded at each port (a process which takes time and resources). In fact, the ships need no longer come into dock at these intermediate ports. Thus, the ships travel directly between origin and destination.

  Similarly, APPN provides additional functions in the transport layer of SNA which enable non-adjacent peer systems to appear adjacent. APPN also enables the best route (at a particular point in time) to be chosen between two nodes in a network.

Figure 2-1 (Part 2 of 2). An Analogy of SNA

An APPN network can be as simple as Figure 2-2, which shows two nodes directly attached. The network can also be more complex as in Figure 2-3 on page 2-3, Figure 2-4 on page 2-3, and Figure 2-5 on page 2-3. In Figure 2-3 and Figure 2-5, sessions between non-adjacent systems appear to be directly attached (as though the network only consisted of two nodes as in Figure 2-2). The data simply passes through one or more network nodes on its way to the session end point. (This function is called intermediate session routing.) The size of your network can be as small or as large as you decide.

In Figure 2-4 on page 2-3, the intermediate session routing is taken a step further in that the directory and routing services are extended between the two different networks by network nodes B and NN1.

Note: An application on the system in New York that communicates with an application on the system in Los Angeles would work, without changes, in all three example networks shown.

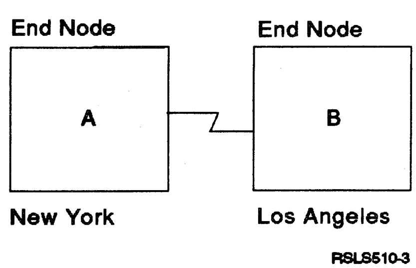


Figure 2-2. Example of a Simple APPN Network

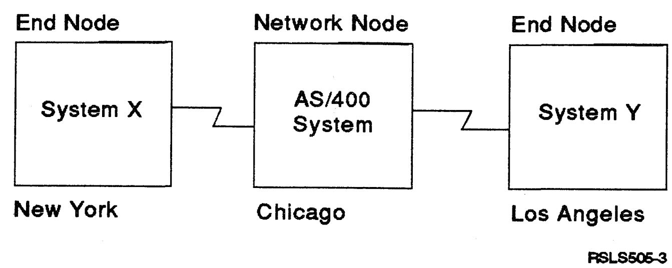


Figure 2-3. Example of an APPN Network with a Network Node

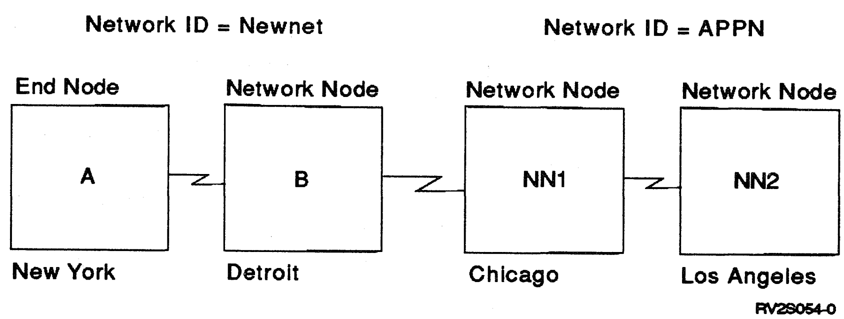


Figure 2-4. Example of Two Linked APPN Networks

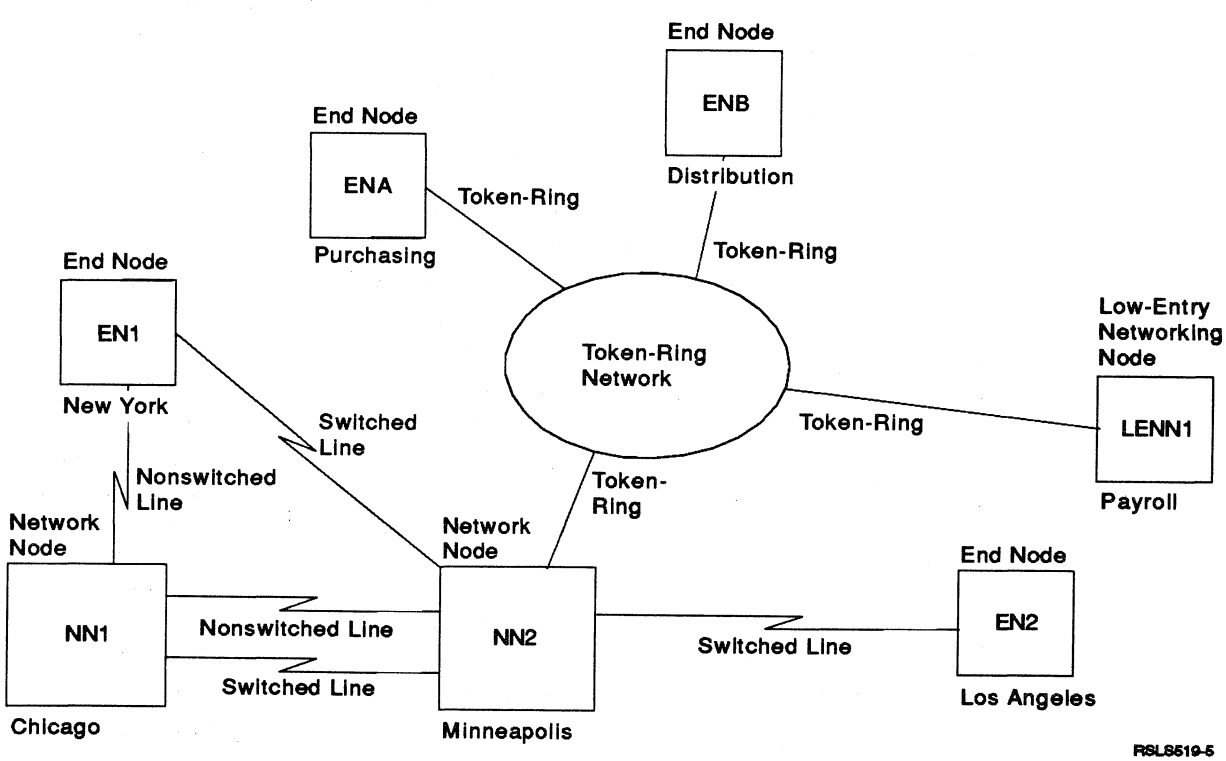


Figure 2-5. Multiple-System APPN Network

Node Type 2.1 Nodes

A node type 2.1 node is a system, such as an AS/400 system, that provides support to local users and system functions to allow participation in a peer-to-peer network.

Each node is distinguished from other nodes in the network by a unique name. This name consists of two parts, a network identifier and a control-point name. This name identifies each system to all other systems in the network.

Types of node type 2.1 nodes are:

Low-Entry Networking Node
A low-entry networking node uses the node type 2.1 architecture without the APPN extensions. A low-entry networking node may participate in an APPN network by using the services of an attached network node server. A **network node server** is a network node that is directly connected to an end node or a low-entry networking node, and that has been assigned to service the end node or low-entry networking node session requests. The user of a low-entry networking node must specifically configure all the remote locations with which communications is to occur as if they existed at the network node server. A low-entry networking node can have only one connection into an APPN network. The ability for a low-entry networking node to use the APPN network varies depending on the specific implementation. Examples of a low-entry networking node are:

- System/38
- System/36 without the APPN feature
- Series/1
- An AS/400 system configured without APPN (APPN(*NO) specified in the controller description)
- A personal computer running APPC/PC
- A personal computer running OS/2* communications manager
- A System/370 host running VTAM/ACF
- A System/370 host running VTAM/NCP

APPN End Node
A node that does not provide any network services to other nodes (such as intermediate session routing) but may participate in the APPN network by using the services of an attached network node server is called an end node. An APPN end node operates in a peer environment similar to low-entry networking nodes while providing additional functions, such as automatic creation of configuration resources. An end node can communicate directly with an adjacent network node or end node, but requires the routing services of a network node to communicate with a non-adjacent node. The AS/400 system can be configured as an APPN end node.

See Chapter 4 and "End Node Support" on page 2-5 for additional information.

APPN Network Node
A network node that provides intermediate session routing, route selection services, and distributed directory services for local users and to end nodes and low-entry networking nodes that it is serving. Examples of a network node include the AS/400 system and the System/36 with the APPN feature. The AS/400 system using the

Operating System/400 licensed program, Version 2 Release 1 or later, when configured as a network node, provides additional networking functions. For example, a network node can link two adjacent APPN networks that have different network IDs.

Refer to Chapter 4 and to "Network Node Support" for additional information.

Note: The AS/400 system can be both a low-entry networking node and either an APPN end node, or an APPN networking node at the same time. Refer to Chapter 4 and to Chapter 8 for additional information.

End Node Support

If you have no need for intermediate session routing through a system and only want to participate in an APPN network as the sender or destination of sessions, you can configure your system as an end node. This is advantageous because as an end node, a system uses fewer resources (such as processing time and storage) than a network node.

An end node may use the services of an attached network node server. The AS/400 system allows you to define, using the Change Network Attributes (CHGNETA) command, up to five potential servers. Through the CHGNETA command, you may also specify that any attached network node may be your server. These servers perform the necessary directory searches and route calculations for the end node. One of the benefits of having a network node server is that the remote locations with which the end node wishes to communicate do not have to be configured at the end node. In addition, the server does not have to configure the locations residing at the end node because the AS/400 system end nodes are able to send register requests informing the network node of all the local location names that are defined in the end node (if a control-point session is activated between the end node and the network node).

An AS/400 system end node can be attached to multiple network nodes, but may have only one control-point session active at a time, and only to a network node server. Sessions may be established to other directly attached end nodes and network nodes. Network nodes (including both the server and non-server network nodes) can perform intermediate routing into the network for the end node. Class of service is also available on end nodes so that the end node is able to specify the exact transmission group to use on a session basis if operating in point-to-point environments without a network node server.

See Chapter 8 for information on APPN end nodes in a switched line environment.

Network Node Support

A network node provides the following:

- All the functions performed by an APPN end node
- Intermediate session routing function
- Session routing between adjacent APPN networks
- Network server functions (perform directory searches and route selection) for attached APPN end nodes or low-entry networking nodes
- The management services focal point for network problem management

Functions Provided by AS/400 APPN

The AS/400 APPN support provides the following functions:

- Distributed searches of the network to locate any remote location requested by a local application. This minimizes the need to manually configure at the AS/400 system every remote location that a local application may need to establish a session with.
- Route selection based on user-defined information. By accepting the defaults when creating a line description, IBM-supplied mode descriptions and class-of-service descriptions can be used to establish sessions through an APPN network. You can change the line and class-of-service descriptions to influence the route that a session takes through the network. **Mode** refers to the session limits and common characteristics of the sessions associated with APPC devices managed as a unit with a remote location. A **mode description** is a system object created for APPC devices that describes the session limits and characteristics. A system **object** is anything that exists in and occupies space in storage and on which operations can be performed.
- Sessions can be established between adjacent APPN networks that have different network IDs
- Automatic creation and vary on of APPN controller descriptions on a token-ring network or Ethernet network. This occurs when systems that are not yet configured call in to the AS/400 system.
- Define and use an APPN connection network. This allows the AS/400 automatic configuration support on a token-ring network or Ethernet network to create and vary on APPN controller descriptions for outgoing connections. The AS/400 APPN support dynamically determines the remote system's LAN address.
- Automatic creation and starting of remote locations. When APPN has determined that a session can be routed through the network, the APPN support can automatically create and start the necessary device descriptions for the remote location.
- Adaptive pacing and transmission priority. By using the values defined during configuration and those set during session establishment, APPN will automatically control or change how data is arranged by importance in the network. This also allows APPN to better use the AS/400 system's buffers and services and to better manage the data flow.

Note: This chapter describes advanced functions of APPN that you may need to use. You can configure your system to use APPN support by selecting the IBM-supplied defaults during the configuration process. See Chapter 4 for a description of configuration.

AS/400 System Implementation of APPN

The remainder of this chapter describes the functions that are available with APPN.

Control-Point Services

A **control point** is defined as a collection of tasks which provide directory and route selection functions for APPN. An end node control point provides its own configuration, session, and management services with assistance from the control point in its serving network node. A network node control point provides session and routing service.

Once the connection has been established, identification information is exchanged between the nodes, and a control-point session will be started between the control points in the directly attached network nodes. A control-point session may also be started between the control points in a directly attached network node and an APPN end node. However, a control-point session cannot be started with a low-entry networking node. The control-point session is used to exchange network topology information (when the session is between directly attached network nodes) and to conduct directory searches. The result of the exchange of network topology information is the creation of a table, called the network topology database, that holds the current network connectivity information.

Parallel Transmission Groups

Parallel transmission groups (TGs) allow more than one direct connection between two directly attached systems. Each TG is identified by a unique TG number.

The transmission group number is optionally configured as part of the controller description, or it can be calculated by the system at link activation. If the system is to calculate the TG number (TMSGRPNBR(*CALC) specified in the controller description), the system must start the link at vary on time. This may not be desirable for switched line connections. See Chapter 8 for additional switched line considerations.

Note: The AS/400 system does not support multiple link transmission groups. Each link is considered to be a unique TG. The TG number is used by the system to differentiate between two controller descriptions with the same remote control-point name.

Network Topology Database

The network topology database in a network node contains information about all network nodes, and transmission groups between network nodes in the network, along with the links to adjacent end nodes. The network topology database in an end node contains information about itself and directly attached nodes only.

The network topology database is stored across system starts, which means that the information is not lost when an initial program load is performed. By storing this information, the AS/400 system uses less network resource when it is started because it does not have to rebuild the entire network topology database. Because an end node keeps less network information than a network node, the network topology database is deleted and then recreated, with current information, when a network node is changed to be an end node.

Automatic Disconnect on Switched Lines

APPN allows for the automatic disconnection of switched lines between two end nodes, an end node and a network node, or between two network nodes. The disconnection occurs when there are no sessions bound over a transmission group configured for automatic disconnection.

If a user session is routed over any transmission group that could be automatically disconnected, then the session is deactivated (unbound) when it is no longer in use so that the automatic disconnection can occur.

Once a control-point session is activated, it is not deactivated; therefore, automatic disconnection of switched lines is ignored if a control-point session is active over a controller description. See "Switched Line Considerations" on page 8-5 for more information on this topic.

Directory Services

The directory services function in an APPN network identifies the system (by using a combination of the system's network ID and control-point name) containing the remote location to which a session has been requested. Each APPN network node and APPN end node contain a directory database which associates location names to owning control-point names. These locations can reside on the local node, on its served end node, or on low-entry networking nodes. A network node also participates in network directory searches by receiving and processing or receiving and forwarding directory searches.

The directory database is built from configuration information contained in the APPN location lists as well as from information obtained dynamically over control-point sessions. The directory database is kept across system starts, which means that the information is not lost when an initial program load is performed. By storing the information, the AS/400 system uses less network resources when it is started because it does not have to rebuild the entire directory database. Because an end node keeps less information than a network node, the directory database is deleted and then re-created with current information when a network node is changed to an end node.

The directory services supplied by APPN simplify configuration in the network because you do not have to configure every location with which you want to communicate. The only remote locations that *must* be configured as directory entries are:

- Locations in adjacent low-entry networking nodes that do not have the same name as the remote control-point name of the low-entry networking node.
- Locations in adjacent APPN end nodes (without control-point sessions to any network node) that do not have the same name as the remote control-point name of the end node.
- Locations in nodes that are not directly attached that require using a directly attached host system for intermediate session routing. The host system must be using VTAM Version 3 Release 2 or later and NCP Version 4 Release 3 or later.

If the locations meet any of these conditions, they must be configured in the APPN remote location list. See "Defining APPN Location Lists" on page 4-4 for information on APPN location lists.

For more information on performing directory searches and how they affect performance, see "Network Performance Considerations" on page 8-1.

Generic Location Naming and Generic Routing

To minimize the configuration necessary when locations must be defined, the APPN support allows for generic location names and generic routing. A network node that is acting as a server for an end node that does not support a control-point session must configure all the location names as described in "Directory Services" on page 2-8. Generic location naming allows you to configure a location name ending with an * (asterisk). This implies that any location name starting with the same characters preceding the * match this entry. For example, if locations CHI0, CHI02, and CHI03 exist in an end node (with a control-point name of CHICAGO), you only need to configure CHI* as being located at CHICAGO.

Note: To ensure that your network operates properly, there should be no other locations in the network that start with CHI.

Generic routing allows you to specify *ANY as a location name. This specifies that when a session is requested for a location that does not match an explicit entry or a generic location name anywhere in the network, then that location will be assumed to reside in the control point associated with the *ANY entry.

Note: To ensure that your network operates properly, *ANY should only be defined once in a network.

Generic location names and generic routing entries are defined in the APPN remote location list, which is described in Chapter 4.

Route Selection

Frequently, there are multiple paths over which a session between two locations could be routed. The AS/400 APPN route selection support uses the information defined (either explicitly or by accepting the defaults) as part of the configuration to determine the best route through the network for a session. This information about link and node characteristics, used to determine the route that is selected for a session or sessions, is referred to as the **class-of-service** support. This support uses system objects that describe the transmission group characteristics and the node characteristics that are acceptable for a given session. Within the group of nodes and links between the origin control point and the destination control point that are acceptable, the combination with the lowest weighting factor is selected. See "Class-of-Service Descriptions" on page 4-32 for more information.

When a link between two network nodes becomes inoperative due to a failure, updates are sent around the network to inform all network nodes of the condition so that subsequent session requests may be routed around the failed link or node. When and if the link becomes operative again, another update will be sent around the network to inform all network nodes of the new condition.

Transmission Group Characteristics

The transmission group characteristics that can be configured for each physical port are:

- Link speed
- Security
- Cost per connect time

- Cost per byte
- Propagation delay
- Three user-defined fields

These characteristics are used by APPN to select the best available route to satisfy your request for a session to a remote location. These characteristics are configured in the line description and apply to end nodes as well as network nodes. "Line Descriptions" on page 4-9 discusses the line description characteristics and Appendix B, "APPN Class of Service," describes how to use these characteristics. A **line description** is an object that contains information describing a particular communications line that is attached to the system. For a complete description of line configuration, see the *OS/400* Communications Configuration Reference*

Node Characteristics

The node characteristics, which define the ability of a particular network node to perform intermediate routing, are applicable only to network nodes. There are two node characteristics, route addition resistance (RAR) and congestion, that are used in route selection. You may use the RAR, which is a network attribute defined using the Change Network Attributes (CHGNETA) command, to change the desirability for a network node to perform intermediate session routing. The higher the value (valid range is 0 through 255, with 128 the default) configured for this attribute, the less desirable the node becomes for intermediate session routing purposes. See "Change Network Attributes (CHGNETA) Command" on page 4-1 for a description of the CHGNETA command.

Congestion is automatically calculated by APPN so that sessions can be directed away from a node when 90% of the configured maximum number of intermediate sessions allowed has been reached. A node is considered no longer congested when the number of intermediate sessions drops below 80% of the maximum number. Node congestion may or may not allow additional sessions to be routed through a network node, depending on the class of service selected, but it does indicate to all the remaining network that alternative routes should be used if possible. The maximum number of intermediate sessions allowed is defined on the AS/400 system by using the CHGNETA command. See "Change Network Attributes (CHGNETA) Command" on page 4-1 for a description of the CHGNETA command.

Local Location Names

The local location name, when combined with the local network identifier, identifies your local system to remote systems in the APPN network. If the configuration being used specifies that APPN is to be used (APPN(*YES) has been specified in the controller description), then you can define local location names on your system by:

- Defining the local control-point name (LCLCPNAME) using the CHGNETA command. See "Change Network Attributes (CHGNETA) Command" on page 4-1 for a description of the CHGNETA command.
- Defining the default local location name (LCLLOCNAME) using the CHGNETA command.
- Creating an APPN local location list. See "Defining APPN Location Lists" on page 4-4 for a description of the APPN location list support.

If the configuration being used specifies that APPN is **not** being used (APPN(*NO) has been specified in the controller description), then the local location names are defined by configuring the local location name parameter (LCLLOCNAME) in the APPC device descriptions.

Class-of-Service Description

Each session initiation request is associated with a specific mode description. (See "Mode Descriptions" on page 4-26 if you are unfamiliar with modes.) Each mode description has an attached class-of-service (COS) description. The COS description, attached to the mode, defines the range of node and transmission group characteristics that are acceptable when determining the route to satisfy the session initiation request. In addition, the COS defines the transmission priority (high, medium, or low), which determines the priority at which data will be transferred through the network after the session has been established.

Five pre-defined COS descriptions are shipped with the AS/400 system. If you do not need to tailor and control the routes taken, use the default COS. The default COS selects the route, based on the following values:

- Fastest line speed
- Lowest propagation delay
- Lowest cost per byte
- Lowest cost per connect time

If two routes are equal, the APPN support will randomly choose the route taken.

If you do wish to tailor the routes, you can either change one or more of the IBM-supplied descriptions (using the CHGCOSD command) or create a new class-of-service description (using the Create Class-of-Service Description (CRTCOSD) command).

Note: If you change a class-of-service description, including one of the IBM-supplied class-of-service descriptions, you must ensure that **all** descriptions using that name in the network are also changed accordingly.

For example, if you require both batch and interactive communications with another location, you could use existing COS descriptions, change existing COS descriptions, or create new COS descriptions that would cause the batch traffic to take one route and the interactive traffic another route. For more information about creating class-of-service descriptions, see "Create Class-of-Service Description (CRTCOSD) Command" on page 4-33.

Note: It is recommended that you not change existing COS descriptions. Instead, you should create a new COS from the current one, change the new COS description, and then ensure that the new description works before removing the old COS description. If this is not done, sessions using the same class-of-service name may use transmission groups with different characteristics.

Session Activation

A session is activated by the transmission of a BIND that is sent from the system requesting the session to the remote location over the path that the session is to follow.

Figure 2-6 illustrates an APPN network with six systems. To illustrate how session activation works, assume that control point X (Atlanta) has requested a session with control point Y (Chicago).

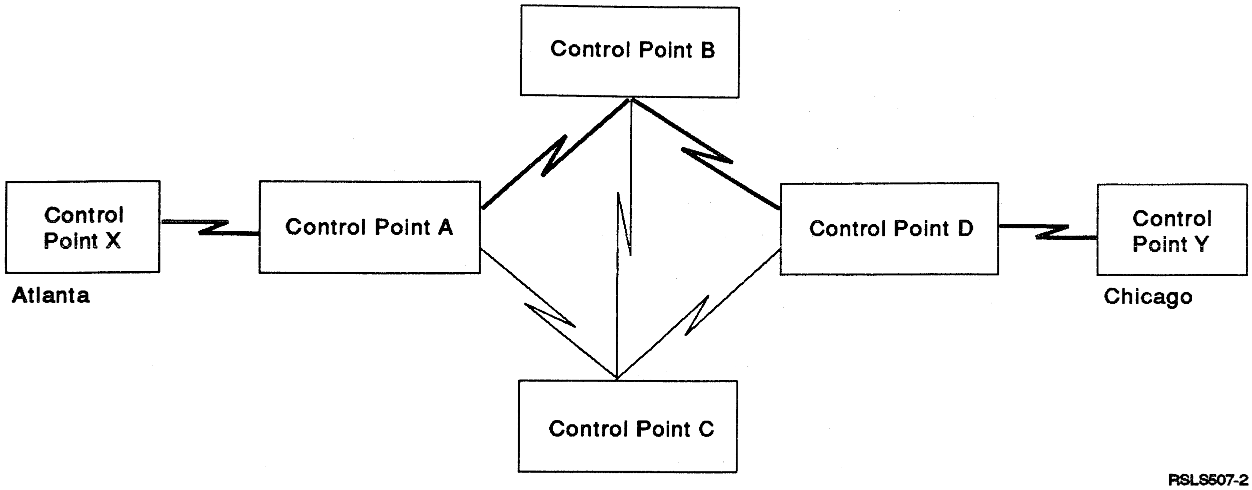


Figure 2-6. Routing through an APPN Network

Directory services, network configuration, and route selection services will determine the correct route to control point Y from control point X. The resulting BIND contains the names of the session source (Atlanta), the session target (Chicago), and the route description (control point A, control point B, control point D, control point Y). The BIND is transmitted one node at a time through the network; each node uses the route description to determine the next node. As the BIND passes through each node along the path, it leaves behind routing table entries, called session connectors, that cause subsequent packets of information that belong to that particular session between Atlanta and Chicago to always follow the same path.

Dynamic Session Establishment

Sessions can be established between a local location (as an APPN end node or network node only) and a remote location without configuring location information for either location. The device description needed to represent the local and remote locations is created, attached to the correct controller description, and varied on automatically by the APPN support when the session is requested.

User-created device descriptions are used *if* they are attached to the controller description that APPN has selected as the first (or only) hop on the route to the remote location.

Control of Data Flow

To manage the flow of data over the network, the AS/400 APPN support uses adaptive session pacing, intermediate session routing, and transmission priority.

Adaptive Session Pacing

Adaptive session pacing permits AS/400 nodes to control the amount of data that is sent and received during normal session operation. Session **pacing** is a technique by which the receiving system can control the rate at which it receives data into its session buffers to prevent overrun. In an APPN environment, multiple sessions require a dynamic pacing method to allocate resources to a session that has a burst of activity, and reclaim unused resources from sessions that have no activity. Adaptive session pacing allows the receiving node to efficiently utilize its available buffer resources.

For more information on adaptive session pacing, and how it affects performance, see "Network Performance Considerations" on page 8-1.

Intermediate Session Routing

An AS/400 network node will allow an LU session type 6.2, which neither originates nor ends at the network node, to be routed through it. This type of session is referred to as an intermediate session. The origin and/or destination of the session may be another APPN network node, an APPN end node, or a low-entry networking end node.

For more information on intermediate session routing and how it affects performance, see "Network Performance Considerations" on page 8-1.

Transmission Priority

Transmission priority allows you to specify the priority at which data on a session is to be transported across the network. The priority can be defined (in the class-of-service description) as low, medium, or high. Each AS/400 system node in the session path is aware of the priority associated with the session. Higher priority traffic is transmitted earlier than lower priority traffic provided there are multiple sessions crossing a transmission group. If there is only one transmission priority being used, then the session traffic is all transmitted at the same priority regardless of how many sessions are active.

For example, if you require both batch and interactive communications with another location, you could use a high transmission priority for the interactive applications and use a lower transmission priority for the batch applications. This allows the interactive applications to have a better response time than the batch applications.

Chapter 3. Network Planning

This chapter contains information about the types of networks that can be supported by AS/400 APPC/APPN. While all possible network configurations are not shown, this chapter does provide a starting point for network planning and network layouts. Refer to Appendix C, "APPN Configuration Examples," for configuration examples.

Non-APPN Networks

Some LU session type 6.2, node type 2.1 networks require that you configure all the resources that are to be used by the communications support. This is true of the System/38 APPC or System/36 APPC (without the APPN feature). It is also true if you are configuring an AS/400 system and do not plan to use the APPN functions (APPN(*NO) specified on the controller description). In this case, the AS/400 system is considered to be a low-entry networking node. An example of this type of network is shown in Figure 3-1.

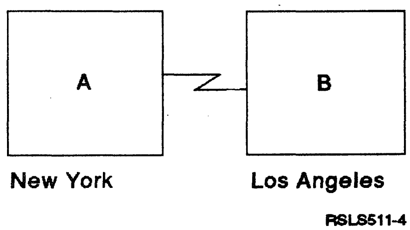


Figure 3-1. Non-APPN Two-System Network

In this network you must configure an APPC device description for each of the locations that will be communicating between the two systems.

If you have no need now and no plans for your system to perform APPN networking functions or to support the advanced functions provided by the APPN support, you may want to configure your system in this manner. In this environment, you do not need to configure transmission group and node characteristics or class-of-service descriptions. The system does not use this information when APPN functions are not being provided.

APPN Networks

When using the APPN functions provided with the AS/400 system, your networks can be as simple as the network shown in Figure 3-2 on page 3-2, or as complex as the networks shown in Figure 3-3 on page 3-2, Figure 3-4 on page 3-3, Figure 3-5 on page 3-4, and Figure 3-6 on page 3-5.

When you configure your system for APPN (you select this support by specifying APPN(*YES) in the controller descriptions, as described in Chapter 4), the AS/400 system automatically creates and activates the APPC device descriptions to represent the remote locations with which your system is communicating.

Note: APPN automatically creates device descriptions and does not delete those device descriptions when they are no longer in use (unless they are associated with an automatically created controller description, and the associated controller description is deleted).

See "Security Considerations" on page 8-3 for security information related to device descriptions automatically created by the system.

APPN allows you to determine how much networking function you want your system to provide. You can define your system as either an APPN end node or a network node. See "Node Type 2.1 Nodes" on page 2-4 for a description of the APPN node types.

Two-System APPN Network

In Figure 3-2, the network attributes of both systems are configured as APPN end nodes. The only APPN-specific parameter that must be configured is the remote control-point name in the controller description. Because the APPN functions are being used, you do not need to create device descriptions. The system automatically creates and starts the necessary device when the sessions are established.

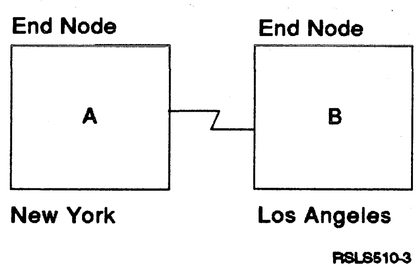


Figure 3-2. Two-System APPN Network

Three-System APPN Network

In Figure 3-3, A and B are APPN end nodes and C is a network node. Network node C must configure its network attributes to reflect that it is a network node. Each system must configure the remote control-point name in the controller description representing the adjacent system. A and B must add C to the network node server list in their network attributes so that C can act as a network node server for both APPN end nodes.

Note: Neither APPN end node needs to configure any information about the other APPN end node unless there are special considerations, such as security, or if either end node is a single session location.

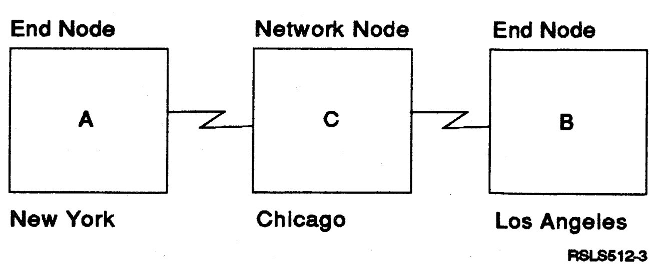


Figure 3-3. Three-System APPN Network

Two APPN Networks Linked Together

In Figure 3-4, node A is configured as an end node and node NN2 is configured as a network node. Node A must add node B to the network node server list in its network attributes.

Nodes B and NN1 are network nodes that link the two APPN networks together. Therefore, in addition to the controller descriptions which define nodes A and NN2, nodes B and NN1 must each have a second controller description which configures nodes B and NN1 as adjacent control points to each other. This allows nodes B and NN1 to supply directory and routing services for communications between all nodes in the two networks.

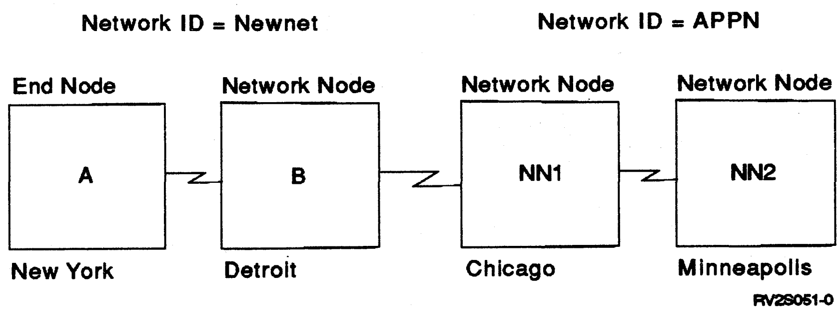


Figure 3-4. Example of Two APPN Networks Linked by Network Nodes

Multiple-System APPN Network with Alternate Paths

In this figure, the configuration requirements are the same as for Figure 3-3 on page 3-2, except for the parallel transmission groups (TGs) between network node NN1 and network node NN2 in the middle of the diagram. Each of these two network nodes must have two controller descriptions with the same remote control-point name.

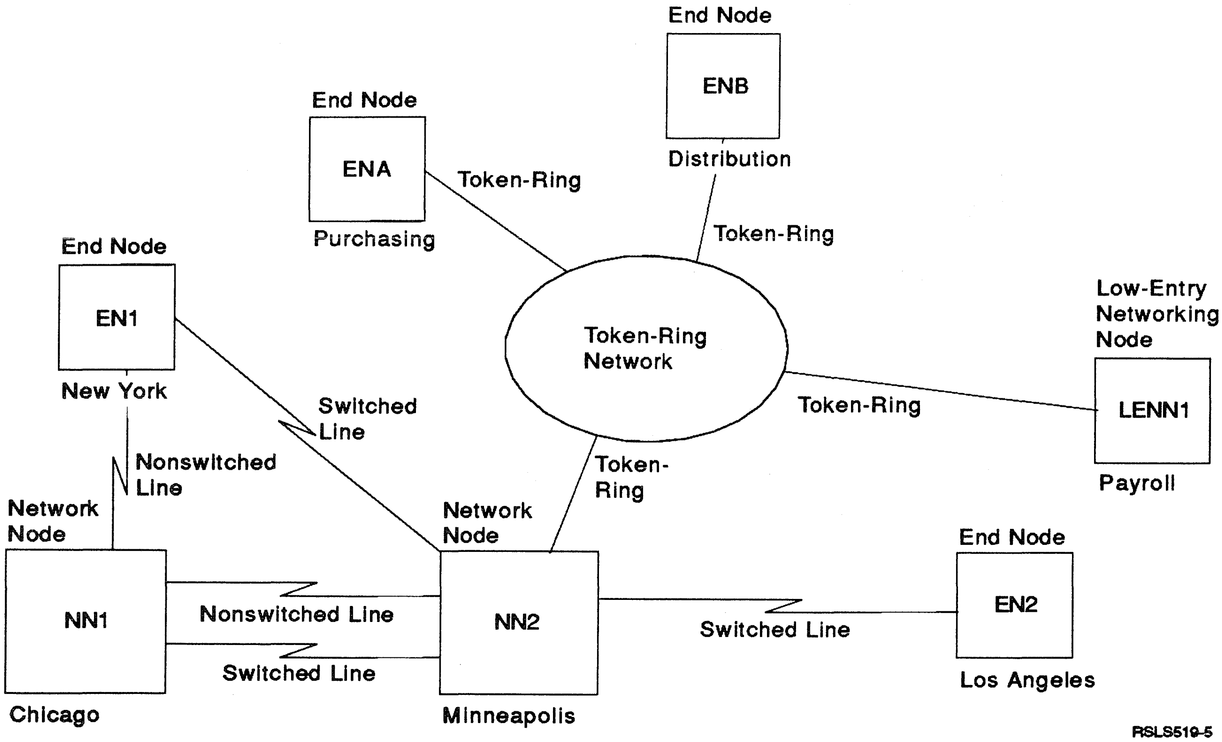


Figure 3-5. Multiple-System APPN Network

This figure also demonstrates some of the support provided for an APPN end node. Suppose that APPN end node 1 (EN1) requests a session with end node 2 (EN2). If network node 1 (NN1) is the network server for EN1 and EN1 has a control-point session with NN1, then EN1 will ask NN1 for the best route to EN2. NN1 will calculate the route and may tell EN1 that the best route is from EN1 to NN2 to EN2. All the data exchanged for the session will flow on this route. If the switched lines involved have automatic disconnect configured, a line disconnection may be done when the session is ended (that is, if no other sessions are active).

On the other hand, if EN1 was not configured to have a control-point session with NN1, but NN1 was still EN1's server, then EN1 would not ask NN1 for the best route to EN2. Instead, EN1 would simply use NN1 (its server) as the first hop in the route. NN1 would then calculate the best available route from that point. Thus, the route would be EN1 to NN1 to NN2 to EN2.

AS/400 APPN and Subarea Networks

A **subarea** is a portion of an SNA network consisting of a subarea node, attached peripheral nodes, and associated resources.

Figure 3-6 on page 3-5 shows an APPN network interacting with a subarea network where the host support includes:

- Virtual Telecommunications Access Method (VTAM) Version 3, Release 2
- Advanced Communications Facility/Network Control Program (ACF/NCP) Version 4, Release 3

This level of host support appears as a low-entry networking node that does not support control-point (CP) sessions, but which can perform intermediate session routing through the subarea network.

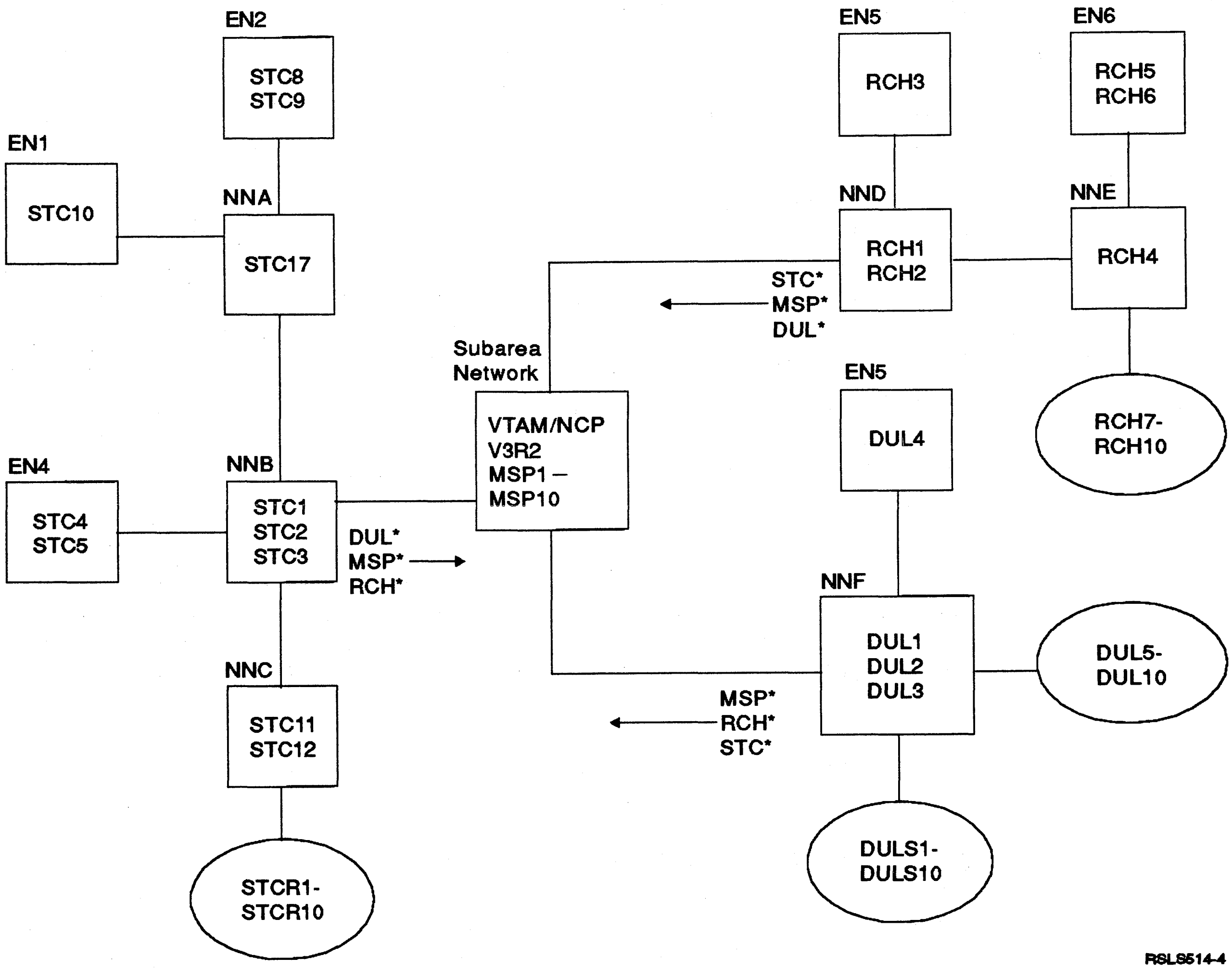


Figure 3-6. APPN Network Interacting with a Subarea Network

Note: In Figure 3-6, the boxes represent systems that contain the locations configured in a single system; the ovals represent token-ring networks consisting of the locations identified within the different systems.

This diagram illustrates the use of generic location naming, which was described in "Generic Location Naming and Generic Routing" on page 2-9. Because network node B (NNB) has no CP session to the host low-entry networking node (the subarea network) it cannot dynamically find out about the locations within the host or on the other side of the host. Without generic location naming, all of these locations would need to be configured (through the APPN location list) as being located at the host. As shown, NNB can use generic location naming and configure DUL*, MSP*, and RCH* as being located at the host; thus only three entries are needed in the location list to represent all of the locations.

Similarly, NND and NNF (the other systems directly attached to the host) can use generic location naming to define the locations with which they require sessions.

Note: Releases of VTAM prior to Version 3, Release 2 do not allow this level of support. In these environments, the AS/400 system is configured as a dependent logical unit.

Automatic Configuration and Connection Network Support

Automatic configuration and connection network support allows you to significantly reduce the configuration required when using an AS/400 system on a local area network (token-ring network or Ethernet network). That is, the number of controller descriptions that must be manually created is reduced.

The AS/400 system can automatically create APPC controller descriptions for any remote system type that supports the node type 2.1 architecture (for example, AS/400 systems, System/36s, or personal computers) over LANs. When an incoming call is received from a remote system, the local system will create and vary on an APPC controller description that specifies APPN(*YES). The following conditions must be met:

- There is no controller description that is varied on with a matching LAN address of the calling system.
- The line description is defined to allow automatic creation of controller descriptions.

The AS/400 system can also automatically vary off controller descriptions (and their associated device descriptions) that have been automatically created and varied on. After controller descriptions and associated device descriptions are automatically varied off, they can be automatically deleted. The automatic vary off and deletion is specified in the token-ring network or Ethernet network line description.

For more information on automatic configuration, see "Automatic Configuration on LANs" on page 7-1.

Connection Network Support for LANs

A local area network (LAN), such as a token-ring network or an Ethernet network, is considered a *virtual node* by all the systems that are part of the connection network. APPN can calculate routes that go through this virtual node. When a route needs to be calculated, APPN route selection services realizes that two end nodes have connections to the same virtual node. The routing information, returned by the serving network node to the originating node, contains signaling and address information of the destination. The originating node can then establish a direct outgoing connection to the destination (since it now has the address of the destination). A connection network may also be used for intermediate routing purposes by network nodes.

For a node to participate in a connection network, it must have a control point-to-control point (CP-CP) session with a network node. Therefore, some configuration is required to establish its CP-CP session. Network nodes have the ability to dynamically establish CP-CP sessions that are initiated by other nodes in the connection network. For example, if there are 30 end nodes in the connection network, an AS/400 network node does not require the configuration of 30 controller descriptions in order to establish CP-CP sessions with these other nodes. An AS/400 network node simply offers its CP-CP session services to systems that have not been manually configured.

For more information on connection networks, see "Connection Network Support" on page 7-7.

Chapter 4. Configuring APPN

This chapter contains information about configuring APPC/APPN on your system. To configure APPC/APPN support on your system, you can either use the menus or the control language (CL) commands. In this chapter, the parameters of the CL commands that apply to APPC/APPN configuration are described. For information that is common across multiple communications types, see the *OS/400* Communications Configuration Reference*.

Appendix C, "APPN Configuration Examples," shows examples of APPN configurations. It includes defining communications descriptions and remote system considerations.

Important Information About System Names

Use caution when you use names with the special characters # ('7B'), $ ('5B'), and @ ('7C'). These special characters might not be on the remote system's keyboard. The use of these symbols should be limited to migration of the operating system. These characters should not be used for newly created names.

If you are using a national language keyboard that does not have the #, $, or @ symbols, see the appendix on national language keyboard types and the appendix on code pages in the *National Language Support Planning Guide*.

The names that may be exchanged with remote systems include the following:

- Network IDs
- Location names
- Mode names
- Class-of-service names
- Control-point names
- Connection network names

Changing Network Attributes

Network attributes are local system values that govern how the AS/400 system participates in the network. The AS/400 system is shipped with IBM-supplied values for the network attributes. You may need to change some of these attributes depending on the local AS/400 system's participation in the network.

Change Network Attributes (CHGNETA) Command

The network attributes are changed using the Change Network Attributes (CHGNETA) command. The default for all the parameters of the CHGNETA command is *SAME, which means that the current value is unchanged. *In the following parameter descriptions, the IBM-supplied value is shown as the default.*

The following restrictions apply when you change the network attributes:

- The default local location name, local network ID, and local control-point name can be changed only when there are no entries in the APPN remote location list indicating that there are remote locations in the APPN network with these names. The combination of local network ID and default local location name, or local network ID and local control-point name, cannot match the combination of remote network ID and remote location name, or remote network ID and remote control-point name, in any APPN remote location list entry.

- The combination of local network ID and default local location name cannot match the combination of remote network ID and remote location name in any APPC device description.
- The combination of remote network ID, remote location name, local network ID, and local location name in any APPC device description cannot match another APPC device description that is connected to the same controller description. If any APPC device description has *NETATR as a local location name, this restriction will be enforced before the default local location name will be allowed to change.
- The local network ID cannot be changed to the same value as specified in the RMTNETID parameter of APPC devices if those devices have the same local location name and remote location name.
- The local network ID, local control-point name, and local node type cannot be changed if a controller description with APPN(*YES) is in a status other than varied off.
- The local network ID and/or local control-point name cannot be changed if any X.21 short hold mode (SHM) line descriptions are in a status other than varied off.

Note: If APPN is not being used (APPN(*NO) specified on the controller description), only the following parameters need to be specified on the CHGNETA command:

Local network ID (LCLNETID)
Local control-point name (LCLCPNAME)
Default local location name (LCLLOCNAME)
Default mode name (DFTMODE)

Local network identifier (LCLNETID)

Specifies the local network ID assigned to the system. This name may be up to 8 alphanumeric characters in length. The first character must be uppercase A through Z, or special character $, #, or @ followed by 0 through 9, A through Z, $, #, or @. Plus signs (+), periods (.), underscores (_), or embedded blanks are not allowed, but trailing blanks are allowed.

You should use a unique value for the local network ID, rather than the IBM-supplied value of APPN. Unique local network IDs allow APPN networks to be connected together with a minimum of reconfiguration. AS/400 APPN support allows multiple networks to be interconnected and also allows a large network to be broken into more manageable smaller networks that are linked together. IBM has established an SNA Network Registry so that you can request or register your unique network ID. Contact your IBM branch office representative to use the SNA Network Registry.

APPN: The IBM-supplied value, as shipped with the system.

local-network-ID: Specify the name of the local network.

Local control-point name (LCLCPNAME)

Specifies the local control-point name for the system. This name is used, along with the local network ID, to identify the local system. This name may be up to 8 alphanumeric characters in length. The first character must be uppercase A through Z, or special character $, #, or @ followed by 0 through 9, A through Z, $, #, or @. Plus signs (+), periods (.), underscores (_), or embedded blanks are not allowed, but trailing blanks are allowed.

Snnnnnnn: The IBM-supplied value, as shipped with the system, where nnnnnnn is the machine serial number.

local-control-point-name: Specify the 1- to 8-character name assigned to your system.

If the adjacent system is an AS/400 system, then this name must match the remote control-point name (RMTCPNAME) specified in the controller description at the remote AS/400 system.

Default local location name (LCLLOCNAME)

Specifies the default local location name for the system. This name may be up to 8 alphanumeric characters in length. The first character must be uppercase A through Z, or special character $, #, or @ followed by 0 through 9, A through Z, $, #, or @. Plus signs (+), periods (.), underscores (_), or embedded blanks are not allowed, but trailing blanks are allowed.

Snnnnnnn: The IBM-supplied value, where nnnnnnn is the machine serial number.

default-local-location-name: Specify the default local location name for the system.

Default mode (DFTMODE)

Specifies the name of the mode description, defined using the Create Mode Description (CRTMODD) command, or supplied by IBM, that will be used if no mode is specified by the user application. See "Create Mode Description (CRTMODD) Command" on page 4-27 for a description of modes. The first character must be uppercase A through Z, or special character $, #, or @ followed by 0 through 9, A through Z, $, #, or @. Plus signs (+), periods (.), underscores (_), or embedded blanks are not allowed, but trailing blanks are allowed.

BLANK: Use the IBM-supplied mode description named BLANK. The name of this mode is represented in the network as 8 blank characters.

mode-name: Specify the 1- to 8-character name of a mode description. The names SNASVCMG and CPSVCMG cannot be specified (they are reserved for system use).

Note: The maximum number of conversations allowed with the remote location (MAXLOCCNV) parameter was deleted in Version 2 because of the APPC enhancement which dynamically allocates the storage required for conversations as needed. It is no longer necessary to specify the maximum possible conversations in the network attributes.

APPN node type (NODETYPE)

Specifies whether the local system is an APPN end node or an APPN network node. See "Node Type 2.1 Nodes" on page 2-4 for a description of the APPN node types.

***ENDNODE:** The IBM-supplied value, as shipped with the system, indicating that this system is an APPN end node.

***NETNODE:** Specifies that the local system is an APPN network node.

Maximum number of intermediate sessions allowed (MAXINTSSN)

Specifies the maximum number of APPN intermediate sessions. This parameter is valid only when NODETYPE(*NETNODE) is specified.

200: The IBM-supplied value, as shipped with the system, is 200 intermediate sessions.

0: Specifies that no intermediate sessions are allowed.

maximum-number-of-intermediate-sessions: Specify the maximum number of intermediate sessions. A valid value is 0 to 2000. When the number of active intermediate sessions is 90% of the value you specify here, the other network nodes in the APPN network are notified that this node is congested. The other network nodes are notified that this network node is no longer congested when the number of active intermediate sessions is below 80% of the configured value.

For a description of how the maximum number of sessions affects performance, see "Network Performance Considerations" on page 8-1.

Route addition resistance (RAR)

Specifies, for a network node only, the relative desirability of each network node to perform intermediate session routing functions as compared with other network nodes in the same network. Valid values are from 0 (most desirable) to 255 (least desirable).

128: The IBM-supplied value, as shipped with the system.

route-addition-resistance: Specify the route resistance. A valid value is 0 to 255.

For a description of how route resistance affects performance, see "Network Performance Considerations" on page 8-1.

Network node service provider list (NETSERVER)

Specifies, for an end node only, the names of up to five potential network node servers. Each name consists of a network identifier and a control-point name.

***LCLNETID *ANY:** The IBM-supplied value, as shipped with the system.

network-node-servers: Specify a maximum of five qualified network node servers (network ID and control-point name). If *LCLNETID is specified as the network ID, the value used depends on the current value of the local system's network ID at the time the node server is referred to. If *ANY is specified in the control-point name field, then this indicates that any network node with the same network ID as specified in the NETSERVER network ID field may be a potential network node server.

**NONE* indicates that there is no network server.

Defining APPN Location Lists

For APPN only (APPN(*YES) specified in the controller description), the location list defines local locations to the APPN support and defines special characteristics of remote locations. Not all users of APPN need to create location lists. The following sections describe when location lists are needed.

Note: Any time a parameter value defaults to *NETATR, the value specified for the corresponding parameter on the CHGNETA command is used. If the network attribute is changed (using the CHGNETA command) after the location entry has been created, the location entry is *not* updated with the new information. To have the location entry updated with the new information, you must delete the entry in the list and then enter it again, or use the change command to change the entry in the list.

Create Configuration List (CRTCFGL) Command

You create the location lists by using the Create Configuration List (CRTCFGL) command. A location list can be changed by using the Change Configuration List (CHGCFGL) command. For APPN, two types of configuration lists can be created, local location lists and remote location lists.

Creating an APPN Local Location List

A local location list defines the names of the locations that are defined on the local system. Each system in a network has one local network ID and one control-point name. The local control-point name is also a local location name (automatically defined to the system). In addition, each system has a default location name, which can be the same as the control-point name. See the "Change Network Attributes (CHGNETA) Command" on page 4-1 for a description of the default local location name (LCLLOCNAME parameter).

You can use the CRTCFGL command to define up to 476 *additional* local locations that are to be associated with the local network ID and local CP name.

The local control-point name and default local location name (as defined in the network attributes) are automatically used as local location names without having to be explicitly defined in the APPN local location list.

When the CRTCFGL command is used to create an APPN local location list entry, the parameters are applicable, as follows:

Configuration list type (TYPE)
Specifies the type of location list.

***APPNLCL:** Specifies that this is an APPN local location list.

The local location list will be named QAPPNLCL in the QSYS library. There can be only one local location list on the system.

APPN local location entry (APPNLCLE)
Valid only when the list type is *APPNLCL.

***PROMPT:** The special value of *PROMPT allows you to specify up to 476 local location entries.

Note: By using *PROMPT when you change a configuration list (CHGCFGL), you can add, remove, and change the entries on a display. You can enter 50 entries by using the command. If you specify local location entries directly on the CHGCFGL command rather than using *PROMPT, you replace all existing entries with the new ones.

local-location-name: Specifies the location name residing on the local system and is used by APPN to determine if the request coming in is for this system or another system in the network. The local location name must be unique and cannot already exist as a remote location name used by configuration list QAPPNRMT or be specified on another system as a local location in the same APPN network. The first character must be uppercase A through Z, or special character $, #, or @ followed by 0 through 9, A through

Z, $, #, or @. Plus signs (+), periods (.), underscores (_), or embedded blanks are not allowed, but trailing blanks are allowed.

entry-description: Contains a short description for each local entry.

Creating an APPN Remote Location List

The CRTCFGL command is also used to define a list of remote location entries for APPN. When used to define remote location names, the list type must be *APPNRMT.

Not all remote locations need to be defined in the remote location list. Any remote location that meets one or more of the following conditions *must* be defined in the remote location list:

- Single session connections between a local location and a remote location.
- Location passwords needed between a local location and a remote location.
- Directory entries (by specifying the remote control-point name that is providing the network functions for the remote location).

  A directory entry is required for:

  - Locations in adjacent low-entry networking nodes that do not have the same name as the remote control-point name of the low-entry networking node.
  - Locations in adjacent APPN end nodes (without control-point sessions to any network node) that do not have the same name as the remote control-point name of the end node.
  - Locations in nodes that are not directly attached that require using a directly attached host system for intermediate session routing. The host system must be using VTAM Version 3 Release 2 or later and NCP Version 4 Release 3 or later.

The following prompts are from the Create Configuration List (CRTCFGL) command prompt display:

Configuration list type (TYPE)

Specify the type of location list being created.

***APPNRMT:** Specifies that this is an APPN remote location list.

The remote location list will be named QAPPNRMT in library QSYS. There can be only one remote location list on the system.

APPN remote location entry (APPNRMTE)

Valid only when the configuration list type is *APPNRMT.

The values specified for the APPNRMTE parameter define a remote location to the APPN support on the system. Up to 50 entries can be specified on the command, or you can specify *PROMPT, which allows you to enter the values.

***PROMPT:** This parameter provides a display that allows you to specify up to 1,898 remote location entries.

Note: By using *PROMPT when you change a configuration list (CHGCFGL), you can add, remove, and change the entries on a display. You can enter up to 50 entries by using the command. If you specify remote location entries directly on the CHGCFGL command rather than using *PROMPT, you replace all existing entries with the new ones.

remote-location-name: Specify the full name of a remote location or a generic name ending with an asterisk. The first character must be uppercase A through Z, or special character $, #, or @ followed by 0 through 9, A through Z, $, #, or @. Plus signs (+), periods (.), underscores (_), or embedded blanks are not allowed, but trailing blanks are allowed. The generic location name is used to allow one directory entry to be defined for all locations, on a single control point, whose name matches the characters preceding the *. Network nodes can also specify one *ANY. *ANY indicates that all remote locations not explicitly identified as existing on a control point in the network will be assumed to be in the control point associated with the *ANY entry. Generic entries can only be used on network nodes.

When a generic name or *ANY is specified for the remote location name, a directory entry is being identified and a remote control-point name must be specified.

network-identifier: Specifies the network identifier in which the remote location resides. The first character must be uppercase A through Z, or special character $, #, or @ followed by 0 through 9, A through Z, $, #, or @. Plus signs (+), periods (.), underscores (_), or embedded blanks are not allowed, but trailing blanks are allowed. The values *NONE and *NETATR are allowed; the default is *NETATR.

local location name: Specify the location name residing on the local system. The first character must be uppercase A through Z, or special character $, #, or @ followed by 0 through 9, A through Z, $, #, or @. Plus signs (+), periods (.), underscores (_), or embedded blanks are not allowed, but trailing blanks are allowed. This name is used by APPN to match a local and remote location-pair entry. The default is *NETATR.

entry-description: Specify a short description for each remote entry.

Specify the following information when defining directory entries:

control-point name: Specify the control point providing network functions for the remote location. The first character must be uppercase A through Z, or special character $, #, or @ followed by 0 through 9, A through Z, $, #, or @. Plus signs (+), periods (.), underscores (_), or embedded blanks are not allowed, but trailing blanks are allowed. This field is required if the entry is generic or *ANY.

control-point-network identifier: Specify the network identifier of the network that the control point resides in. The first character must be uppercase A through Z, or special character $, #, or @ followed by 0 through 9, A through Z, $, #, or @. Plus signs (+), periods (.), underscores (_), or embedded blanks are not allowed, but trailing blanks are allowed. The values *NONE or *NETATR are also allowed; *NETATR is the default.

Specify the following information when defining passwords:

location-password: Specify the password that is used when establishing sessions on the local location and remote location name pair. See "Security Considerations" on page 8-3 for additional information about security.

secure-location: If *YES is specified, the local location allows the remote location to verify user passwords when sending program start requests to the local location. If *NO is specified, the local location does not allow the remote location to verify user passwords when sending program start requests to the local location. The default is *NO. See "Security Considerations" on page 8-3 for additional information about security.

Specify the following information when defining single-session connections:

single-session location: Specify *YES or *NO if the connection between the local location and the remote location is a single session connection. The default is *NO.

locally-controlled session: Specify *YES or *NO if the single session is a locally controlled session for this local location and remote location name pair. The default is *NO. This parameter is valid only when single-session-location is specified as *YES.

preestablished session: Specify *YES or *NO if the single session will be automatically established when the mode is started between the local and remote location. The default is *NO. This parameter is valid only when the single-session-location and locally controlled session are both specified as *YES.

number of conversations: Specify the number of conversations (from 1 through 512) that can be active at the same time between the local location and the remote location. The default is 10. This parameter is valid only when the single-session location is specified as *YES.

Defining Communications Descriptions

This section describes the communications descriptions you need to configure before you can begin using the APPC/APPN support. For more detailed information about defining communications descriptions, and the configuration process, see the *OS/400* Communications Configuration Reference*. You can also refer to the online information available during the configuration process.

The following commands are used to create or change line descriptions:

- CRTLINETH (Create Line Description (Ethernet))
- CRTLINIDLC (Create Line Description (IDLC))
- CRTLINSDLC (Create Line Description (SDLC))
- CRTLINTRN (Create Line Description (Token-Ring Network))
- CRTLINX25 (Create Line Description (X.25))

- CHGLINETH (Change Line Description (Ethernet))
- CHGLINIDLC (Change Line Description (IDLC))
- CHGLINSDLC (Change Line Description (SDLC))
- CHGLINTRN (Change Line Description (Token-Ring Network))
- CHGLINX25 (Change Line Description (X.25))

The following commands are used to create or change controller descriptions:

- CRTCTLAPPC (Create Controller Description (APPC))
- CRTCTLHOST (Create Controller Description (HOST))

- CHGCTLAPPC (Change Controller Description (APPC))
- CHGCTLHOST (Change Controller Description (HOST))

The following commands are used to create or change device descriptions:

- CRTDEVAPPC (Create Device Description (APPC))
- CHGDEVAPPC (Change Device Description (APPC))

The following commands are used to create or change mode descriptions:

- CRTMODD (Create Mode Description)
- CHGMODD (Change Mode Description)

The following commands are used to create or change class-of-service descriptions:

- CRTCOSD (Create Class-of-Service Description)
- CHGCOSD (Change Class-of-Service Description)

Line Descriptions

You describe the physical line connection and the data link protocol to be used between the AS/400 system and the network by using the line description commands:

- CRTLINETH
- CRTLINIDLC
- CRTLINSDLC
- CRTLINTRN
- CRTLINX25

For a complete description of the line commands and parameters not specific to APPC/APPN, see the *OS/400* Communications Configuration Reference*.

Line Description Parameters for APPN Only

When you use the AS/400 APPN support, you can configure characteristics, such as link speed, cost, security, and propagation delay in the line description. These characteristics are defaulted but may be specified for each line that will be used by APPN. APPN support uses these values, along with the class of service selected, to determine session routes through the network. The default values for link speed, security, propagation delay, cost per byte, and cost per connect time will vary depending on the protocol and physical interface. After the line descriptions have been created, these attributes can be changed. The values take effect when an attached controller with the APPN parameter specified as *YES is varied on. If the controller with the APPN parameter specified as *YES is varied on when the values are changed, the controller must be varied off and then varied on again for the new values to take effect. If you are using a switched line list, all APPN parameters in all line descriptions in the list must be identical (except for the AUTOCRTCTL and AUTODLTCTL parameters).

The following parameters apply only when an APPC or host controller description, with APPN(*YES), uses the line.

Link speed (LINKSPEED)

The data rate for the line.

***INTERFACE:** Specifies that the link speed is based on the type of interface defined for the line. This parameter is only valid for SDLC and X.25 lines.

9,600 bps for RS-232C/V.24 and X.21 BIS/V.24
48,000 bps for RS-232C/V.35 and X.21 BIS/V.35
64,000 bps for X.21

link-speed: Specify the link speed, in bits per second (bps), for the line. Valid entries are: *MIN, 1200, 2400, 4800, 7200, 9600, 14400, 19200, 48000, 56000, 64000, 4M, 10M, 16M, or *MAX.

Cost per connect time (COSTCNN)

The relative cost of being connected on the line. For example, connection to a nonswitched line has the lowest relative cost and a switched line a higher value. You pay the same for a nonswitched line regardless of the use; you pay for a switched line based on the amount of time you use it.

***CNN:** Specifies that the default used is based on the connection type.

See Figure 4-1 on page 4-12 for the default values.

cost-per-connect-time: Specify a value, from 0 through 255, that defines the relative cost of being connected to the line.

Cost per byte (COSTBYTE)

The relative cost per byte of sending and receiving data on the line. Valid values are from 0 (lowest cost) to 255 (highest cost). This value is used for data flowing on the line after the initial connection is made.

***CNN:** The default used is based on the line and connection type. This parameter is only valid for SDLC.

See Figure 4-1 on page 4-12 for the default values.

cost-per-byte: Specify a value from 0 to 255.

Security used on line (SECURITY)

Note: The security specified here is not related to the system user ID and password security.

See Figure 4-1 on page 4-12 for the default values.

***NONSECURE:** There is no security on the line.

***PKTSWTNET:** This is a packet-switched network, so the line is secure in the sense that the data does not always use the same path through the network.

***UNDGRDCBL:** This is an underground cable; secure conduit.

***SECURECND:** This is a secured conduit but not guarded, such as a pressurized pipe.

***GUARDCND:** The line is a guarded conduit and protected against physical tapping.

***ENCRYPTED:** Data flowing on the line is to be encrypted.

Note: This does not mean that the AS/400 system is performing encryption. Separate hardware and programs can be purchased to perform encryption.

***MAX:** This is a guarded conduit, protected against physical and radiation tapping.

Propagation delay (PRPDLY)

This specifies the time required for a signal to travel from one end of a link to the other end. The delay is based on the protocol used and the physical connection.

See Figure 4-1 on page 4-12 for the default values.

***MIN:** Specifies the minimum delay.

***LAN:** Specifies a local area network delay (less than .48 milliseconds).

***TELEPHONE:** Specifies a telephone network with a delay from .48 milliseconds through 49.152 milliseconds.

***PKTSWTNET:** Specifies a packet-switched network with the delay from 49.152 through 245.76 milliseconds.

***SATELLITE:** Specifies satellite delay (greater than 245.76 milliseconds).

***MAX:** Specifies the maximum delay.

User-defined value 1 (USRDFN1)

Specifies the first of three user-definable fields. This field is used to describe any unique characteristics of the line that you want control over.

128: The default value is 128.

user-defined-1: Specify a value from 0 to 255.

User-defined value 2 (USRDFN2)

Specifies the second of three user-definable fields. This field is used to describe any unique characteristics of the line that you want control over.

128: The default value is 128.

user-defined-2: Specify a value from 0 to 255.

User-defined value 3 (USRDFN3)

Specifies the third of three user-definable fields. This field is used to describe any unique characteristics of the line that you want control over.

128: The default value is 128.

user-defined-3: Specify a value from 0 to 255.

Note: All of the preceding line description parameter values can be used to set conditions which affect the selection of a line. For more information about the effect of user-defined values, see "Create Class-of-Service Description (CRTCOSD) Command" on page 4-33 and "Route Selection Example" on page B-3.

Automatically create controller (AUTOCRTCTL)

Specifies whether the system automatically creates APPC controller descriptions. This parameter can be changed at any time (that is, all the controllers on the LAN need not be varied off).

***NO:** The default value is *NO. The system does not automatically create controller descriptions.

***YES:** The system automatically creates an APPC controller description when incoming calls are received from adjacent systems on a LAN or APPN connection network that are not already defined to the system. (That is, there is not a controller description already varied on to represent the adjacent system).

Automatically delete controller (AUTODLTCTL)

Specifies the number of minutes an automatically created APPC controller can remain in an idle state (status changed from varied on to varied on pending) before the controller description and attached device descriptions are automatically varied off and deleted. Only APPC controller descriptions that specify CTLOWN(*SYS) are automatically deleted.

1440: The default is to allow the controller description to be idle for 1440 minutes (24 hours).

automatically delete controller: Specify a value between 1 and 10,000 that represents how many minutes the controller description can be idle.

***NONE:** The system does not automatically vary off and delete APPC controller descriptions and attached device descriptions.

Figure 4-1. Defaults for APPN Line Parameters

Line Type	COSTCNN Parameter	COSTBYTE Parameter	SECURITY Parameter	PRPDLY Parameter	LINKSPEED Parameter
Ethernet	0	0	*NONSECURE	*LAN	10M
IDLC Nonswitched	0	0	*NONSECURE	*TELEPHONE	64000
IDLC Switched	128	128	*NONSECURE	*TELEPHONE	64000
SDLC Nonswitched	0	0	*NONSECURE	*TELEPHONE	*INTERFACE
SDLC Switched	128	128	*NONSECURE	*TELEPHONE	*INTERFACE
X.25	128	128	*PKTSWTNET	*PKTSWTNET	*INTERFACE
Token-Ring	0	0	*NONSECURE	*LAN	4M

Controller Descriptions

The controller descriptions describe the adjacent systems. Certain parameters on the Create Controller Description (APPC) (CRTCTLAPPC) or Create Controller Description (Host) (CRTCTLHOST) commands dictate how the local system will treat the adjacent system. APPN automatically creates APPC controller descriptions in certain situations. For more information, see "Automatic Configuration on LANs" on page 7-1.

This section describes the parameters that have unique meaning to APPC/APPN. For a complete description of controller commands and parameters that are not specific to APPC/APPN, see *OS/400* Communications Configuration Reference*.

The parameters for the Create Controller Description (APPC) (CRTCTLAPPC) command and the Create Controller Description (HOST) (CRTCTLHOST) command are:

APPN capable (APPN)

Specifies whether the controller will be known to the local APPN support.

***YES:** This value indicates this controller is for APPN.

***NO:** This value indicates this controller is not for APPN.

If *NO is specified, then the *local* AS/400 system will appear as a low-entry networking node to the adjacent system.

System services control-point ID (SSCPID)

The value identifies the host controller or remote system when a connection is established and the remote system sends an activate physical unit request (**ACTPU**)[1] to the AS/400 system. For APPC controllers, this parameter is the value that is sent to the adjacent system by the AS/400 system.

system-service-control-point-identifier: The system service control-point identifier (SSCPID) is a 12-digit hexadecimal value, with the first two digits

1 In SNA, a command used to start a session on a physical unit.

being hex 05 if no value is specified, or if the remote system requests an ACTPU request in its exchange identifier (XID).

This value is required for an SDLC switched line. For other line types (SDLC nonswitched, X.25, token-ring network, and Ethernet), this parameter is optional because the initial identification of the adjacent system will have already been made, using the network address, before the ACTPU is received.

The value must be obtained from the host system administrator (it is specified in the START procedure for ACF/NCP and VTAM), and is entered in this parameter as a 12-character value. The first character is always 0. The second character is the physical unit type of the host. The last 10 characters are host dependent.

For ACF/NCP/VTAM, the last 10 characters are in the form 000000XXXX, where XXXX can be in the range 0000 through FFFF. The AS/400 system will allow a nonzero value, to be specified in the third character of the SSCPID, to have a special meaning. If an ACTPU request is received from a host over an SDLC switched line and no controller is varied on that has a matching SSCPID, the AS/400 system will determine if there is one or more host controllers varied on that have a nonzero value in the third character of its SSCPID. If an available host controller is found that has the line description that the ACTPU was received on in its switched line list (SWTLINLST), then the connection will be established using that host controller. This allows the AS/400 system to attach to a host remote system without matching the received SSCPID.

If more than one host controller is varied on that has its SSCPID configured in this manner, then these controllers and attached devices should be created with identical attributes because the choice of a host controller on a received ACTPU will be random.

Notes:

1. If the SSCPID specified for a host controller has its first 3 characters set to 050, then it is always used to verify that the received SSCPID matches. If they do not match, the connection is not established. If no SSCPID is specified (for other than SDLC switched lines), then no SSCP verification is performed.
2. For more information on how the SSCPID parameter, together with the RMTNETID and RMTCPNAME parameters are used during XID exchange, see “XID Exchange” on page 8-16.
3. The SSCPID is shown in decimal by the host controller. The SSCPID is shown in hexadecimal on the AS/400 system. See Appendix E, “Conversions,” for examples on how to convert a decimal number to a hexadecimal number.

Notes for APPC Controller Descriptions:

1. If the remote system does not request an ACTPU request in its XID, the AS/400 system sends an ACTPU request to the remote system only if this parameter is specified in the APPC controller description.
2. If the remote system is dependent on the SSCPID that is received on the ACTPU request to establish the connection, then this SSCPID value must be coordinated with the remote system.

3. Some remote systems must receive an ACTPU request to forward alerts to the AS/400 system.

   For more information on alerts, see the *Alerts and DSNX Guide*.

4. Not all remote systems support receiving ACTPU requests on APPC connections.

Remote network identifier (RMTNETID)
The name of the remote network in which the adjacent control point resides. Also see the definition for the remote control-point name (RMTCPNAME) parameter.

remote-network id: Specifies the remote network identifier. This name may be up to 8 alphanumeric characters in length. The first character must be uppercase A through Z, or special character $, #, or @ followed by 0 through 9, A through Z, $, #, or @. Plus signs (+), periods (.), underscores (_), or embedded blanks are not allowed, but trailing blanks are allowed.

<u>*NETATR:</u> The remote network name is taken from the network attributes that are specified with the Change Network Attributes (CHGNETA) command. Refer to the "Change Network Attributes (CHGNETA) Command" on page 4-1 for a description of the command.

***NONE:** The network has no name. This is only valid if APPN(*NO) is specified for the controller description, or if MDLCTL(*YES) is specified for the controller description. For more information on how model controller descriptions are used, see "Model Controller Considerations" on page 7-6.

The RMTNETID and RMTCPNAME parameters describe the adjacent system's network identifier and control-point name. Both are required if APPN(*YES) is specified, unless MDLCTL(*YES) is specified.

If MDLCTL(*YES) is also specified, the RMTCPNAME and RMTNETID parameters may be used to specify the remote control-point name of a network node to which CP-CP sessions are to be established. When the controller description for the model controller is varied on, the system automatically creates and varies on an APPC controller description using the remote control-point name and remote network ID of the model controller, but only if the ADPTADR parameter of the remote system has also been supplied.

When the controller is connected on an SDLC switched line, this parameter, when combined with the station address (STNADR) parameter, must be unique among all controllers attached on a switched line that:

- Specifies APPN(*YES) and the remote system type (NODETYPE) is not a low-entry networking node (*LENNODE).
- Specifies APPN(*NO) and has both the remote network ID (RMTNETID) and remote control-point name (RMTCPNAME) specified.

Notes:

1. For more information on how the RMTNETID parameter, together with the RMTCPNAME, EXCHID, and SSCPID parameters are used during XID exchange, see "XID Exchange" on page 8-16.

Remote control-point name (RMTCPNAME)
The name of the remote control point.

remote-cp name: Specifies the remote control-point name. This name may be up to 8 alphanumeric characters in length. The first character must be uppercase A through Z, or special character $, #, or @ followed by 0 through 9, A through Z, $, #, or @. Plus signs (+), periods (.), underscores (_), or embedded blanks are not allowed, but trailing blanks are allowed. *NONE may be specified on the CHGCTLAPPC and the CHGCTLHOST commands.

The RMTNETID and RMTCPNAME parameters describe the adjacent system's network identifier and control-point name. Both are required if APPN(*YES) is specified, unless MDLCTL(*YES) is specified.

Whenever the RMTNETID and RMTCPNAME parameters are specified, the received exchange identifier will be validated to ensure that values specified here match the values received from the adjacent controller.

Note: This verification does not occur if the local AS/400 system specifies APPN(*YES) and the adjacent system is a low-entry networking node (NODETYPE(*LENNODE) specified). However, the remote network ID and the remote control-point name are needed so that directory entries made through the location lists (CRTCFGL command) can be associated with a particular controller. The names are not used for exchange identification, but are used for directory and routing control by the AS/400 system's APPN support.

In addition, there can only be one controller varied on with any given remote network ID and remote control-point name if the remote system is a low-entry networking node (NODETYPE(*LENNODE) specified).

If the adjacent controller is an AS/400 system, then these values must match those specified for the local network identifier (LCLNETID) and local control-point name (LCLCPNAME) on the change network attributes (CHGNETA) command.

If APPN(*NO) is specified, then these values should be specified when:

- The connection to the adjacent APPC controller is over an SDLC switched line and that controller does not send an exchange ID number; or
- The connection to an adjacent host controller is over an SDLC switched line and that host does not provide a systems services control-point identifier on the activate physical unit (ACTPU) command.

Note: When the local system places an outgoing call on an SDLC switched line, it does not send the exchange identifier (specified in the line description) if APPN(*YES) is specified for the remote controller and the remote system is not a low-entry networking node. This allows multiple controllers to share the same line description and still be able to uniquely identify a controller.

For more information on how the RMTCPNAME parameter, together with the RMTNETID, EXCHID, and SSCPID parameters are used during XID exchange, see "XID Exchange" on page 8-16.

Exchange identifier (EXCHID)

The exchange identifier of this controller. Defined only on the CRTCTLAPPC command.

exchange-identifier: Specify the hexadecimal value, 8 digits long (using the hexadecimal digits 0 through F) that identifies this controller.

The 8-digit hexadecimal value used to identify the remote control point during exchange identifier processing.

This parameter is required for an SDLC switched line if:

- APPN(*YES) has been specified and the remote system is a low-entry networking end node (NODETYPE(*LENNODE)); or
- APPN(*NO) has been specified and no remote control-point name (RMTCPNAME) has been specified.

For line types other than SDLC switched, this parameter is optional because the initial identification of the adjacent system will have already been made, using the network address, prior to exchange identifier processing.

Notes:

1. If an EXCHID is specified, it is always used to verify that the received exchange identifier matches. If they do not match, the connection is not established. If no EXCHID is specified, then no exchange identifier verification is performed.
2. For more information on how the EXCHID parameter, together with the RMTNETID and RMTCPNAME parameters are used during XID exchange, see "XID Exchange" on page 8-16.

The value is specified as yyyxxxxx, where yyy is the block number of the remote system and xxxxx is the identifier of the remote system.

The System/36 uses a block number of '03E'. A System/38 uses a block number of '022'. The AS/400 system uses a block number of '056'. There are certain products that do not send an EXCHID number on their XID (such as a personal computer with PC Support/400). In these cases, this parameter should not be specified. The identifier is specified in the line description and can be defined when the line description is created or automatically created by the system.

When the controller is connected through an SDLC switched line, this parameter, combined with the station address (STNADR) must be unique among all the other controllers on an SDLC switched line except:

- The APPC controller is defined with APPN(*YES) and the remote system type (NODETYPE) is not *LENNODE.
- The APPC controller description has APPN(*NO) specified, but a remote network ID (RMTNETID) and remote control-point name (RMTCPNAME) have been specified.

Switched disconnect (SWTDSC)

Valid only if *YES is specified for the SWITCHED parameter or for the SNBU parameter, or if the LINKTYPE is *LAN. These parameters are also specified in the controller description.

<u>*YES:</u> The switched connection is dropped when the last session is unbound. Specify *YES to automatically disconnect from the adjacent system when there are no end point (synchronous conversations) or intermediate sessions active on the link. *YES may not be specified if MINSWTSTS(*VRYON) has been specified.

***NO:** This switched connection is not dropped when the last session is unbound.

See "Switched Line Considerations" on page 8-5 for more information.

APPN control-point session support (CPSSN)

Specify whether this controller supports control-point-to-control-point sessions. This parameter is valid only when the node type parameter is specified as *ENDNODE, *NETNODE, or *CALC.

<u>*YES:</u> This value means that this controller supports control-point-to-control-point sessions.

***NO:** This value means that this controller does not support control-point-to-control-point sessions.

Note: If a network node is adjacent to one or more network nodes, it must have an active control-point-to-control-point session with at least one of the adjacent network nodes.

Refer to "Control-Point-to-Control-Point Session" on page 8-13 for information on how this value can affect a switched-line environment.

APPN node type (NODETYPE)

Specify the type of node being defined by this controller description.

See "Node Type 2.1 Nodes" on page 2-4 for a description of the node types.

<u>*ENDNODE:</u> The remote node is an end node in an APPN network.

***CALC:** AS/400 APPN support attempts to determine the remote system node type during the exchange identification processing. This option is only allowed to determine whether a remote system is an APPN network node or an APPN end node. This decision is made during the exchange identification processing. If the remote system is a low-entry networking node, you cannot specify *CALC.

***NETNODE:** The remote node is a network node in an APPN network.

***LENNODE:** The remote node is a low-entry networking node in an APPN network.

Products that should be configured as either *NETNODE, *ENDNODE, or *CALC are:

- AS/400 system that has its controller description configured as APPN(*YES), all values are possible for the NODETYPE parameter.
- System/36 that is using an APPN subsystem member, *NETNODE or *CALC are possible for the NODETYPE parameter.
- Personal computer using PC Support/400, *ENDNODE or *CALC are possible for the NODETYPE parameter.

If the remote system is an AS/400 system that is using a controller that indicates APPN(*YES), then the NODETYPE parameter should be set to the NODETYPE parameter specified in the CHGNETA command on the remote system. If the remote system is an AS/400 system that is using a controller that indicates APPN(*NO), then the NODETYPE parameter must be set to *LENNODE.

Notes:

1. An AS/400 system that has its controller description configured as APPN (*NO) can connect to another AS/400 system without the controller description indicating NODETYPE(*LENNODE). The AS/400 configured as APPN(*NO) sends its network identifier and control-point name in the XID. However, in the XID, the AS/400 system configured as APPN(*NO) indicates that it does not support parallel transmission groups. If parallel connections (multiple controller descriptions) are required between an

AS/400 system and another AS/400 system that specifies APPN(*NO) in its controller description, then the user must configure the controllers with NODETYPE(*LENNODE) and have separate RMTCPNAME parameters specified for each controller description. This allows the AS/400 APPN support to treat each controller description as a separate remote system.

2. When the IBM personal computer is running APPC/PC running the DOS operating system, it must be configured as a *LENNODE over SDLC connections and may be configured as either a *LENNODE or *ENDNODE over LAN connections.
3. When the IBM personal computer is running OS2/EE it may be configured as a *LENNODE or *ENDNODE over all types of connections.

If the adjacent system being defined is a low-entry networking node, you must specify NODETYPE(*LENNODE).

If the adjacent system is not a low-entry networking node, this value is used for switched line processing along with the transmission group number (TMSGRPNBR) parameter. See "Switched Line Considerations" on page 8-5 for information on how this value affects a switched-line environment.

APPN transmission group number (TMSGRPNBR)

Specify the value to be used by the APPN support for transmission group negotiation with the remote system.

1: A value of 1 is used for the transmission group number.

***CALC:** The AS/400 system determines the value for the transmission group number. *CALC should be specified if the transmission group number on the remote system is unknown, or if you want the AS/400 system to manage the transmission group number selection.

transmission-group-number: Specify a value from 1 to 20 for the transmission group number.

If you specify *CALC, the value used is from 21 through 239. If you specify a number (from 1 through 20), the same number must be specified at the adjacent system.

Note: If the adjacent system is a System/36, you can specify any number from 1 through 20 because the System/36 allows only one transmission group between adjacent systems and will accept any transmission group number specified by the local AS/400 system.

If the remote system is an AS/400 system, and a transmission group number is specified in this controller description, then the same transmission group number should be specified in the controller description on the remote system.

This parameter is negotiated with the adjacent system and, if the value specified here does not match the value specified at the remote system, the transmission group number used can be different. If there are parallel transmission groups, this could cause the vary on of the controller to fail because a parallel transmission group may already be active with the same configured or negotiated transmission group number on another line. For more information on use of this parameter with parallel transmission groups, see "Parallel Transmission Groups" on page 8-14.

Note: See "Switched Line Considerations" on page 8-5 for information on the use of this value in a switched-line environment. The choice of using *CALC or an explicit transmission group number has a significant effect in an APPN switched-line environment.

Minimum switched status (MINSWTSTS)
This parameter specifies the minimum status of the switched connection that APPN will consider as a controller available for routing. This parameter may only be specified if APPN(*YES) is specified and the controller is switched. This parameter may be changed using the CHGCTLAPPC command or CHGCTLHOST command when the controller is varied off.

<u>*VRYONPND:</u> APPN considers the controller available for routing if the status is vary on pending, varied on, or active.

***VRYON:** APPN considers the controller available for routing only if the status is varied on or active. If this option is specified, then SWTDSC(*NO) must also be specified.

If MINSWTSTS(*VRYONPND) is specified, then the controller description is considered available for routing requests when the controller is in varied on pending status (provided a TG number has already been configured or negotiated with the adjacent system).

If MINSWTSTS(*VRYON) is specified, then the system treats this connection differently. If INLCNN(*DIAL) is specified, then when the controller description is varied on or when recovery is activated for the controller, this system attempts to call the other system. The controller description is not considered eligible for APPN routing until the other system has been contacted. If the connection is broken, the TG is marked as inactive. This support allows the connection to stay active anytime the controllers on both systems are varied on. If both systems are configured as INLCNN(*DIAL), then the system that varied on its controller last causes the connection to be made.

Model controller (MDLCTL)
Indicates whether this controller description is a model for automatically created controller descriptions. This parameter may only be specified if APPN(*YES) is specified and the link type (LINKTYPE) for the controller description is *LAN. This parameter is defined only on the CRTCTLAPPC command and the CHGCTLAPPC command.

<u>*NO:</u> This controller is not a model controller.

***YES:** This controller description is a model for all automatically created controller descriptions associated with the single line description listed in this controller description's switched line list (SWTLINLST parameter).

For more information on the use of model controllers, see "Automatic Configuration on LANs" on page 7-1.

Connection network network ID (CNNNETID)
Indicates the connection network network identifier. If a value (other than *NONE) is supplied, then this controller description represents this connection to the connection network. It has the same values and default as the RMTNETID parameter. This parameter is defined only on the CRTCTLAPPC command and the CHGCTLAPPC command. This parameter is optional and may only be specified if MDLCTL(*YES) is specified. See the RMTNETID parameter on page 4-14.

Connection network CP name (CNNCPNAME)

Indicates the connection network control-point name. This parameter is defined only on the CRTCTLAPPC command and the CHGCTLAPPC command. This parameter may only be specified if MDLCTL(*YES) is specified. This parameter is optional.

If this parameter and a CNNNETID value (other than *NONE) is supplied, then this controller description represents this connection to the connection network. Varying on of this controller description causes a topology database entry to be added to represent this connection to the connection network. These names are shown as a virtual node, the origin of a TG entry, or the destination of a TG entry using the DSPAPPNINF command. The controller description name is associated with the connection network TG entry. This parameter can be changed when the controller description is varied off.

This parameter has the same values and default as the RMTCPNAME parameter (including *NONE). See the RMTCPNAME parameter on page 4-14.

For advanced considerations, see "Connection Network Support" on page 7-7.

Control owner (CTLOWN)

Indicates whether this controller description was automatically created by the system. To change a controller description, this parameter must be set to *USER. This parameter is shown only on the CHGCTLAPPC command.

If a controller description is automatically created by the system, the control owner can be changed to *USER using this parameter on the CHGCTLAPPC command. A controller description cannot be changed from *USER to *SYS.

Disconnect timer (DSCTMR)

The number of seconds to wait before dropping an inactive connection on a switched line.

<u>170:</u> The default is 170 seconds.

Number of seconds: Specify the number of seconds, from 0 through 65,535 to wait before dropping the connection on a switched line when there are no active sessions. This timer is only used when SWTDSC(*YES) is also specified in the controller description.

The disconnect timer is started when the switched connection is established. When the timer expires, the system checks for any active sessions:

- If there are no active sessions when the timer expires, the line is disconnected.
- If there are active sessions, the line is disconnected when the last active session ends.

A special value of 0 indicates that a session needs to be established and then ended before the connection drops. If you do not want the line to drop, specify *NO for the SWTDSC parameter.

To control the switched disconnect function, the DISCNT parameter on the GROUP macroinstruction in the NCP/VTAM definition may be used.

You can change this parameter using the CHGCTLAPPC or CHGCTLHOST command.

See "Automatic Disconnect of a Switched Line" on page 8-7 for more information.

Device Descriptions

The device description describes the characteristics of the logical connection between two locations (the local location and the remote location) in the network. The device descriptions exist only at the end points (the local location and the remote location) of a session. There are no device descriptions for intermediate sessions at a network node. You must create a device description if you are running to the host as a dependent LU or if creating APPN(*NO) device descriptions. APPN will automatically create a device description if:

- A request is issued by an application program for a session between the local location and a remote location that is found in the APPN network, and a device description with the specified location names does not exist for the controller description chosen for this session route.
- A BIND request is received from the network for a location on this system, and a corresponding device description does not exist on the controller description on which the BIND was received.

The device description is built by the AS/400 system using the information defined in the network attributes, the associated mode description, the location list, and the application program. The name of the device description created will be the same as the remote location name. If a device description with that name already exists on the system, then the name used is the remote location name with two additional characters added (for uniqueness).

The characters added will be from the set 0 through 9 and A through Z. If the system is unable to create a unique name by using the remote location name, the system will create a random name that is not currently being used on the system. Once created and varied on, these device descriptions are like any other device description on the system. They are not automatically varied off or deleted by the APPN support except when they are attached to automatically created controller descriptions, the control owner (CTLOWN) parameter is set to *SYS in the controller description, and the controller is automatically varied off and deleted.

Note: Device descriptions created automatically by the system have the TEXT parameter set to read *This description created by auto-configuration*.

A device description that is automatically created is also automatically varied on.

Note: If an existing device description can be used but it is not varied on, the device description will be automatically varied on.

Create Device Description APPC (CRTDEVAPPC)

The Create Device Description (APPC) (CRTDEVAPPC) command creates a device description for an APPC device.

The parameters for the CRTDEVAPPC command are:

Device description name (DEVD)

The name assigned to the device description.

device-description name: Specify the device description name.

The name you give the device and its description must follow the AS/400 system naming conventions, but it can be as descriptive as you choose. Examples: NYCS36 and CUSINQ.

Remote location name (RMTLOCNAME)
Specify the name of the remote location associated with this remote device.

remote-location name: Specify the name of the remote location. The first character must be uppercase A through Z, or special character $, #, or @ followed by 0 through 9, A through Z, $, #, or @. Plus signs (+), periods (.), underscores (_), or embedded blanks are not allowed, but trailing blanks are allowed.

This name is required and is used along with the remote network ID to define the location to the AS/400 APPN support.

All local location and remote location name pairs defined for a controller must be unique. This name must match the local location name specified in the remote system's configuration definition.

If the remote system is:

- An AS/400 system not using APPN (APPN(*NO) specified in the controller and device descriptions), the name must match the value specified for the LCLLOCNAME parameter in the remote AS/400 system's device description.
- An AS/400 system using APPN (APPN(*YES) specified for the controller and device descriptions), the name must match a local location name specified in the local configuration list (defined by the CRTCFGL command), the default local location name (defined by the CHGNETA command), or the local control-point name.

Local location name (LCLLOCNAME)
The name which, when combined with the local network ID, identifies your local system to a remote system.

***NETATR:** The default local location name, as defined by the network attributes (which can be changed by using the CHGNETA command), is used for the local location name. See the "Change Network Attributes (CHGNETA) Command" on page 4-1 for information on the network attributes.

local-location name: Specify the name (8 characters maximum) by which the local system is known to the remote system. The first character must be uppercase A through Z, or special character $, #, or @ followed by 0 through 9, A through Z, $, #, or @. Plus signs (+), periods (.), underscores (_), or embedded blanks are not allowed, but trailing blanks are allowed.

Your location is considered the *local* location. This name is also used by the remote locations to identify your location. This name must match one of the remote location names specified on the remote system's configuration definition.

If the remote system is:

- An AS/400 system not using APPN (APPN(*NO) specified for the controller and device descriptions), the name must match the value specified for the RMTLOCNAME parameter in the remote system's device description.
- An AS/400 system using APPN (APPN(*YES) specified for the controller and device descriptions), the local location can match a value specified as a remote location name (RMTLOCNAME) in the remote system's APPN remote location list. However, because you need not define remote locations on an AS/400 system using APPN, your system's local location name does not need to be defined as a remote location name on

a remote AS/400 system. See "Creating an APPN Remote Location List" on page 4-6 for information on remote location lists and when remote location names need to be defined.

This name appears in system messages at both the local and remote systems to help associate messages with a particular location.

Remote network identifier (RMTNETID)
The name of the remote network in which the location resides.

***NETATR:** The remote network name is taken from the network attributes.

***NONE:** The remote network has no name.

remote-network ID: Specify the 8-character remote network ID. The first character must be uppercase A through Z, or special character $, #, or @ followed by 0 through 9, A through Z, $, #, or @. Plus signs (+), periods (.), underscores (_), or embedded blanks are not allowed, but trailing blanks are allowed.

If the remote system is an AS/400 system, this ID must match the value specified for the LCLNETID parameter in the remote system's network attributes.

Mode name (MODE)
Specifies the name that is to be used by both ends of the data link to refer to a group of sessions between the local and remote locations with the same characteristics. A maximum of 14 mode names can be specified.

Notes:

1. For a device description that is attached to a controller description and configured with APPN(*NO), a maximum of 14 modes can be specified.
2. For a configuration with the controller description configured with APPN(*YES), a maximum of 14 modes can be specified for a local location and remote location pair.
3. If the single session location parameter (SNGSSN) specifies *YES, then a maximum of one mode name can be specified.

***NETATR:** The mode name is specified in the network attributes. See the "Change Network Attributes (CHGNETA) Command" on page 4-1 for a description of the network attributes.

mode name: Specify the 8 character mode name for this mode entry. The first character must be uppercase A through Z, or special character $, #, or @ and cannot contain blanks, plus signs (+), periods (.), or underscores (_). The mode name cannot be CPSVCMG or SNASVCMG; these mode names are reserved for system use. A maximum of 14 mode names can be specified. Using a mode name of BLANK specifies that the name will be represented in the network as 8 blanks.

Note: If APPN(*YES) and LOCADR(00) are specified for this device description, no modes should be added to the device description. The APPN support will automatically add modes to the device when a session establishment request is received on a mode currently not attached to the device.

The mode name is specified at a remote AS/400 system as follows:

- If the device is configured APPN(*NO), then the mode name is specified on the mode parameter of the device description.

- If the device is configured APPN(*YES), the mode name must exist on the system.

Use APPN function (APPN)
Specifies whether this device will be used in an APPN network.

__*YES:__ Networking is used and dynamic definition of resources is allowed.

***NO:** Networking is not used. No mode names will be added to the devices automatically. The user must add all mode names to the device manually.

The value specified here must match the value specified for the APPN parameter in the associated controller description.

Local location address (LOCADR)
Specifies the address assigned to this location.

__00:__ The default address is hex 00.

local-location address: Specify the two hexadecimal character address for this location. Valid location addresses are from hex 00 through hex FF. Addresses other than hex 00 must be unique for all devices attached to the same host controller. Multiple devices can be defined with an address of hex 00.

When the APPC device being defined is attached to an APPC controller, specify hex 00 for the location address.

When the APPC device is attached to a host controller, specify this parameter as follows:

- If the local location is dependent on the host system to send an activation command before sessions can be established, specify a value other than hex 00. This indicates that the dependent local location cannot send session activation requests to the host system and that a session limit of 1 is enforced for this device description. In this case, the SNGSSN parameter must be specified as *YES.
- If either the local or remote location can establish the sessions, meaning that the locations are independent, specify a value of 00.

Note: Only host systems with VTAM Version 3, Release 2 and ACF/NCP Version 4, Release 3 (or later) can support independent locations.

Single session location (SNGSSN)
Specify whether communications with the remote location is limited to one session.

__*NO:__ Multiple sessions over one or more attached modes are allowed. Refer to the CRTMODD command for information concerning session limits.

***YES:**

- This device description is for a single session remote location and is limited to a maximum session limit of 1.
- If *YES is specified, the maximum number of conversations can also be specified. The number of conversations specified can be any number from 1 through 512. The default is 10. *YES may be required by the remote system with which you are communicating. For example, 5520 and Displaywriter, which are single session locations, both require that *YES be specified.

Locally controlled sessions (LCLCTLSSN)
Specifies if the single session is locally or remotely controlled. Valid only if SNGSSN(*YES) is specified.

***NO:** The single session is controlled by the remote location.

***YES:** The single session is controlled by this local location.

Preestablished session (PREESTSSN)
Indicates whether the single session is to be established when the connection with the remote system is established. Valid only if SNGSSN(*YES) and LCLCTLSSN(*YES) are specified.

***NO:** Do not establish the session when the connection is made.

***YES:** The single session is established at connection time.

Location password (LOCPWD)
Specifies the use of a password to validate session establishment.

This parameter is not applicable if APPN(*YES) and LOCADR(00) are specified. In this case, the information is obtained from the APPN remote location configuration list.

When password validation is required and specified by this parameter, you must enter the password value in hexadecimal notation.

***NONE:** No password is required to validate a session activation request.

location-password: The system password you specify to validate session establishment. You must enter the value as the hexadecimal equivalent of the password characters; therefore, an even number of characters must be specified. The parameter value must be any combination of 0 through 9, A through F. A maximum of 16 characters can be entered, providing an 8-byte password. Refer to "Security Considerations" to create a random hexadecimal password.

For example, the password B1 would be entered as C2F1 (hexadecimal representation of the EBCDIC characters) as the value for this parameter.

See "Security Considerations" for additional information on APPC/APPN security.

Secure location (SECURELOC)
This parameter is not applicable if APPN(*YES) and LOCADR(00) are specified. In this case, the information is obtained from the APPN remote location configuration list.

Specify whether the local system allows the remote system to verify user passwords and to send an already verified indicator with the program start request.

***NO:** Security validation by the remote location will not be accepted.

***YES:** Security validation by the remote location will be accepted.

See "Security Considerations" for additional information on APPC/APPN security.

Mode Descriptions

The mode description describes the session characteristics and number of sessions that will be used to negotiate the allowed values between the local and remote locations. A mode with the same name must exist at both end points (the local location and the remote location) of a session. The mode does not need to exist for an intermediate session except at the network node server for a low-entry networking node.

Important Information About System Names

Use caution when you use names with the special characters # ('7B'), $ ('5B'), and @ ('7C'). These special characters might not be on the remote system's keyboard. The use of these symbols should be limited to migration and support of other systems that use a previous release of the operating system. These characters should not be used for newly created names. A **previous release** is the last required release of the system, prior to the current release, including any modifications that were not required.

If you are using a national language keyboard that does not have the #, $, or @ symbols, see the appendix on national language keyboard types and the appendix on code pages in the *National Language Support Planning Guide*.

The names that may be exchanged with remote systems include the following:

- Network IDs
- Location names
- Mode names
- Class-of-service names
- Control-point names
- Connection network names

Five predefined modes are shipped with the AS/400 system:

- BLANK, the default mode name specified in the network attributes when the system is shipped. Using this mode results in a mode name of 8 blanks (hex 40). This mode is equivalent to the *BLANK session group name on a System/36 and to the *BLANK mode name parameter of the Add Device Mode Entry (ADDDEVMODE) command on a System/38.
- #BATCH, a mode tailored for batch communications.
- #BATCHSC, which is the same as #BATCH except that the associated class-of-service description requires a data link security level of at least *PKTSWTNET (packet-switched network).
- #INTER, a mode tailored for interactive communications.
- #INTERSC, which is the same as #INTER except that the associated class-of-service description requires a data link security level of at least *PKTSWTNET, (packet-switched network).

See Figure 4-2 on page 4-31 for the values in the IBM-supplied mode descriptions. Every local location on your local system will use global mode limits to negotiate session limits with every remote location. After session limit negotiation, the limits are kept between each local location and remote location.

Note: For a single session device, the values for the mode parameters MAXSSN, MAXCNV, LCLCTLSSN, and PREESTSSN are not used. The values for MAXSSN, MAXCNV, LCLCTLSSN, and PREESTSSN come from the device description for configurations not using APPN and from the APPN remote location list for configurations using APPN.

Create Mode Description (CRTMODD) Command

The Create Mode Description (CRTMODD) command creates a mode description. For a description of controlling modes, see Chapter 5.

The parameters for the CRTMODD command are:

Mode description name (MODD)

Specifies the name of the mode being created. This name may be up to 8 alphanumeric characters in length. The first character must be uppercase A through Z, or special character $, #, or @ followed by 0 through 9, A through Z, $, #, or @. Plus signs (+), periods (.), underscores (_), or embedded blanks are not allowed, but trailing blanks are allowed.

mode-name: Specify the mode name.

Note: When you specify BLANK it results in a mode name of 8 blank characters.

The values CPSVCMG and SNASVCMG are reserved for use by the system and cannot be specified here.

Class of service (COS)

Specifies the name of an existing class-of-service description. This name may be up to 8 alphanumeric characters in length. A class-of-service description is created using the Create-Class-of Service Description (CRTCOSD) command. The first character must be uppercase A through Z, or special character $, #, or @ followed by 0 through 9, A through Z, $, #, or @. Plus signs (+), periods (.), underscores (_), or embedded blanks are not allowed, but trailing blanks are allowed.

#CONNECT: Specifies that the #CONNECT class-of-service is to be used.

#BATCH: Specifies that the #BATCH class-of-service is to be used.

#INTER: Specifies that the #INTER class-of-service is to be used.

#BATCHSC: Specifies that the #BATCHSC class-of-service is to be used.

#INTERSC: Specifies that the #INTERSC class-of-service is to be used.

class-of-service-name: Specify the class-of-service name.

For a description of the class of service and IBM-supplied class-of-service descriptions, refer to "Class-of-Service Descriptions" on page 4-32 and to Appendix B.

Maximum number of sessions (MAXSSN)

Specify the maximum number of sessions (1 through 512) that can be active at once for this mode.

8: The maximum number of active sessions allowed is 8.

maximum-number-of-sessions: Specify a value, 1 through 512, to specify the maximum number of sessions.

The value specified here should be at least as large as the value specified for the locally controlled session (LCLCTLSSN) parameter plus the number of locally controlled sessions specified at the remote system. When the mode is started, the maximum number of sessions is negotiated with the remote system, so the number of sessions will be less than or equal to this value.

Maximum number of conversations (MAXCNV)

Specify the maximum number of conversations that can be active at one time with the remote system that are allowed by this mode.

8: A maximum of eight conversations is allowed.

maximum number of conversations: Specify a value, 1 through 512, to specify the maximum number of conversations.

A conversation is the temporary connection of a program to a session, and can be either synchronous (both the source and target system are communicating) or asynchronous (the source has completed and detached from the session, but the target is still attached and has access to all the data sent by the source program). The value specified for MAXCNV is the sum of the synchronous and asynchronous conversations. The value specified here must be at least as large as the value specified for the MAXSSN parameter.

Note: For a device description that is attached to a controller description that specifies APPN(*NO), the total conversation count for all modes attached to that device description cannot exceed 512.

Locally controlled sessions (LCLCTLSSN)

Specify the minimum number of sessions that need to be established and controlled by this system for this mode.

4: A minimum of four sessions is used as locally controlled sessions for this mode entry.

locally controlled sessions: Specify a value, 0 through 512, to specify the number of locally controlled sessions to be used. The total must be less than or equal to the value specified for the maximum number of sessions active at the same time (MAXSSN) parameter. This value must also be greater than or equal to the value specified for the preestablished sessions (PREESTSSN) parameter.

It is possible for the number of active sessions shown on the Mode Status display to exceed the number specified in this parameter if all locally controlled sessions are in use.

Preestablished sessions (PREESTSSN)

Specifies the number (0 through 512) of concurrent sessions that are to be established when the mode is started. Once the mode is started, additional sessions may be established as needed.

0: No session is established when the connection is made.

number of preestablished sessions: Specify a value, 0 through 512, to specify the maximum number of preestablished sessions that can be established when the connection is made.

The value specified here must be less than or equal to the value specified for the maximum number of locally controlled sessions (LCLCTLSSN) parameter. If a switched line is used, a value of zero allows the AS/400 system to automatically disconnect the line when there are no active sessions (no synchronous conversations). A value greater than zero keeps the line active until the device is varied off. Refer to "Switched Line Considerations" on page 8-5 for additional information on switched line considerations.

Inbound pacing value (INPACING)

Specifies the pacing value to be used for incoming request/response units (RUs).

7: A value of seven is used as the pacing value.

inbound-pacing value: Specify a value, 0 through 63, used as the limiting value.

This parameter is used as follows:

- If the adjacent system does not support adaptive pacing, then the value specified here is used to negotiate the maximum number of RUs that are to be received on a session before a response is sent to the adjacent system.
- If the adjacent system does support adaptive pacing, then the value specified here is the suggested minimum number of RUs that are to be received on a session before a response is sent to the adjacent system. The value is not negotiated with the adjacent system.

For a description of how the pacing value affects performance, see "Network Performance Considerations" on page 8-1.

Outbound pacing value (OUTPACING)

Specifies the pacing to be suggested for outgoing request/response units (RUs).

7: A value of seven is used as the pacing value.

outbound-pacing value: Specify a value, 0 through 63, used as the limiting value.

This parameter is used as follows:

- If the adjacent system does not support adaptive pacing, then the value specified here is used to negotiate the maximum number of RUs that are to be sent on a session before a response is received from the adjacent system.
- If the adjacent system does support adaptive pacing, then the value specified here is the suggested minimum number of RUs that are to be sent on a session before a response is received from the adjacent system. The value is not negotiated with the adjacent system.

At a remote AS/400 system, the matching value is specified by the INPACING value in the corresponding mode description.

For a description of how the pacing value affects performance, see "Network Performance Considerations" on page 8-1.

Maximum length request unit (MAXLENRU)

Specifies the length of the request/response units as follows:

- The value specified is used as the maximum size of request/response units that can be received by the local system.
- The value specified is used to negotiate (at session establishment) the maximum value the remote system can receive.

CALC: The AS/400 system will select a MAXLENRU value close to the most efficient value for this link. This is the recommended value to use.

maximum length unit: Specify a value, 241 through 16,384, used as the maximum length for incoming and outgoing request units.

At a remote AS/400 system, the matching value is specified by the MAXLENRU value in the corresponding mode description. In general, performance improves if the request unit size is a multiple of the frame size minus the SNA headers. Some systems perform better if this is a large multiple. *CALC will generate a multiple of one.

While *CALC is the recommended value to use, if you are using a system that performs better with a larger multiple, you can use the following method for determining the MAXLENRU size.

1. Find the line with the smallest frame size that this mode will use. Look at the frame size for the lines this mode will use on the local system, remote system, and (for APPN networks) any intermediate systems. This frame size value represents the maximum size in bytes of higher layer SNA headers and user data that can be transported in one transmission from the AS/400 system to the remote system by the particular link layer protocol in use; for example, SDLC, token-ring, Ethernet, or the logical link layer (LLC) selected for X.25.

   Note: For X.25, this value represents the maximum LLC frame size that can be transmitted DTE to DTE (data terminal equipment), and should not be confused with the high-level data link control (HDLC) frame or packet size in use from one DTE to the X.25 network. These LLC frames can span multiple packets and also HDLC frames.

   The maximum outbound frame size is determined dynamically by the AS/400 system at connection initiation time. The maximum outbound frame size is determined by comparing the maximum frame size supported on the line being used by the AS/400 system with the maximum frame size that can be received by the remote system. The smaller of these two frame sizes will be the maximum outbound frame size. These two frame sizes can be determined as follows:

   - The maximum frame size supported by the AS/400 system is configurable for SDLC through the MAXFRAME parameter in the line description and can be displayed by using the Display Line Description (DSPLIND) command. For X.25, this maximum frame size value is set to 1024 for connections supporting QLLC and 1018 for those using ELLC. These values are not configurable for X.25.

     The maximum frame size supported for a token-ring is configurable through the MAXFRAME parameter in the line description. Ethernet does not have a MAXFRAME parameter on the line description. For Ethernet, the maximum frame size is set to 1496. Both token-ring and Ethernet line descriptions can also configure the maximum frame size on a service access point (SAP) basis. In addition, a controller description also has a MAXFRAME size. At run time, the actual frame size used is the smaller of the three values: line MAXFRAME, SSAP MAXFRAME, and the controller MAXFRAME.

   - The maximum received frame size supported by the remote system is received by the AS/400 system in the XID data from the remote system or from the MAXFRAME parameter for SNA host controller descriptions; for example, on the CRTCTLHOST command.

     For X.25, because the LLC frames are carried in packets, and because some X.25 networks can charge a tariff for each packet sent, the AS/400 system can adjust this maximum frame size value supported by the remote system to a slightly smaller, more efficient value. This adjusted value, when combined with the appropriate LLC header (0 bytes for

QLLC or 6 bytes for ELLC), can be transported to the remote system with efficient packet use.

2. Subtract 9 bytes for the higher layer SNA headers from the frame size determined in the previous step.

   Note: These header sizes take the entire SNA header into account (6-byte transmission header and 3-byte request header). If segmentation is done by the SNA transport layer (for example, the RU size exceeds the frame size), the 3-byte request header is only included in the first frame of the request unit.

3. If this mode is used to send large amounts of data, then a larger multiple of the frame size minus the header is recommended. If small amounts of data are sent, a small multiple is recommended. Add three for each multiple except the first multiple because the request header is only sent on the first frame.

The previous steps used for determining a MAXLENRU size can be shown in the following equation. With a frame size of F, an SNA header size of 9, and the multiple of M, the equation for determining the MAXLENRU size is:

```
M(F-9) + 3(M-1) <= 16,384
```

Note: This equation assumes the remote system supports 16,384-byte request units.

For example, a mode communicating to a system across a token-ring line with a frame size of 1977 bytes, and sending large amounts of data, can use an RU size of 15765. This takes into account the largest multiple (8) of 1977 (frame size) minus the SNA headers that fit into 16384 (the largest R U size that the AS/400 system supports).

IBM-Supplied Mode Descriptions

The following table shows the values defined in the five IBM-supplied mode descriptions.

Figure 4-2 (Page 1 of 2). IBM-Supplied Mode Description

Prompt	Keyword	BLANK	#INTER	#INTERSC	#BATCH	#BATCHSC
Mode description name	MODD	BLANK	#INTER	#INTERSC	#BATCH	#BATCHSC
Class of service	COS	#CONNECT	#INTER	#INTERSC	#BATCH	#BATCHSC
Maximum number of sessions	MAXSSN	8	8	8	8	8
Maximum number of conversations	MAXCNV	8	8	8	8	8
Locally controlled sessions	LCLCTLSSN	4	4	4	4	4
Preestablished sessions	PREESTSSN	0	0	0	0	0
Inbound pacing value	INPACING	3	7	7	3	3
Outbound pacing value	OUT-PACING	3	7	7	3	3

Figure 4-2 (Page 2 of 2). IBM-Supplied Mode Description

Prompt	Keyword	BLANK	#INTER	#INTERSC	#BATCH	#BATCHSC
Maximum length request unit	MAXLENRU	*CALC	*CALC	*CALC	*CALC	*CALC
Text description	TEXT					

Class-of-Service Descriptions

A class-of-service description is used to select the nodes and transmission groups (TGs) that are eligible for inclusion in APPC/APPN session routes. TGs and nodes are selected based on how well their values for characteristics fit the values for these characteristics as specified by the class-of-service description. This is accomplished by specifying the values that the characteristics for TGs and nodes must possess in order to be acceptable for the class of service. This selection of TGs and nodes is performed at session request time by using the class of service that is pointed to by the user-selected mode description. The APPN route selection algorithm compares the actual values that the TGs and nodes have with the values specified for the same characteristics in the selected class-of-service description, and assigns a relative weight to each node and link that is applicable only for this session request. All other TGs and nodes between the session origin control point and the session destination control point that collectively supplies the least weight route will be used.

Important Information About System Names

Use caution when you use names with the special characters # ('7B'), $ ('5B'), and @ ('7C'). These special characters might not be on the remote system's keyboard. The use of these symbols should be limited to migration of the operating system. These characters should not be used for newly created names.

If you are using a national language keyboard that does not have the #, $, or @ symbols, see the appendix on national language keyboard types and the appendix on code pages in the *National Language Support Planning Guide*.

The names that may be exchanged with remote systems include the following:

- Network IDs
- Location names
- Mode names
- Class-of-service names
- Control-point names
- Connection network names

The following class-of-service descriptions are shipped with the AS/400 system:

- #CONNECT, the default class of service
- #BATCH, a class of service that is tailored for batch communications
- #BATCHSC, which is the same as #BATCH except that a data link security level of at least *PKTSWTNWK is required
- #INTER a class of service that is tailored for interactive communications

- #INTERSC, which is the same as #INTER except that a data link security level of at least *PKTSWTNWK is required

See Appendix B for the values in the IBM-supplied class-of-service descriptions.

The #CONNECT, #BATCH, and #INTER predefined class-of-service descriptions will select any line description (link) that is configured, from either default values or user specified values in the line description.

If you need to force a particular route to be selected, a user class-of-service description (COSD) can be created. Refer to Appendix B for an example of route selection.

You use the Create Class-of-Service Description (CRTCOSD) command to define the attributes such as link speed, cost per connect time, cost per byte, and security. Each set of attributes is assigned a weighting factor that indicates the preference for each set (the lower the weighting value, the more desirable the set). The initial values for a new class-of-service being created default to the same values used by #CONNECT class-of-service.

Eight sets of values, or rows, must be defined for each class-of-service description. Each row is a set of characteristics which the chosen link and intermediate node must satisfy to be considered as part of the route. The route taken depends on the weights of each row. The rows are in ascending order by weight from row 1, the smallest, through row 8, the largest. The characteristics of a row should make preceding rows more desirable than the next row. As an example, the values specified in row 1 should make that row preferable to the values in row 2.

The higher values for link speed, security, and the three user-defined fields are preferable whereas the lower the values for cost per byte, cost per connection, propagation delay, route addition resistance, and congestion are preferable.

Refer to Appendix B for additional information on class-of-service support.

Create Class-of-Service Description (CRTCOSD) Command

The CRTCOSD command creates a class-of-service description. For more information, see "Route Selection Example" on page B-3.

Class-of-service description name (COSD)

Specify the name (1 to 8 characters) of the class-of-service description to be created.

class-of-service description name: There is no default. The entries CPSVCMG and SNASVCMG cannot be used. The first character must be uppercase A through Z, or special character $, #, or @ followed by 0 through 9, A through Z, $, #, or @. Plus signs (+), periods (.), underscores (_), or embedded blanks are not allowed, but trailing blanks are allowed.

Transmission priority (TMSPTY)

Specify the transmission priority (low, medium, or high) for this class-of-service description.

<u>*MED:</u> Specifies medium transmission priority for this class-of-service description.

***LOW:** Specifies the lowest transmission priority for this class-of-service description.

***HIGH:** Specifies the highest transmission priority for this class-of-service description.

For a description of how transmission priority affects performance, see "Network Performance Considerations" on page 8-1.

Row n for lines (ROW1LINE through ROW8LINE)

Specify the list of line-related values used for this row, which can be from row 1 through row 8, of the class-of-service description.

Note: The rows must be defined in sequence (row 1 first, then row 2, and so on).

The row describes the attributes of the line connection between two nodes in the APPN network. The rows are examined in sequence (row 1 then row 2 then row 3 and so on) to attempt to define a network routing path. The value specified for the minimum attributes must be less than or equal to the maximum attributes for the same line row. The value specified for the maximum attributes must be equal to or greater than the minimum attributes for the same line row. The list entries are the following:

Line row weight: Specify the relative weight of this row for lines. The weight can range from 0 to 255. The weight indicates the relative cost of a line connection. More desirable line connections should be assigned lower weights.

The value specified here is dependent on the row you are specifying. The value for row 1 must always be the lowest, row 2 is next, then row 3, and so on, with the last row specified always the highest.

For the default line row weight values, see Figure 4-3.

Figure 4-3. Default Line Row Weight Values

Row	Default Weight
Row 1	30
Row 2	60
Row 3	90
Row 4	120
Row 5	150
Row 6	180
Row 7	210
Row 8	240

Minimum link speed: Specify the minimum link speed for a line connection that can be accepted by this row value. Valid values are *MIN, 1200, 2400, 4800, 7200, 9600, 14400, 19200, 48000, 56000, 64000, 4M, 10M, 16M, or *MAX bps.

Maximum link speed: Specify the maximum link speed for a line connection that can be accepted by this row value. Valid values are: *MIN, 1200, 2400, 4800, 7200, 9600, 14400, 19200, 48000, 56000, 64000, 4M, 10M, 16M, or *MAX. The default maximum is *MAX for all line rows.

For the default link speed values for line rows, see Figure 4-4.

Figure 4-4. Default Link Speed Values for Line Rows

Row	Default Minimum	Default Maximum
Row 1	4M bps	*MAX
Row 2	56000 bps	*MAX
Row 3	19200 bps	*MAX
Row 4	9600 bps	*MAX
Row 5	19200 bps	*MAX
Row 6	9600 bps	*MAX
Row 7	4800 bps	*MAX
Row 8	*MIN	*MAX

Minimum cost per connect time: Specify the minimum relative cost per connect time that can be accepted by this row value. More desirable costs are assigned lower values. Valid costs can range from 0 to 255. The default value is 0 for all line rows.

For the default cost per connect time values for line rows, see Figure 4-5.

Maximum cost per connect time: Specify the maximum relative cost per connect time that can be accepted by this row value. More desirable costs are assigned lower values. Valid costs can range from 0 to 255.

For the default cost per connect time values for line rows, see Figure 4-5.

Figure 4-5. Default Cost per Connection Time Values for Line Rows

Row	Default Minimum	Default Maximum
Row 1	0	0
Row 2	0	0
Row 3	0	0
Row 4	0	0
Row 5	0	0
Row 6	0	128
Row 7	0	196
Row 8	0	255

Minimum cost per byte: Specify the minimum relative cost per byte that can be accepted by this row value. More desirable costs are assigned lower values. Valid costs can range from 0 to 255. The default value is 0 for all line rows.

For the default cost per byte values for line rows, see Figure 4-6.

Maximum cost per byte: Specify maximum relative cost per byte that can be accepted by this row value. More desirable costs are assigned lower values. Valid costs can range from 0 to 255.

For the default cost per byte values for line rows, see Figure 4-6.

Figure 4-6. Default Cost per Byte Values for Line Rows

Row	Default Minimum	Default Maximum
Row 1	0	0
Row 2	0	0
Row 3	0	0
Row 4	0	0
Row 5	0	0
Row 6	0	128
Row 7	0	196
Row 8	0	255

Minimum security for line: Specify the minimum security level that can be accepted by this row value. Valid values are *NONSECURE, *PKTSWTNET (Packet-switched network), *UNDRGRDCB (Underground cable), *SECURECND (Secure conduit), *GUARDCND (Guarded conduit), *ENCRYPTED, and *MAX (Guarded conduit, protected against physical and radiation tapping) in order from least to most secure. The default value is *NONSECURE for all line rows.

For the default security values for line rows, see Figure 4-7.

Maximum security for line: Specify the maximum security level that can be accepted by this row value. Valid values are *NONSECURE, *PKTSWTNET (Packet-switched network), *UNDRGRDCB (Underground cable), *SECURECND (Secure conduit), *GUARDCND (Guarded conduit), *ENCRYPTED, and *MAX (Guarded conduit, protected against physical and radiation tapping) in order from least to most secure. The default value is *MAX for all line rows.

For the default security values for line rows, see Figure 4-7.

Figure 4-7. Default Security Values for Line Rows

Row	Default Minimum	Default Maximum
Row 1	*NONSECURE	*MAX
Row 2	*NONSECURE	*MAX
Row 3	*NONSECURE	*MAX
Row 4	*NONSECURE	*MAX
Row 5	*NONSECURE	*MAX
Row 6	*NONSECURE	*MAX
Row 7	*NONSECURE	*MAX
Row 8	*NONSECURE	*MAX

Minimum propagation delay: Specify the minimum propagation delay that can be accepted by this row value. Propagation delay is the amount of time it takes for a signal to travel through the network. Valid values are *MIN,

*LAN, *TELEPHONE, *PKTSWTNET, *SATELLITE, and *MAX in order from least to longest delay. The default value is *MIN for all line rows.

For the default propagation values for line rows, see Figure 4-8.

Maximum propagation delay: Specify the maximum propagation delay that can be accepted by this row value. Valid values are *MIN, *LAN, *TELEPHONE, *PKTSWTNET, *SATELLITE, and *MAX in order from least to longest delay.

For the default propagation values for line rows, see Figure 4-8.

Figure 4-8. Default Propagation Values for Line Rows

Row	Default Minimum	Default Maximum
Row 1	*MIN	*LAN
Row 2	*MIN	*TELEPHONE
Row 3	*MIN	*TELEPHONE
Row 4	*MIN	*TELEPHONE
Row 5	*MIN	*PKTSWTNET
Row 6	*MIN	*PKTSWTNET
Row 7	*MIN	*MAX
Row 8	*MIN	*MAX

Minimum user-defined 1: Specify your own line connection value from 0 through 255, with the default being 0 for all line rows. The values specified for the user-defined parameters are used when all other values selected for a line row are equal. These values allow you to determine which line row will be used.

Maximum user-defined 1: Specify your own line connection value from 0 through 255, with the default being 255 for all line rows.

Minimum user-defined 2: Specify your own line connection value from 0 through 255, with the default being 0 for all line rows.

Maximum user-defined 2: Specify your own line connection value from 0 through 255, with the default being 255 for all line rows.

Minimum user-defined 3: Specify your own line connection value from 0 through 255, with the default being 0 for all line rows.

Maximum user-defined 3: Specify your own line connection value from 0 through 255, with the default being 255 for all line rows.

Row n for nodes (ROW1NODE through ROW8NODE)

Specify the list of node-related values used for the rows of the class-of-service description. Each row describes the attributes of a node in the APPN network. Row 1 is the first node row examined to attempt to define a network routing path, then row 2, and so on, with row 8 being the last examined. All of the list entries have provided defaults. The list entries are the following:

Node row weight: Specify the relative weight of this row for nodes. The weight can range from 0 to 255. The weight indicates the relative cost of passing through a node in the network. More desirable nodes are assigned lower weights.

The value specified here is dependent on the row you are specifying. The value for row 1 must always be the lowest, row 2 is next, then row 3, and so on, with the last row specified always the highest.

For the default node row weight values, see Figure 4-9.

Figure 4-9. Default Node Row Weight Values

Row	Default
Row 1	5
Row 2	10
Row 3	20
Row 4	40
Row 5	80
Row 6	100
Row 7	120
Row 8	150

Minimum route addition resistance: Specify the minimum route addition resistance that can be accepted by this row value. Valid values are 0 to 255 with 0 being the default.

For the default route addition resistance values for node rows, see Figure 4-10.

Maximum route addition resistance: Specify the maximum route addition resistance that can be accepted by this row value.

For the default route addition resistance values for node rows, see Figure 4-10.

Figure 4-10. Default Route Addition Resistance Values for Node Rows

Row	Default Minimum	Default Maximum
Row 1	0	31
Row 2	0	63
Row 3	0	95
Row 4	0	127
Row 5	0	159
Row 6	0	191
Row 7	0	223
Row 8	0	255

Minimum congestion for node: Specify whether low or high congestion will be tolerated. Valid values are *LOW or *HIGH. The default is *LOW.

The value specified here must be equal to or less than the value specified for the maximum congestion for node entry for the same node row.

Maximum congestion for node: Specify whether low or high congestion will be tolerated. Valid values are *LOW or *HIGH. The default is *LOW for rows 1 through 6 and *HIGH for rows 7 and 8.

The value specified here must be equal to or greater than the value specified for the minimum congestion for node entry for the same node row.

Chapter 5. Running APPN

This chapter contains the information you need to run your network, including information on the Vary Configuration (VRYCFG) command and on the commands used to control modes. For additional information, see the *Communications Management Guide*.

Vary On and Vary Off Support

The Vary Configuration (VRYCFG) command is used to start and end the communications support.

VRYCFG with STATUS(*ON) starts or activates the link between two or more systems and associates the communications support with a particular configuration consisting of network interface (IDLC only), line, controller, and device descriptions (if manually created).

VRYCFG with STATUS(*OFF) ends the link between two or more systems and releases the communications support with a particular configuration. When you specify VRYCFG with STATUS(*OFF), the association between the local and remote system is ended. No further communication is possible between the systems using the specified configurations.

For additional information concerning the Vary Configuration command, see the *OS/400* Communications Configuration Reference*.

The VRYCFG command has the following parameters:

CFGOBJ
Specifies the name of the description for the line, controller, or device to be varied on or off or a list of names of configuration elements of the same description type, such as line, controller, or device type.

CFGTYPE
Specifies the type of configuration description to be varied on or off.

***NWI:** The network interface is varied.

***LIN:** The line is varied.

***CTL:** The controller is varied.

***DEV:** The device is varied.

STATUS
Specifies the status to vary the configuration object to.

***ON:** The object is varied on.

***OFF:** The object is varied off.

RANGE
Specifies what configuration elements should be varied, such as only the configuration element specified (*OBJ) or the configuration element specified and its attached configuration elements (*NET). For network interface descriptions, the attached configuration elements are lines, controllers, and devices. For lines, the attached configuration elements are controllers and devices. For controllers, the configuration elements are devices. Devices

are considered not to have attached configuration elements. For devices, there is no difference in specifying RANGE(*OBJ) or RANGE(*NET).

<u>*NET:</u> All downline attached configuration elements are varied.

***OBJ:** Only the specified objects are varied.

RESET

Specifies if a reset is to be done for the input/output processor (IOP) associated with the object.

<u>*NO:</u> The associated IOP is not reset.

***YES:** The associated IOP is reset.

VRYWAIT

Specifies whether the token-ring, Ethernet network, IDLC, X.25, or switched SDLC line description is to be varied on asynchronously or synchronously. Specifies a wait time (synchronous vary on) when an application will open/acquire to an intersystem communications function (ICF) file immediately after issuing the vary on of the communications description.

***CFGOBJ:** Use the VRYWAIT parameter value specified in the line description.

***NOWAIT:** Do not wait for vary on completion. The line will vary on asynchronously.

WAIT-TIME: Specify a value from 15 to 180 seconds in 1-second intervals.

The system will wait until either the line goes to varied on before completing the VRYCFG command, or the timer expires.

ASCVRYOFF

Specifies if the configuration object (or objects if RANGE(*NET) is specified) is to be varied off synchronously or asynchronously. If the synchronous option is chosen, the configuration will be completely varied off before returning control to the user. If the asynchronous option is chosen, control may be returned to the user prior to the vary off operation being completed.

<u>*NO:</u> The vary off is done synchronously.

***YES:** The vary off is done asynchronously.

Vary Configuration On Example

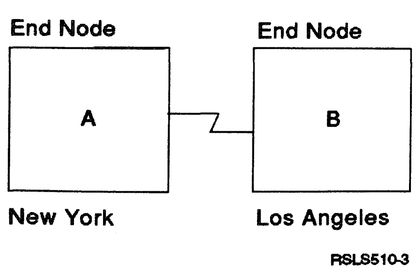


Figure 5-1. Two-System APPN Network

Using the network shown in Figure 5-1 and configured on "Two AS/400 Systems as End Nodes Using APPN" on page C-1, the same VRYCFG commands will activate only the line and controller. Device descriptions will be automatically created and activated by an implicit VRYCFG command when a session establishment request is issued for a remote location that does not have an associated device description.

Note: The system will issue an implicit STRMOD command when the device description becomes active. The STRMOD command is discussed later in this chapter.

Controlling Modes

This section contains information about controlling modes. Included in this section are the Start Mode (STRMOD) and End Mode (ENDMOD) commands, which are used to start and end modes with remote locations and the Change Session Maximum (CHGSSNMAX) command, which is used to control the number of sessions that are currently active between a local location and remote location using the specified mode.

Note: For information on how the system processes the RMTLOCNAME, LCLLOCNAME, DEV, RMTNETID, and MODE parameters, see the chapter on writing APPC application programs in the *APPC Programmer's Guide*.

Start Mode (STRMOD) Command

The STRMOD command can be used to start one or all modes for an APPC/APPN configuration. Once a mode is started, sessions can be established between the local location and remote location using the started mode. For a device description automatically created by APPN support or a device description manually created with the APPN parameter specified as *YES, the following statements apply:

- If you specify *ALL for the MODE parameter, only those modes will be started that have been used since the configuration has been activated to the remote location and are currently not started.
- If you specify any of the other values for the MODE parameter, the specified mode is started and attached to the appropriate device description associated with the remote location if it is not already attached.

This command is only required if the mode has been explicitly ended by a previous ENDMOD command. The APPC/APPN support will issue an implicit STRMOD command when a device description becomes active as follows:

- For a device description automatically created by the APPN support or a device description manually created with the APPN parameter specified as *YES, the modes are started when a session establishment request is received.
- For a device description manually created with the APPN parameter specified as *NO, the modes are started when the device description is varied on.

The STRMOD command has the following parameters:

RMTLOCNAME
Specifies the remote location name. This parameter is required.

DEV
Specifies the device description name.

***LOC:** Specifies that the device description will be determined by the system.

device name: Specify the name of the device description.

Note: The device description parameter is ignored if the system is using APPN support to communicate with the remote location specified as RMTLOCNAME.

The STRMOD, ENDMOD, and CHGSSNMAX commands may affect multiple device descriptions (depending on your configuration). These commands affect all device descriptions associated with a particular local location name, remote location name, and remote network ID. For more information on using location parameters, see the chapter on writing APPC application programs in the *APPC Programmer's Guide*.

MODE
Specifies the mode that is to be started.

<u>*NETATR:</u> Specifies that the mode specified in the network attributes is used.

***ALL:** Specifies all modes currently in use for the remote location are to be started.

- For a device description automatically created by the APPN support or a device description manually created with the APPN parameter specified as *YES, *ALL indicates that any modes that have been used while the remote location was active, but are not currently started, are to be started.
- For a device description manually created with the APPN parameter specified as *NO, *ALL specifies that all configured modes for the specified remote location are to be started.

BLANK: A mode name consisting of 8 blank characters is used.

mode-name: Specify a mode name.

Note: SNASVCMG and CPSVCMG are reserved names and cannot be specified.

LCLLOCNAME
Specifies the name of your location.

<u>*LOC:</u> Specifies that the local location name will be determined by the system.

***NETATR:** Specifies that the default local location name specified in the network attributes is to be used.

local-location name: Specify the name of your location. The local location name is specified if you want to indicate a specific local location name for the remote location.

RMTNETID
Specifies the remote network ID used with the remote location.

<u>*LOC:</u> Specifies that the system selects the remote network ID.

***NETATR:** Specifies that the remote network ID specified in the network attributes is used.

***NONE:** The remote network has no name.

remote-network-id: Specify the name of the remote network ID.

Example 1

```
STRMOD  RMTLOCNAME(LOSANGEL)  MODE(BLANK)
```

This command starts a mode named BLANK with a remote location named LOSANGEL. The device, local location name, and remote network identifier are selected by the system based on the remote location name LOSANGEL.

Example 2

```
STRMOD  RMTLOCNAME(LOSANGEL)  MODE(*ALL)
LCLLOCNAME(NEWYORK) RMTNETID(APPN)
```

If LOSANGEL is a configuration that was created automatically by the APPN support or was created manually with *YES specified for the APPN parameter on the device description, this command will only start those modes that have been used and that are currently not started.

If LOSANGEL is a configuration that was created manually by the user with *NO specified for the APPN parameter on the device description, this command will start all configured modes that are currently not started. Because the device description was left to default to *LOC, the system selects the device description that is affected by the command.

End Mode (ENDMOD) Command

The ENDMOD command ends one or more active modes. You can also specify how activities that have been requested on the remote system, but have not been performed are to be handled. This command is not required, but it can be explicitly issued whenever you wish to do so. Once an ENDMOD command is run, no sessions can be started between the local and remote locations, on any mode that has ended, until an explicit STRMOD command is run. However, a local session maximum of zero does not prevent a switched connection from being made. While the local session maximum is zero and a switched connection is made (either dial or answer), no communications will occur on that mode until a STRMOD command is run to allow sessions to be established.

The ENDMOD command has the following parameters:

RMTLOCNAME
Specifies the remote location name for which one or more modes are to be ended. This parameter is required.

DEV
Specifies the device description name.

LOC: Specifies that the device description is determined by the system.

device-name: Specify a device description name.

Note: The device description parameter is ignored if the system is using APPN support to communicate with the remote location specified as RMTLOCNAME.

The STRMOD, ENDMOD, and CHGSSNMAX commands may affect multiple device descriptions (depending on your configuration). These commands affect all device descriptions associated with a particular local location name, remote location name, and remote network ID. For more information on using location parameters, see the chapter on writing APPC application programs in the *APPC Programmer's Guide*.

MODE

Specifies the mode that is to be ended.

***NETATR:** Specifies that the mode specified in the network attributes is used.

***ALL:** Specifies all modes currently in use by the remote location are to be ended.

BLANK: The mode name, consisting of 8 blank characters, is to be used.

mode-name: Specify a mode name.

Note: SNASVCMG and CPSVCMG are reserved names and cannot be specified.

LCLLOCNAME

Specifies that the name of your location.

***LOC:** Specifies that the local location name will be determined by the system.

***NETATR:** Specifies that the local location name specified in the network attributes is used.

local-location-name: Specify the name of your location. The local location name is specified if you want to indicate a specific local location name for the remote location.

RMTNETID

Specifies the remote network ID used with the remote location.

***LOC:** Specifies that the system selects the remote network ID.

***NETATR:** Specifies that the remote network ID specified in the network attributes is used.

***NONE:** The remote network has no name.

remote-network-id: Specify the name of the remote network ID used.

CPLPNDRQS

The complete pended requests parameter allows you to specify whether the remote location can complete pending work or if the pended work should be ended before being allowed to start.

***NO:** Specifies that requested activities currently in progress at the remote location can complete; activities that have been requested, but not started at the remote location will not be performed.

***YES:** Specifies that all requested activities be allowed to complete before the mode is ended.

Example 1

```
ENDMOD  RMTLOCNAME(LOSANGEL)  MODE(BLANK)
```

This command ends mode named BLANK for remote location LOSANGEL. The device, local location name, and remote network ID are selected by the system based on the remote location name LOSANGEL.

Example 2

```
ENDMOD  RMTLOCNAME(LOSANGEL)  MODE(*ALL)
LCLLOCNAME(NEWYORK) RMTNETID(APPN)
CPLPNDRQS(*NO)
```

All currently active modes for remote location LOSANGEL are ended. Any pended work on the modes is not allowed to complete. Because the device description was left to default to *LOC, the system selects the device descriptions that are affected by the command.

Change Session Maximum (CHGSSNMAX) Command

The Change Session Maximum (CHGSSNMAX) command is used to dynamically change the maximum number of sessions the local location allows to a mode. When a change to the MAXSSN parameter is made, the remote location is informed and allowed to negotiate for a lower session maximum. The remote location cannot negotiate a session maximum higher than the value specified for the MAXSSN parameter. The resulting session maximum value is the *current session maximum.* Neither location may activate more sessions than the current session maximum. If the requested session maximum is accepted or negotiated by the remote location, the value requested on the CHGSSNMAX command is stored as the *local session maximum*; the remote location is not allowed to increase the current session maximum above the value stored as the local session maximum.

If the request to change the session maximum is rejected by the remote location, the CHGSSNMAX command ends abnormally and the local session maximum is changed. If it is increasing, it is changed to the value specified on the MAXSSN parameter; if it is decreasing, it is not changed. This new value for the local session is only used the next time a new session maximum needs to be negotiated. The current session maximum, which controls how many sessions can be active between the local and remote location, is not changed if the command fails.

This command is normally used by the system operator to control the number of sessions that can be active at the same time with a remote location. This command is used only when the specified remote location and mode are active. If the current number of active sessions is greater than the maximum number specified on the command, no new sessions are created until the number of active sessions falls below that specified on the command. If the current number of active sessions is less than the maximum number specified, sessions may not be established until jobs requiring them are started.

The value determined by the locations remains in effect until another CHGSSNMAX command or an End Mode (ENDMOD) command is run for the same mode, or until all the device descriptions associated with the remote location are varied off.

Many CHGSSNMAX commands can be issued before the current maximum number of sessions ever become active. The number specified the last time the command was issued is the current *local session maximum* value.

If a vary off of the device description associated with the specified remote location is in progress, this command ends with an error.

Notes:

1. When this command is used to reduce the number of sessions with a remote location, the sessions that are ended first are the available locally controlled sessions, followed by any other available sessions. If the new session count is still not reached, other sessions are ended as jobs using them are completed or are canceled.
2. When the CHGSSNMAX command is used to increase the maximum number of sessions that can be created with a remote location, the locally controlled sessions are made available first (depending on the negotiated values), and then other sessions are made available.
3. The CHGSSNMAX command does not change the value specified for the MAXSSN parameter in the mode description; the Change Mode Description (CHGMODD) command must be used to permanently change the value.

The CHGSSNMAX command has the following parameters:

RMTLOCNAME
Specifies the remote location name. This is a required parameter.

remote-location name: Specify the name of the remote location.

DEV
Specifies the name of the device description to be used.

***LOC:** The device associated with the remote location is used. If several devices can be associated with the remote location, the system determines which device is used.

device-name: Specify the name of a device description that is associated with the remote location.

Note: The device description parameter is ignored if the system is using APPN support to communicate with the remote location specified as RMTLOCNAME.

The STRMOD, ENDMOD, and CHGSSNMAX commands may affect multiple device descriptions (depending on your configuration). These commands affect all device descriptions associated with a particular local location name, remote location name, and remote network ID. For more information on using location parameters, see the chapter on writing APPC application programs in the *APPC Programmer's Guide.*

MODE
Specifies the name of the mode that is changed.

<u>*NETATR:</u> Specifies that the mode name specified in the network attributes is used.

BLANK: A mode name (consisting of 8 blank characters) is used.

mode-name: Specify a value, no more than 8 characters, used to identify the mode that is changed.

Note: SNASVCMG and CPSVCMG are reserved names and cannot be specified.

MAXSSN
Specifies the number of sessions allowed with the remote location. This value represents the desired maximum session number for the specified

mode name. It must be less than or equal to the MAXSSN parameter limit defined in the mode description. This value can be negotiated to a lower value by the remote location; therefore, the value specified here is not necessarily the value that is used.

Valid values for this parameter are 1 through 512.

LCLLOCNAME

Specifies the local location name used.

***LOC:** Specifies that the local location name will be determined by the system.

***NETATR:** The local location name that is in the network attributes is used.

local-location name: Specify the name of your location. Specify the local location if you want to indicate a specific local location name for the remote location.

RMTNETID

Specifies the remote network ID that is used with the remote location.

***LOC:** The system selects the remote network ID.

***NETATR:** The remote network ID specified in the network attributes is used.

***NONE:** The remote network has no name.

remote-network id: Specify a remote network ID.

Example

```
CHGSSNMAX   RMTLOCNAME(APPCLOC1)  MODE(APPCMOD1)  MAXSSN(10)
```

This command changes the maximum number of sessions allowed by the mode APPCMOD1 for remote location APPCLOC1 to a maximum of 10.

Display Mode Status (DSPMODSTS) Command

The Display Mode Status (DSPMODSTS) command displays the status of all mode entries for an APPC configuration. The display shows the following information:

- Mode name and status
- Device name and status
- Local location name
- Remote location name
- Additional information for conversations and sessions

This command is valid only for APPC device descriptions and if a mode is attached to the APPC device description.

The DSPMODSTS command has the following parameters:

DEV

Specifies the name of the APPC device description that contains the mode to be displayed.

MODE

Specifies the mode whose status is being displayed.

***ALL:** Specifies that all the modes used by the specified device are displayed.

mode: Specify the name (8 characters maximum) of the mode whose status is being displayed for the specified device.

BLANK: Specifies that the mode name of 8 blank characters is displayed.

OUTPUT

Specifies if the output from the command is shown at the requesting display station or printed with the job's spooled output on a printer.

<u>*:</u> The output is shown (if requested by an interactive job) or printed with the job's spooled output (if requested by a batch job).

***PRINT:** The output is printed with the job's spooled output on a printer.

A display similar to the following is shown when you run the DSPMODSTS command and do not select MODE(*ALL).

```
                          Display Details of Mode Status
                                                            System:   MPLS
Mode/status . . . . . . . . . . . . . . :   #INTER       Started
Device/status . . . . . . . . . . . . . :   PURCH        ACTIVE
Local location/network ID . . . . . . . :   MPLS         APPN
Remote location/network ID  . . . . . . :   PURCH        APPN

Conversations:                            Total    Source    Target    Detached
  Configured maximum  . . . . . . . :      8
  Number for device . . . . . . . . :      1         1         0          0
  Number for location . . . . . . . :      1         1         0          0

Sessions:                                  Total     Local     Remote
  Configured limits . . . . . . . . :       8         4
  Local maximum . . . . . . . . . . :       8
  Negotiated limits . . . . . . . . :       8         4          4
  Number for device . . . . . . . . :       1         1
  Number for location . . . . . . . :       1         1

                                                                        Bottom
Press Enter to continue.

F3=Exit   F5=Refresh   F12=Cancel   F14=Display previous mode
```

This display shows the following information:

Mode

Name of the mode description.

Mode status

Status of the mode. One of the following may be displayed in this field:

Ended

Indicates that the mode cannot be used for communications. The local system has issued an ENDMOD command to end the mode. Only the local system can start the mode.

Reset

Indicates that the mode cannot be used for communications. Either the mode is in the initial state (not yet started), or it has been ended by the remote system. Either the local or the remote system may attempt to start the mode.

Started

Indicates that the mode has been started and can be used for communications.

Unknown
Status of mode could not be determined.

Device name
Name of the APPC device.

Device status
Status of the APPC device. One of the following may be displayed in this field:

Vary off pending
The device is in the process of being varied off.

Varied off
The device is not being used for communications.

Vary on pending
The device is in the process of being varied on.

Varied on
The device is varied on.

Active
The device is ready to handle APPC sessions.

Held
The user or the system held the communications device to prevent it from participating in communications.

RCYPND
Error recovery is pending for the device.

RCYCNL
Error recovery was canceled for the device.

Failed
This status indicates that an error occurred for the device that can only be recovered by varying the device off and on again.

*Damaged
The device object has received hard damage.

*Locked
The status of the device could not be determined because another job had an exclusive lock on the device.

*Unknown
The status indicator of the device is indeterminate.

Local location/network ID
The network qualified name of the local location.

Remote location/network ID

The network qualified name of the remote location.

Conversations
Shows the following values:

Configured maximum
How many were configured for this device.

Number for device
Shows the following values:

Total
Current number running on this device.

Source
Current number of conversations that are allocated to source programs on this device.

Target
Current number of conversations that are allocated to target programs on this device (started as a result of a received program start request).

Detached
Current number of conversations that are not active on a session but have not been detached from the program on this device.

Number for location
Shows the following values:

Total
Current number running for this location.

Source
Current number of conversations that are allocated to source programs for this location.

Target
Current number of conversations that are allocated to target programs for this location (started as a result of a received program start request).

Detached
Current number of conversations that are not active on a session but have not been detached from the program for this location.

Sessions
Shows the following values:

Configured limits
Shows the following values:

Total
How many were configured for this device.

Local
Number of locally controlled sessions configured.

Local maximum
Maximum number of sessions requested by the most current CHGSSNMAX command.

Negotiated limits
Shows the following values:

Total
Current maximum number of sessions allowed for this device.

Local
Current minimum number of locally controlled sessions on this device.

Remote
Current minimum number of remotely controlled sessions on this device.

Number for device
: Shows the following values:

  Total
  : Current active number of sessions on this device.

  Local
  : Current active number of locally controlled sessions on this device.

Number for location
: Shows the following values:

  Total
  : Current active number of sessions running for this location.

  Local
  : Current active number of locally controlled sessions for this location.

The following display is shown when you run the DSPMODSTS command and select MODE(*ALL).

```
                              Display Mode Status
                                                         System:   MPLS
 Device  . . . . . . . . . :  PURCH
 Device status . . . . . . :  ACTIVE

 Type options, press Enter.
   5=Display details

               Mode              ---------Conversations---------
 Opt  Mode     Status              Total  Source  Target  Detached
  _   SNASVCMG Started               0       0       0       0
  _   CPSVCMG  Started               0       0       0       0




                                                                Bottom
 F3=Exit   F5=Refresh   F11=Display sessions   F12=Cancel
```

This display shows the device name and status. Current values are also shown for conversations. Pressing F11 displays session information. From this display, you may also select option 5 (Display details) for a selected mode.

Example Showing How Mode-Controlling Commands Affect Modes

Following is an example that shows how the mode-controlling commands (STRMOD, ENDMOD, and CHGSSNMAX) change the affected modes. The DSPMODSTS command is used throughout this example to show the transitions that are taking place for the modes affected by these commands. This example shows the mode-controlling commands being run at system MPLS in relationship to its connection with location PURCH (ENB). For the example multisystem APPN network diagram, see Figure C-5 on page C-33.

The following display was shown by typing:

```
DSPMODSTS DEV(PURCH)
```

```
                              Display Mode Status
                                                           System:   MPLS
Device  . . . . . . . . . :   PURCH
Device status . . . . . . :   ACTIVE

Type options, press Enter.
  5=Display details

               Mode               ---------Conversations---------
Opt  Mode      Status             Total  Source  Target  Detached
 _   SNASVCMG  Started              0       0       0        0
 _   CPSVCMG   Started              0       0       0        0

                                                                 Bottom
F3=Exit   F5=Refresh   F11=Display sessions   F12=Cancel
```

When F11 (Display sessions) is pressed, the following display is shown.

```
                              Display Mode Status
                                                           System:   MPLS
Device  . . . . . . . . . :   PURCH
Device status . . . . . . :   ACTIVE

Type options, press Enter.
  5=Display details

               Mode               --Sessions--
Opt  Mode      Status             Total  Local
 _   SNASVCMG  Started              0      0
 _   CPSVCMG   Started              2      1

                                                                 Bottom
F3=Exit   F5=Refresh   F11=Display conversations   F12=Cancel
```

The DSPMODSTS command for device PURCH shows the state of the modes after the connection between MPLS and PURCH has been established. The display shows that the reserved modes SNASVCMG and CPSVCMG have been started. This is the only possible status for these modes.

Both the SNASVCMG and CPSVCMG modes are used by the system. The first, SNASVCMG, is used for SNA session negotiation between two locations (as well as alerts between network nodes).

The CPSVCMG mode is used by the CP-CP session between two nodes. The CP-CP session enables network information (such as topology updates and network searches) to be sent. If there are any session counts for CP-CP sessions (when they are supposed to be active) other than 2 total (and 1 local when you display details of the mode status for the CPSVCMG mode), a problem may exist. The appropriate configurations should be checked, and if needed, problem determination should be performed.

The next two displays show what happens when the local system has started an application that acquires a session. The mode specified is #INTER.

```
                               Display Mode Status
                                                                 System:    MPLS
Device . . . . . . . . . . :   PURCH
Device status . . . . . . . :   ACTIVE

Type options, press Enter.
  5=Display details

                Mode                 ---------Conversations---------
Opt  Mode       Status               Total  Source  Target  Detached
 _   SNASVCMG   Started                0       0       0        0
 _   CPSVCMG    Started                0       0       0        0
 5   #INTER     Started                1       1       0        0





                                                                       Bottom
F3=Exit   F5=Refresh   F11=Display sessions   F12=Cancel
```

When F11 (Display sessions) is pressed, the following display is shown.

```
                               Display Mode Status
                                                                 System:    MPLS
Device . . . . . . . . . . :   PURCH
Device status . . . . . . . :   ACTIVE

Type options, press Enter.
  5=Display details

                Mode                 --Sessions--
Opt  Mode       Status               Total  Local
 _   SNASVCMG   Started                0      0
 _   CPSVCMG    Started                2      1
 5   #INTER     Started                1      1





                                                                       Bottom
F3=Exit   F5=Refresh   F11=Display conversations   F12=Cancel
```

By starting the application and specifying #INTER as the mode, the mode will be started automatically. As the display shows, the session limits that were negotiated between MPLS and PURCH are the same as the configured limits. The display also shows that there is one session that has been established and there is one conversation currently in progress between MPLS and PURCH using mode #INTER.

```
                      Display Details of Mode Status
                                                        System:   MPLS
Mode/status . . . . . . . . . . . . . . . :   #INTER       Started
Device/status . . . . . . . . . . . . . . :   PURCH        ACTIVE
Local location/network ID . . . . . . . . :   MPLS         APPN
Remote location/network ID  . . . . . . . :   PURCH        APPN

Conversations:                              Total    Source    Target    Detached
  Configured maximum  . . . . . . . :         8
  Number for device . . . . . . . . :         1         1         0           0
  Number for location . . . . . . . :         1         1         0           0

Sessions:                                    Total     Local     Remote
  Configured limits . . . . . . . . :          8         4
  Local maximum . . . . . . . . . . :          8
  Negotiated limits . . . . . . . . :          8         4          4
  Number for device . . . . . . . . :          1         1
  Number for location . . . . . . . :          1         1

                                                                          Bottom
Press Enter to continue.

F3=Exit   F5=Refresh   F12=Cancel   F14=Display previous mode
```

The STRMOD command being issued starts one of the IBM-supplied modes, BLANK, to remote location PURCH. Type

```
STRMOD RMTLOCNAME(PURCH) MODE(BLANK)
```

The DSPMODSTS command indicates that the mode BLANK has been started, and the session limits have been negotiated between MPLS and PURCH. Type

```
DSPMODSTS DEV(PURCH) MODE(BLANK)
```

Note: Because the DSPMODSTS command was started by supplying the mode name, the display that is shown is the one that shows the details of the mode status.

```
                      Display Details of Mode Status
                                                        System:   MPLS
Mode/status . . . . . . . . . . . . . . . :   BLANK        Started
Device/status . . . . . . . . . . . . . . :   PURCH        ACTIVE
Local location/network ID . . . . . . . . :   MPLS         APPN
Remote location/network ID  . . . . . . . :   PURCH        APPN

Conversations:                              Total    Source    Target    Detached
  Configured maximum  . . . . . . . :         8
  Number for device . . . . . . . . :         0         0         0           0
  Number for location . . . . . . . :         0         0         0           0

Sessions:                                    Total     Local     Remote
  Configured limits . . . . . . . . :          8         4
  Local maximum . . . . . . . . . . :          8
  Negotiated limits . . . . . . . . :          8         4          4
  Number for device . . . . . . . . :          0         0
  Number for location . . . . . . . :          0         0

                                                                          Bottom
Press Enter to continue.

F3=Exit   F5=Refresh   F12=Cancel   F14=Display previous mode
```

The CHGSSNMAX command changes the maximum number of sessions allowed between locations MPLS and PURCH to six by using mode BLANK. Type

```
CHGSSNMAX RMTLOCNAME(PURCH) MODE(BLANK) MAXSSN(6)
```

To show the mode status, type

```
DSPMODSTS DEV(PURCH)
```

```
                         Display Mode Status
                                                      System:   MPLS
Device . . . . . . . . . :   PURCH
Device status . . . . . . :   ACTIVE

Type options, press Enter.
  5=Display details

               Mode              ---------Conversations---------
Opt  Mode      Status            Total  Source  Target  Detached
 _   SNASVCMG  Started             0      0       0        0
 _   CPSVCMG   Started             0      0       0        0
 _   #INTER    Started             1      1       0        0
 5   BLANK     Started             0      0       0        0







                                                              Bottom
F3=Exit   F5=Refresh   F11=Display sessions   F12=Cancel
```

When F11 (Display sessions) is pressed, the following display is shown.

```
                         Display Mode Status
                                                      System:   MPLS
Device . . . . . . . . . :   PURCH
Device status . . . . . . :   ACTIVE

Type options, press Enter.
  5=Display details

               Mode              --Sessions--
Opt  Mode      Status            Total  Local
 _   SNASVCMG  Started             0      0
 _   CPSVCMG   Started             2      1
 _   #INTER    Started             1      1
 5   BLANK     Started             0      0







                                                              Bottom
F3=Exit   F5=Refresh   F11=Display conversations   F12=Cancel
```

```
                         Display Details of Mode Status
                                                          System:   MPLS
Mode/status . . . . . . . . . . . . . . . :   BLANK        Started
Device/status . . . . . . . . . . . . . . :   PURCH        ACTIVE
Local location/network ID . . . . . . . . :   MPLS         APPN
Remote location/network ID  . . . . . . . :   PURCH        APPN

Conversations:                              Total    Source     Target     Detached
  Configured maximum  . . . . . . . . :       8
  Number for device . . . . . . . . . :       0        0          0           0
  Number for location . . . . . . . . :       0        0          0           0

Sessions:                                    Total      Local      Remote
  Configured limits . . . . . . . . . :        8          4
  Local maximum . . . . . . . . . . . :        6
  Negotiated limits . . . . . . . . . :        6          3          3
  Number for device . . . . . . . . . :        0          0
  Number for location . . . . . . . . :        0          0

                                                                          Bottom
Press Enter to continue.

F3=Exit   F5=Refresh   F12=Cancel   F14=Display previous mode
```

As the display indicates, the configured limits for the mode are not affected by the CHGSSNMAX command. What has changed is the negotiated limits between MPLS and PURCH using mode BLANK. The ENDMOD command is issued to end all of the user modes between MPLS and PURCH. Once this command has been run, no new sessions can be started between MPLS and PURCH on modes BLANK and #INTER until an explicit STRMOD command is run. Type

```
ENDMOD RMTLOCNAME(PURCH) MODE(*ALL)
```

To display the mode status, type

```
DSPMODSTS DEV(PURCH)
```

```
                            Display Mode Status
                                                          System:   MPLS
Device  . . . . . . . . . :   PURCH
Device status . . . . . . :   ACTIVE

Type options, press Enter.
  5=Display details

               Mode              ---------Conversations---------
Opt  Mode      Status             Total  Source  Target  Detached
 _   SNASVCMG  Started              0      0       0        0
 _   CPSVCMG   Started              0      0       0        0
 5   #INTER    Ended                1      1       0        0
 _   BLANK     Ended                0      0       0        0











                                                                          Bottom
F3=Exit   F5=Refresh   F11=Display sessions   F12=Cancel
```

When F11 (Display sessions) is pressed, the following display is shown.

```
                              Display Mode Status
                                                           System:   MPLS
Device . . . . . . . . . :    PURCH
Device status . . . . . . :   ACTIVE

Type options, press Enter.
  5=Display details

               Mode                --Sessions--
Opt  Mode      Status              Total  Local
 _   SNASVCMG  Started               0      0
 _   CPSVCMG   Started               2      1
 5   #INTER    Ended                 1      1
 _   BLANK     Ended                 0      0

                                                                 Bottom
F3=Exit   F5=Refresh   F11=Display conversations   F12=Cancel
```

Note: Only the user modes #INTER and BLANK are affected by the ENDMOD command. The reserved modes SNASVCMG and CPSVCMG are not affected by the ENDMOD command.

```
                          Display Details of Mode Status
                                                           System:   MPLS
Mode/status . . . . . . . . . . . . . . :    #INTER       Ended
Device/status . . . . . . . . . . . . . :    PURCH        ACTIVE
Local location/network ID . . . . . . . :    MPLS         APPN
Remote location/network ID  . . . . . . :    PURCH        APPN

Conversations:                              Total    Source    Target    Detached
  Configured maximum  . . . . . . . :         8
  Number for device . . . . . . . . :         1        1         0          0
  Number for location . . . . . . . :         1        1         0          0

Sessions:                                    Total    Local     Remote
  Configured limits . . . . . . . . :          8        4
  Local maximum . . . . . . . . . . :          0
  Negotiated limits . . . . . . . . :          0        0         0
  Number for device . . . . . . . . :          1        1
  Number for location . . . . . . . :          1        1

                                                                 Bottom
Press Enter to continue.

F3=Exit   F5=Refresh   F12=Cancel   F14=Display previous mode
```

The ENDMOD command causes the mode #INTER to end, but it does not affect sessions that have already been activated. This is the reason that there is still one active session and one active conversation between MPLS and PURCH using mode #INTER.

To display the mode status, type

```
DSPMODSTS  DEV(PURCH)
```

The DSPMODSTS command shown here occurred after the application that had acquired a session using mode #INTER ended. This caused the session and conversation counts to go to zero.

```
                              Display Mode Status
                                                          System:   MPLS
Device . . . . . . . . . :   PURCH
Device status . . . . . . :   ACTIVE

Type options, press Enter.
  5=Display details

               Mode               ---------Conversations---------
Opt  Mode      Status             Total  Source  Target  Detached
 _   SNASVCMG  Started              0      0       0        0
 _   CPSVCMG   Started              0      0       0        0
 _   #INTER    Ended                0      0       0        0
 _   BLANK     Ended                0      0       0        0

                                                                 Bottom
F3=Exit   F5=Refresh   F11=Display sessions   F12=Cancel
```

When F11 (Display sessions) is pressed, the following display is shown.

```
                              Display Mode Status
                                                          System:   MPLS
Device . . . . . . . . . :   PURCH
Device status . . . . . . :   ACTIVE

Type options, press Enter.
  5=Display details

               Mode               --Sessions--
Opt  Mode      Status             Total  Local
 _   SNASVCMG  Started              0      0
 _   CPSVCMG   Started              2      1
 _   #INTER    Ended                0      0
 _   BLANK     Ended                0      0

                                                                 Bottom
F3=Exit   F5=Refresh   F11=Display conversations   F12=Cancel
```

Chapter 6. Applications in an APPN Network

APPN transports or routes data between nodes in a peer-to-peer network. This support is logically separate from the support provided by APPC, LU6.2, in a higher layer of SNA. APPC delivers the data *from* applications higher in the SNA layers *down to* APPN for transportation through the network.

Communications applications that are used in an APPC (point-to-point) environment are also able to be used in an APPN environment; only the method by which data is transported is changed. The following applications are fully supported in an APPN environment:

- Display station pass-through
- SNADS (including object distribution and OfficeVision/400)
- Distributed data management (DDM)
- PC Support
- User-written APPC programs

To the applications, there is no difference between an APPN environment and a low-entry networking environment (that is, without APPN advanced functions). SNADS, however, may be configured differently. Like APPN, SNADS routes information through a network. SNADS and APPN are not mutually exclusive; SNADS is at a higher level of SNA than APPN and the two may be effectively combined in the same network. The decision to use APPN or SNADS needs consideration and is discussed in "Object Distribution and OfficeVision/400" on page 6-5.

Using APPC, without APPN, it is possible to establish direct sessions with adjacent nodes; an example is using display station pass-through in a network of System/36s, without APPN. However, in a System/38 Release 6 (or above) environment, display station pass-through allows multiple adjacent sessions to be connected between non-adjacent nodes in a network. Figure 6-1 on page 6-2 shows how such an APPC application works.

Although display station pass-through is used as the example, the concept and its implications hold for any APPC application performing such (application-level) routing. In particular, SNADS is another IBM application which uses exactly this concept to perform its routing operations. Figure 6-2 on page 6-3 contrasts such a method with, and highlights the benefits of, APPN (transport-level) routing.

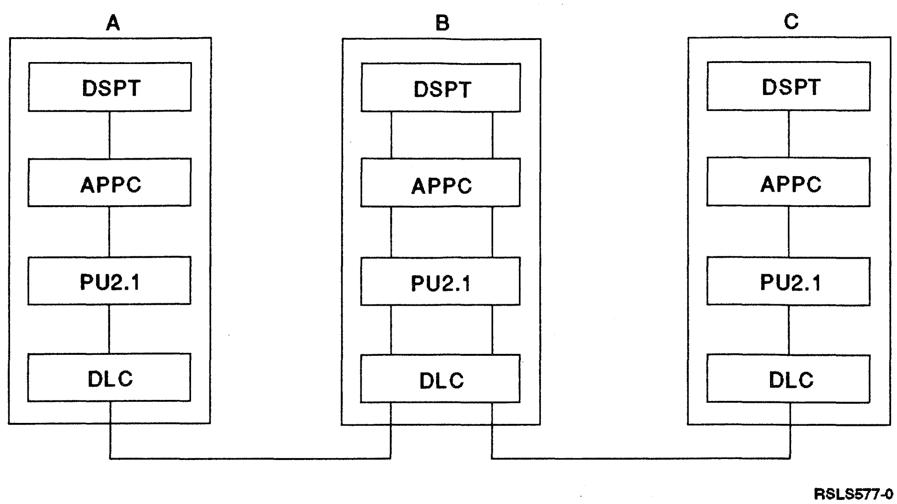


Figure 6-1. IBM System/38 Display Station Pass-Through between Non-adjacent Nodes A to C. Display station pass-through in the intermediate node is responsible for connecting the separate point-to-point sessions.

In Figure 6-1 the connections show passing of control between the layers of SNA. Notice that the connections indicate an application-to-application session establishment between each of the 3 nodes, A to B to C, in this network, even though the user passes through between the two nodes at each end, A to C.

Therefore, although the user is able to pass through between non-adjacent nodes, there are actually two separate point-to-point sessions used by the application on B.

To the user, the process just described is transparent. However, there are some implications:

- The intermediate system requires manually configured definitions (and tables for other applications such as SNADS) when acting as an intermediate node on which the origin and destination end points must rely.
- Performance suffers due to all the communications layers being involved at every node.

In an APPN environment, pass-through from A to C would be performed as shown in Figure 6-2 on page 6-3.

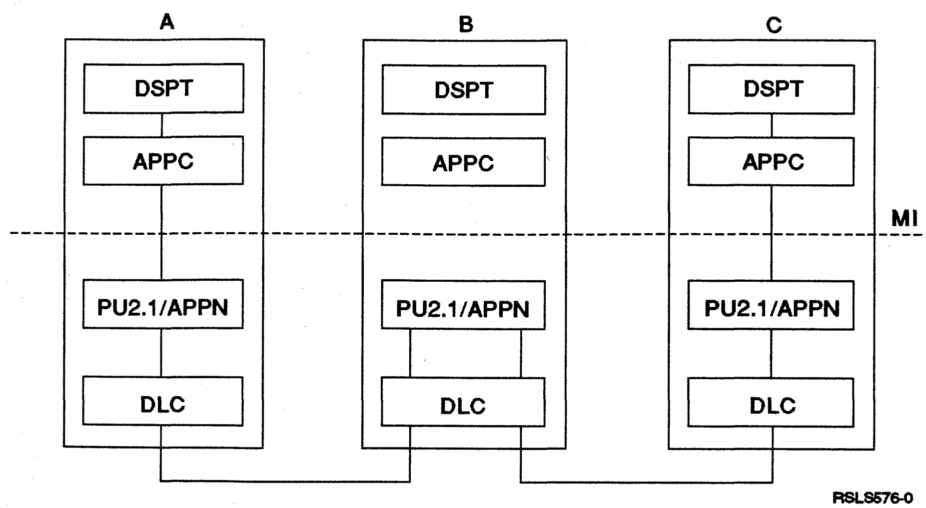


Figure 6-2. Display Station Pass-Through between Non-adjacent Nodes A to C. Only a single session is established between nodes A and C directly.

Figure 6-2 shows the functions of APPN, in addition to the PU2.1 function, allowing a single session to be established between nodes A and C by routing data through node B without establishing an application session with node B.

The implications are:

- Manually defined tables do not need to be defined within intermediate nodes when not involved as a session end point.
- Performance is enhanced in proportion to the number of nodes.

Display Station Pass-Through

APPN provides significant benefits to the display station pass-through user, particularly for large networks. See Figure 6-3 on page 6-4. In such a network APPN enables:

- Display station pass-through to be performed between any of the systems shown, as if they were adjacent systems.
- A significant performance improvement for display station pass-through between the left-most System/36 and the System/38, compared to a non-APPN network in which an application-to-application session is required between each intermediate node (that is, without APPN).
- Concurrent access to remote systems. For example, with PC Support, a personal computer with multiple sessions may hot-key between applications on different AS/400 systems.
- Access to applications on any system as either a console or other display stations, facilitating problem determination,

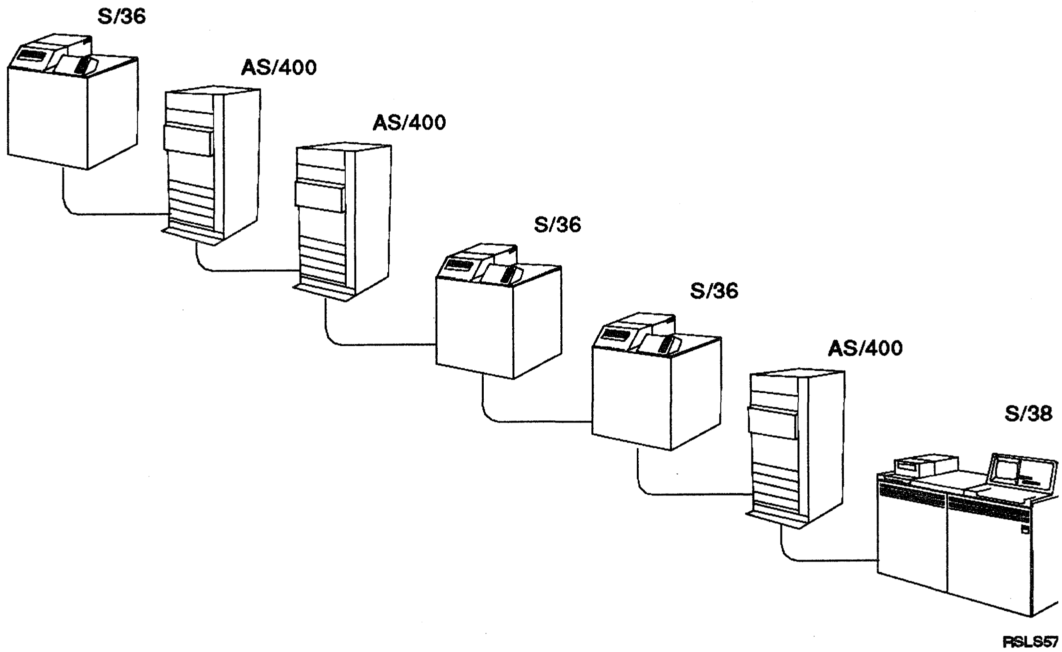


Figure 6-3. Display Station Pass-Through in an APPN Network

The AS/400 system implementation of APPN has also simplified the definition of a pass-through network. The only device descriptions that need to be defined are the virtual devices on the System/38 and AS/400 system at the session end points; the APPN devices are automatically created at the time of pass through (except for low-entry networking nodes where devices still need to be created).

The only requirement for display station pass-through in an APPN network is that the intermediate nodes be capable of performing intermediate routing and thus must be with AS/400 systems or System/36s defined as network nodes. The first and last systems may be a network node, end node, or low-entry networking node. With special configuration the System/38 can perform intermediate routing of pass-through sessions.

For more information on display station pass-through, see the *Remote Work Station Guide*.

SNADS

SNADS is a distribution service for SNA communications that uses *asynchronous* transmission. (Using asynchronous transmission the sending and receiving systems do not send and receive at the same time.) Therefore, the sending system can send (a document, for example) to the receiving system even if the receiving system is not active; only the link to the intermediate system (if there is one) needs to be active. Asynchronous transmission may be preferred in some instances. For example, in networks where there are many switched lines, asynchronous transmission may be preferred since line connections need to be made for only a short period of time. Using asynchronous transmission, SNADS may send when a threshold number of documents are ready to be sent (reducing connection time for switched lines, and thus cost).

For more information about SNADS, see the *Communications: Distribution Services Network Guide*.

Object Distribution and OfficeVision/400

Object distribution and OfficeVision/400 use the SNADS directory and distribution functions. SNADS and APPN may coexist. The way to combine the two functions is to define (in the SNADS routing tables) the nodes to which APPN is used as being *adjacent nodes*; this enables APPN to perform intermediate routing, transparently to SNADS. (SNADS will not need to use the store-and-forward function since it establishes sessions with logically adjacent nodes.) Transmission is controlled by SNADS and is asynchronous between sender and receiver. Both SNADS and APPN use APPC sessions.

- SNADS distributions are sent to *users* (for example, user profiles) on *systems*, (that is, the name in the upper right-hand corner of a display), not to users at locations. APPN does not find SNADS users.
- SNADS looks up the user in the system directory and if the user is not a local user, it places a *copy* of the distribution on a queue that goes to that system. SNADS puts the destination system *in* the distribution. The routing table determines which queue sends the distribution to the destination system.
- When a distribution is received, SNADS looks at the distribution for the destination system name. If the destination system is not equal to the receiving system, or if it is equal but the system directory indicates that the user is not a local user (for example, the user has moved), SNADS places a *copy* of the distribution on a queue that goes to that system. The routing table determines which queue gets the distribution to the destination system.

In Figure 6-4 on page 6-6 a file is sent from SYSTEMB to a user (CHARLIE) on SYSTEME. The SNADS System Directory shows CHARLIE is on SYSTEME. The routing table determines which queue to put a copy of the distribution on. Without APPN, an APPC session is established between SYSTEMB and SYSTEMC, since there is no direct connection to SYSTEME. Likewise, an APPC session is established between SYSTEMC and SYSTEMD, and between SYSTEMD and SYSTEME. An alternative would be to have APPN networking under APPC to specify a location on SYSTEME. From a performance standpoint you should consider whether to use APPN with APPC.

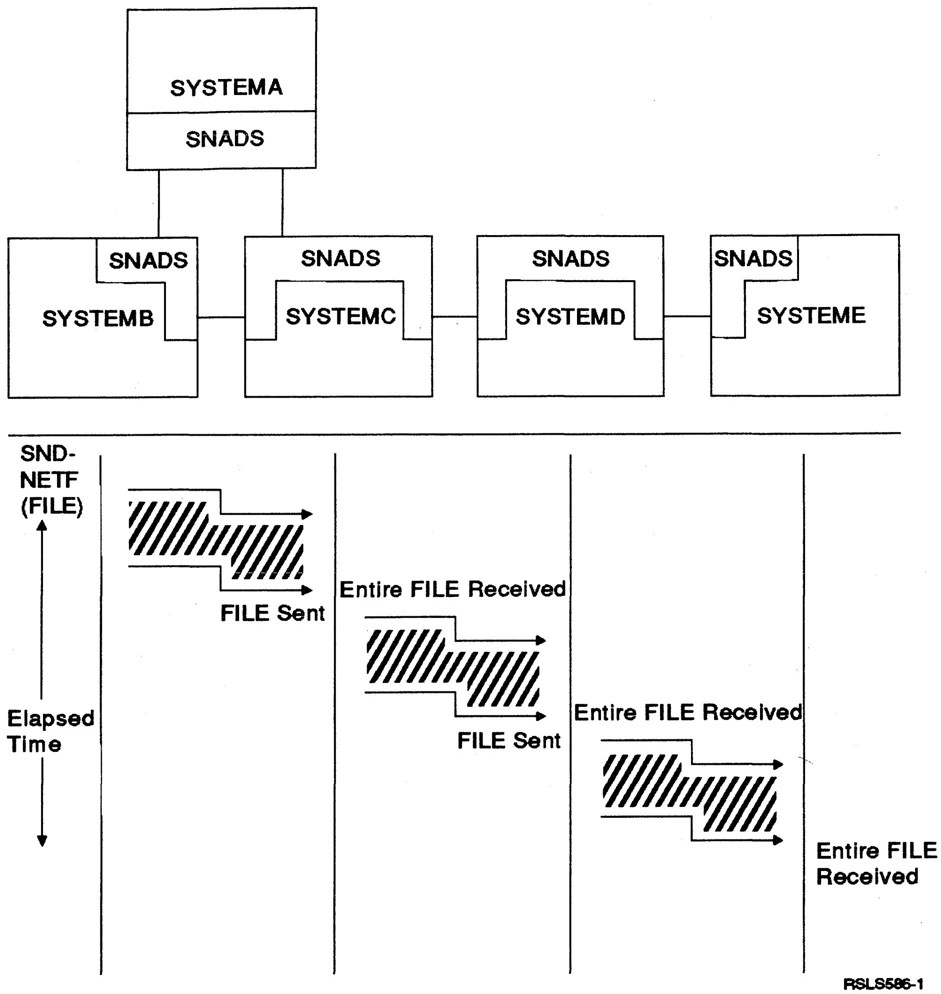


Figure 6-4. SNADS without APPN. A distribution is sent to one user, from SYSTEMB to SYSTEME.

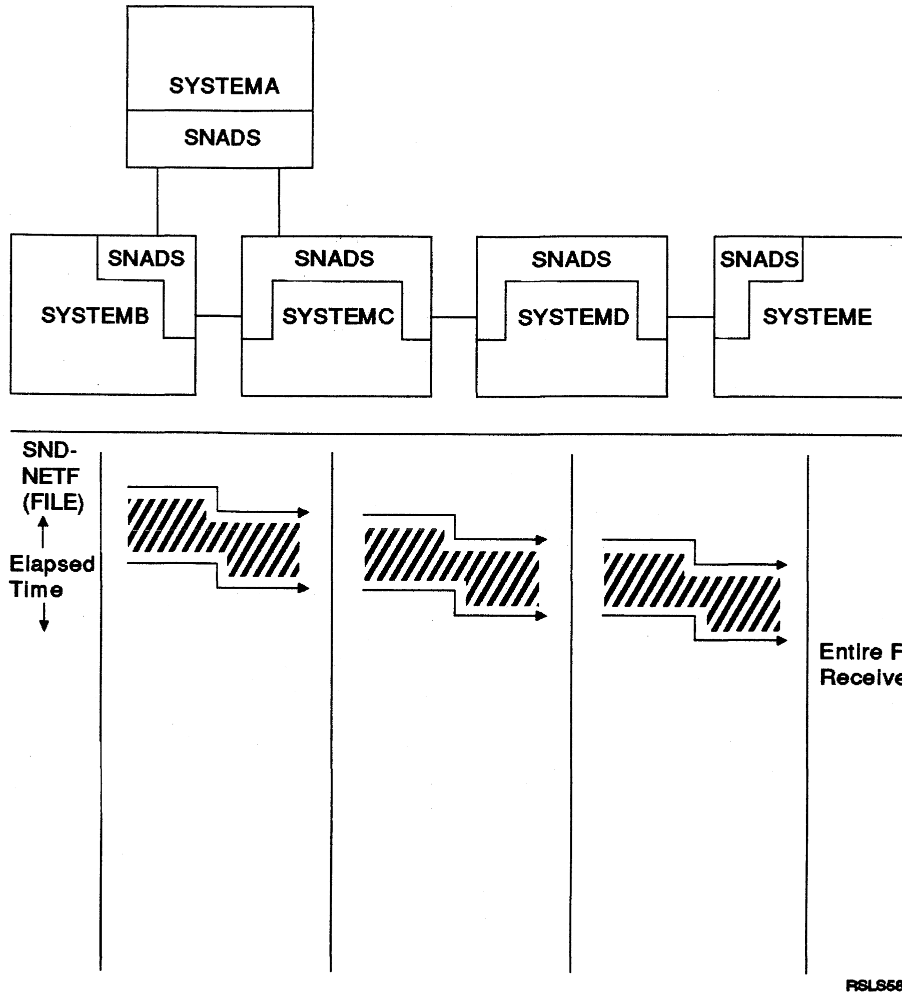


Figure 6-5. SNADS with APPN Intermediate Routing. A distribution is sent to one user, from SYSTEMB to SYSTEME.

In Figure 6-5, APPN provides a logically direct path between the source and destination system by selection of the appropriate remote location. If SYSTEMC and SYSTEMD are not receiving a copy of the distribution, APPN provides better performance.

In Figure 6-6 on page 6-8, a copy of the distribution is to sent to users on SYSTEMC, SYSTEMD, and SYSTEME. In this case, a distribution list is sent along with the distribution. At each node the copy is saved for the users on that node and the distribution is forwarded.

Figure 6-6 on page 6-8 shows that the performance of the SNADS routing is about the same as that shown in Figure 6-4 on page 6-6, where no users on SYSTEMC nor SYSTEMD were addressed.

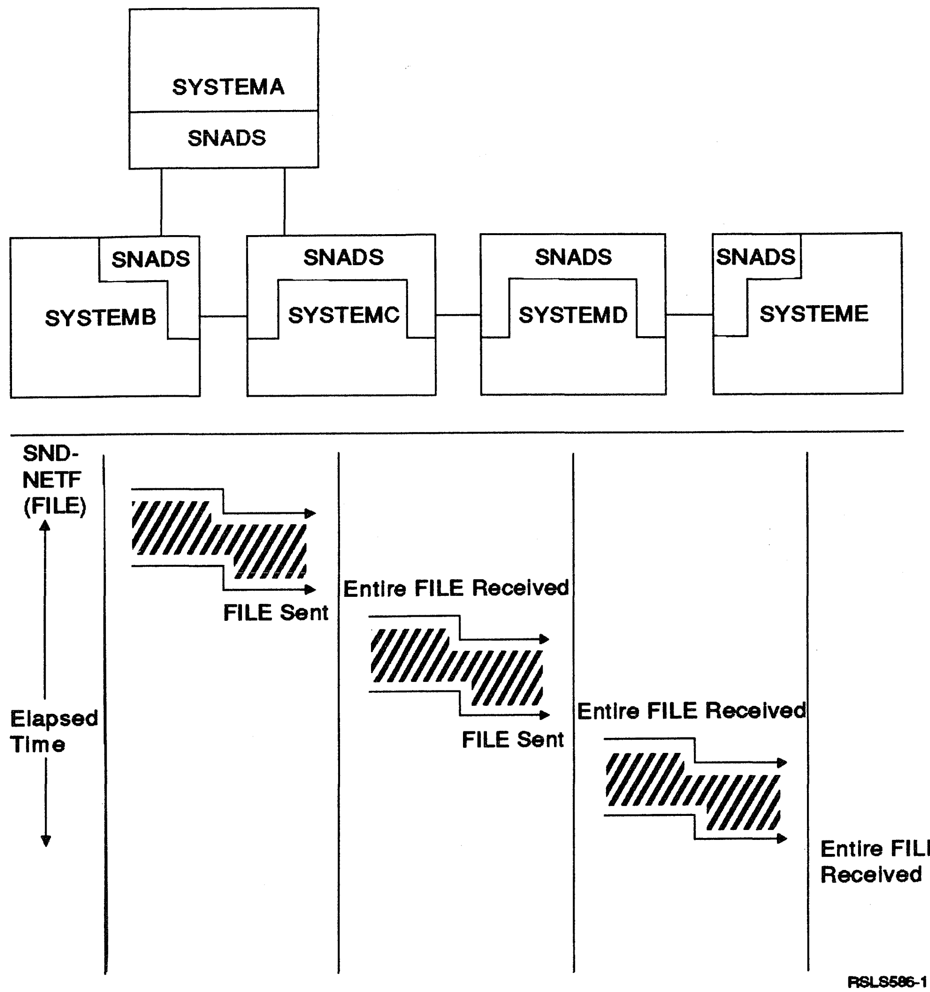


Figure 6-6. SNADS without APPN. A distribution is sent from SYSTEMB to users on SYSTEMC, SYSTEMD, and SYSTEME.

SNADS provides store and forward service. In this case as each FILE is received a copy is kept for object distribution to make the data available to a local user.

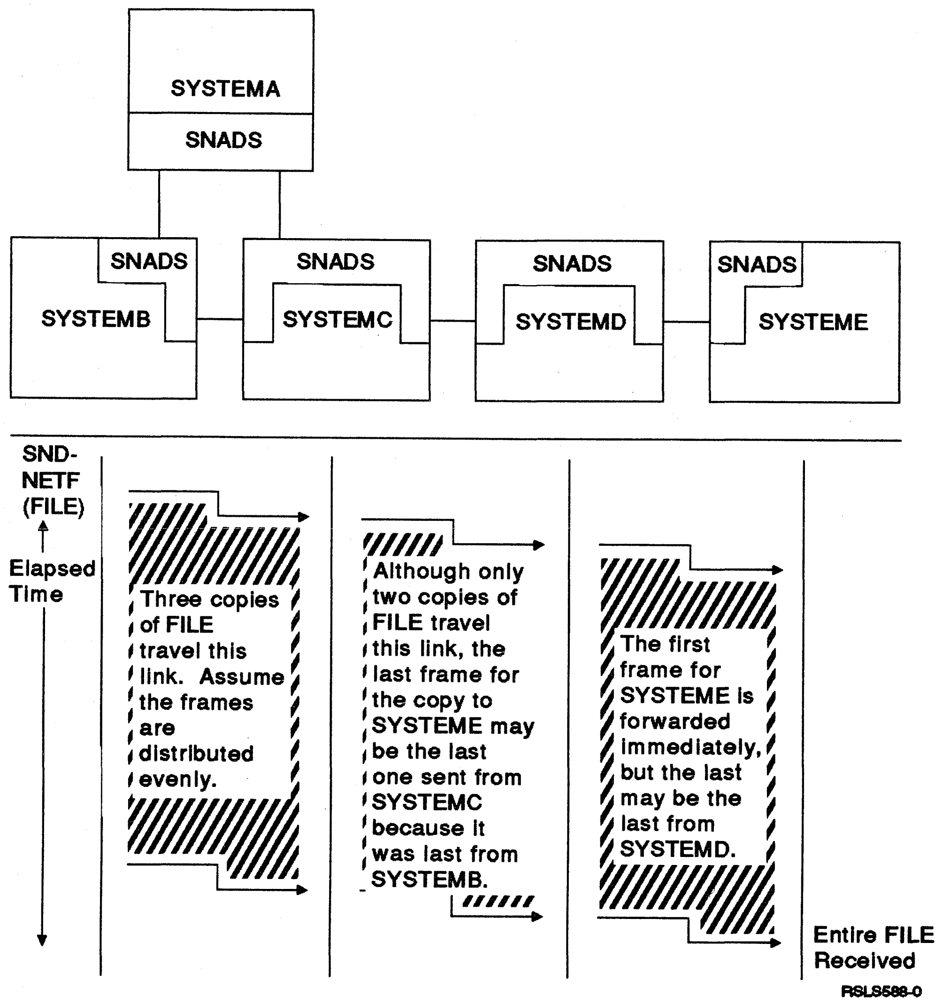


Figure 6-7. SNADS with APPN Intermediate Routing. A distribution is sent from SYSTEMB to users on SYSTEMC, SYSTEMD, and SYSTEME.

In Figure 6-7, APPN routing with SNADS (but without store and forward service) requires more time and system resources. The distribution must be sent to three separate queues, one going to SYSTEMC, SYSTEMD, and SYSTEME, respectively.

A copy of the distribution is sent on each session. Since the sessions all travel the first link, three copies flow on the first link, two copies flow on the second link, and one flows on the third link. The data from all the copies intermixes on the communications line so in general the elapsed time will be much longer than with SNADS routing. The users all get the complete file at about the same time.

Many factors determine the speed with which the entire transaction is done, but if line bandwidth is expensive, and it generally is, the APPN routing is inefficient if copies are distributed to systems along the way.

A combination of APPN and SNADS is generally best. Use APPN to bypass nodes that are not participating in the SNADS network. For these nodes, SNADS configuration is not necessary. Less system resource is used routing data through these nodes. APPN will select the best route to that location.

Following are additional considerations for using object distribution and OfficeVision/400 in an APPN environment.

- Performance

  Because SNADS intermediate routing (store and forward) requires that the SNADS application (SNADS sender and receiver) needs to be started at each intermediate route in a network, the overhead associated with SNADS is generally larger than for APPN. However, APPN is also associated with some overhead (mainly in the initiating node). Therefore, the degree to which APPN uses less resource than SNADS depends on the size of the network.

  Since SNADS places a larger overhead on intermediate nodes, APPN intermediate routing is preferable to SNADS store and forward if the intermediate nodes are small systems (and if there is a large number of them). Moreover, particularly for large networks, APPN is likely to transmit more quickly than SNADS.

- Switched links

  The communications cost of a switched link depends on the amount of time a link is kept active (in most cases, especially for non-local calls). The switched disconnect feature on the System/36, System/38, and AS/400 system enables a switched line to be disconnected when there are no active communications sessions.

  By using SNADS, a switched line may be activated to perform the transmission (or a threshold amount of transmissions) and deactivated when the transmission is complete. Moreover, a switched link may be activated to send a document to another node which may forward the document onto other nodes further downstream while the switched link is deactivated. APPN does not allow the switched disconnect feature to operate between nodes with a CP-CP session since a CP-CP session is itself a communications session. Moreover, if the user chooses not to have a CP-CP session because of the switched disconnect feature, APPN requires that a document be sent repeatedly to each node further downstream.

  The cost of using APPN in a network with switched lines may need to be weighed against the benefits.

- Unreliable links

  If a link in a network fails, SNADS stores a document or file at the intermediate node prior and adjacent to the failed link until the link becomes active. If the failure occurs while the document or file is being sent, only the last hop needs to be resent (when using SNADS store and forward). However, this also means that the document will not reach its final destination until the failed link is reactivated.

  Since APPN routes the data from the source to target system (that is, all nodes are defined as adjacent in the SNADS routing tables), a failed link anywhere along the chosen route (of a SNADS file or document) is reported to the previous adjacent node. This is the SNADS sending node. The SNADS retry function may be used to resend the document or file. This time APPN will choose a route in which the failed link does not participate if another route is available.

- Intermediate nodes and non-APPN nodes

  If APPN is used to perform intermediate routing between SNADS (or OfficeVision/400) end points, the intermediate nodes need not have SNADS (or OfficeVision/400) installed. However, if the intermediate nodes will be a session end point for a SNADS session, SNADS must be installed on that node.

If there are nodes in the network that are not APPN network nodes, these nodes must use SNADS (since they can only participate as a session end point).

- Adding new nodes

  Adding a new node to a network is significantly simplified when APPN is used. The new node must be added to the next system table of other nodes but no communications configurations are required in non-adjacent nodes to the newly added APPN node.

- Users who move

  SNADS can redirect distributions so that the only required changes are on the node from which the user is moving, and the node to which the user is moving. Source systems of distributions do not need to change. In time, however, the SNADS network may not be as efficiently mapped onto the APPN network and reorganization may be necessary.

Data Distribution

Distributed Data Management (DDM): The OS/400 distributed data management support (DDM) on the AS/400 system allows application programs or users to access data files that reside on remote systems (target systems). The remote systems can also access data files on the local AS/400 system.

Using DDM, an application program can get, add, change, and delete data records in a file that exists on a target system. It can also perform file-related operations, such as creating, deleting, or renaming a file on a remote system, or copying a file from one system to another system.

When DDM is in use, neither the application program nor the program user needs to know if the file that is needed exists locally or on a remote system. DDM handles remote file processing in essentially the same way as local file processing. The application program normally does not receive any indication of where the requested file is located.

Distributed Relational Database: The OS/400 support of the Distributed Relational Database Architecture (DRDA) allows an application or user on a local system to access a database that may be stored on one or more systems through the use of Structured Query Language (SQL). The database appears to the user as if it were one whole database. The remote systems must also be using the distributed database function.

Systems that use DDM and distributed relational database communicate with each other using the APPC support and can use the networking support provided by APPN.

Folder Management Services (FMS): The folder management services (FMS) support allows personal computer users to access folders and documents that reside on an AS/400 target system. Remote systems that support Level 2.0 or 3.0 of the DDM architecture for the stream access method can access folders and documents on the local AS/400 system. A **folder** is a directory for documents. It is used to group related documents and to find documents by name.

Note: Distributed data management for the IBM personal computer uses the AS/400 portion of the PC Support/400 licensed program. For information on how to use PC Support/400 on the AS/400 system, see the *PC Support/400 User's Guide for DOS* and *PC Support/400 User's Guide for OS/2*.

For more information, see the *Distributed Data Management Guide* and the *Distributed Database Guide*.

PC Support/400

PC Support on the AS/400 system provides all of the major functions of previous PC Support implementations (except virtual disk support that is replaced by shared folder support); and though some new functions are provided, the concept remains the same. However, the architectural implementation of PC Support has changed.

PC Support programs, in the System/36 and System/38 implementations, were based on transferring data from the personal computer to the system using screen buffers (as if the PC Support program were an attached 5250 screen). The PC Support programs are now based on program to program communications, APPC. Furthermore, the new implementation of PC Support applies for SDLC, LAN (token-ring network or Ethernet), and twinaxial attachment.

A personal computer with PC Support (using APPC) may now be a source low-entry networking node in an APPN network. A personal computer (with PC Support/400) may be a proper subset of a low-entry networking node in an APPN network regardless of whether it is remotely attached (SDLC, token-ring, or Ethernet) or locally attached (TDLC; twinaxial data link control) to an AS/400 system. The personal computer running PC Support may initiate sessions to any other APPC/APPN node (except another personal computer running PC Support) in the APPN network and run applications using APPC. PC Support does not support being a target for sessions and applications being started on it by a remote system. However, if the personal computer has APPC, it can function as both a source and target but cannot run PC Support.

Another change in the implementation of PC Support/400 is that it now includes 5250 emulation function (work station function); this 5250 function enables a personal computer (running pass-through) to also become a low-entry networking node in an APPN network.

Note: The 5250 emulation product (without PC Support) does not enable a personal computer to become a low-entry networking node in an APPN network since it does not utilize APPC. Earlier PC Support allowed the personal computer to appear as a 5250 work station attached to the System/36 or the System/38 and it did not appear as a low-entry networking node.

Since the AS/400 system supports multiple concurrent PC Support sessions (as for PC Support/36) with hot-key support between them, a PC user may establish sessions with a number of different nodes in an APPN network (even when locally attached to an AS/400 system.) A PC Support user may have up to 40 active conversations to 32 different systems, if the conversations are performing virtual print or shared folders. If the work station function is used the personal computer is capable of up to five concurrent 5250 sessions with hot key between those sessions.

Consider the following example to illustrate the use of PC Support/400 with APPN. A PC user is able to have a up to of five concurrent sessions to different nodes in the APPN network (with hot key support between them).

A network with a personal computer and five systems running PC Support has the following qualifications:

- If the only PC Support function is work station function the nodes in the network may be AS/400 systems or System/36s with no qualifications.
- If the user wishes to use PC Support functions other than work station function then either of the following must be true:
  - The network is made up of only AS/400 nodes.
  - System/36s are included in the network with the PC Support/36 coexistence PRPQ (which enables PC Support/400 to communicate to both the AS/400 system and the System/36).

User-Written APPC Programs

Because APPN performs many functions in a communications environment, it is important to consider time out parameters in APPC programs which use ICF. In particular, it may be important to increase the WAITFILE parameter for these applications so that they do not time out while waiting for APPN functions to be performed.

For more information on APPC application program interfaces, see the *Communications: Advanced Program-to-Program Communications Programmer's Guide*.

APPN function is transparent to APPC programs. Programs using APPN take advantage of the following routing functions:

- Non-adjacent nodes appear adjacent and so APPC programs may communicate directly to programs in non-adjacent nodes (without any APPC programs on the intermediate nodes).
- Performance is improved for APPC programs with session end-points that are not physically adjacent in the network.
- APPC programs may communicate directly to programs in nodes in an adjacent APPN network through network nodes.

Chapter 7. Automatic Configuration and Connection Network Support

This chapter includes information on how APPN automatically configures controller descriptions on a LAN. Also included is information on an extension of automatic configuration (connection network support). Finally, this chapter includes examples showing how an AS/400 system must be configured to use automatic configuration and connection network support.

Automatic Configuration on LANs

Automatic configuration support for LANs allows the AS/400 system to accept incoming calls from node type 2.1 systems (for example, AS/400 systems, System/36s, and personal computers) if there is no controller description varied on that has a matching LAN address of the calling system. If the line has been defined to allow automatic creation of controller descriptions, then the system creates and varies on an APPC controller description that specifies APPN(*YES). This support allows for automatic creation, automatic vary on, automatic vary off, and automatic deletion of these APPC controller descriptions and their attached device descriptions.

Notes:

1. An operator may vary on, vary off, or delete automatically created controller descriptions.
2. Only APPC controller descriptions are automatically configured on a LAN. (That is, remote work station controllers and host controllers must be manually configured.)

How to Control Automatic Configuration on LANs

Automatic configuration is controlled on a line-by-line basis. (That is, one line may specify AUTOCRTCTL(*YES) and another line may specify AUTOCRTCTL(*NO).) The automatic configuration support for LANs is not related to the QAUTOCFG system value. The setting of QAUTOCFG has no effect on this support.

Automatic configuration is controlled by the AUTOCRTCTL parameter in the token ring or Ethernet line description. This parameter can be changed at anytime. It is not necessary to vary off controllers that are attached to the token ring or Ethernet line description before changing the AUTOCRTCTL parameter to *YES or *NO.

How Parameters are Determined in the Automatically Created Controller Description

As discussed on page 4-19 under the description of the MDLCTL (model controller) parameter, the system can be told which parameters should be used for the controller descriptions that get automatically created and varied on. If a model controller description does not exist for a line that supports automatic configuration, then the automatically created or varied on controller descriptions use the system-supplied defaults for the various parameters.

There are two types of parameters that are specified in the automatically configured controller descriptions:

Those found during the automatic configuration
Those specified in the model controller or in the system-supplied defaults

Those found during automatic configuration do not use the values specified in the model controller or any system values. Those parameters are found when the adjacent system on the LAN calls the AS/400 system and then participates in an XID exchange. Following are the parameters found in this manner:

RMTNETID Remote network identifier.

RMTCPNAME Remote control-point name.

ADPTADR LAN adapter address of the remote system.

SSAP Source service access point for the connection.

DSAP Destination service access point for the connection.

NODETYPE Set to *LENNODE if the remote system does not supply a control-point name on its XID. Otherwise, it is set to *CALC.

TMSGRPNBR Set to *CALC since the system negotiates this value with the adjacent node.

CPSSN Set to *NO if the NODETYPE parameter in the automatically configured controller gets set to *LENNODE. Otherwise, it is set to *YES. The system determines if it needs to establish a CP-CP session with the adjacent node based on the network server list (if the local system is an end node), or based on the adjacent system's request for CP session services.

SWTLINLST Set to the token ring or Ethernet line the call was received on. For automatically configured controller descriptions, there is only one line listed in the SWTLINLST. The system may change this parameter for automatically configured controllers that already exist.

The other parameters in the automatically created controller descriptions are copied from the model controller description (if the model controller associated with the line that the call was received on is varied on), or are system-supplied defaults. An exception to using system-supplied defaults is the ONLINE parameter. It is set to *NO for automatically configured controller descriptions since various systems may be automatically configured (such as personal computers, AS/400 systems, and System/36s), and you may not want all systems varied on at initial program load (IPL).

APPC controllers that are automatically created on a LAN have the CTLOWN (control owner) parameter set to *SYS since the system controls that controller description. If an operator wishes to change any parameters in a controller that was created automatically, the CTLOWN parameter needs to be set to *USER. By setting this parameter to *USER, the system does not automatically vary on, change, or delete this controller description. (The operator now owns this controller description.)

Configuration Considerations for Personal Computers and for a Mixed Environment

At the time controller descriptions are automatically created, the AS/400 system is not able to determine whether the system calling in is a personal computer or some other system. Therefore, in a mixed environment (AS/400 systems or System/36s, and personal computers), it is recommended that the model controller description be set to INLCNN(*DIAL) and ONLINE(*NO). If the adjacent system calls in, this AS/400 system automatically varies on an existing controller. A possible drawback, however, is if an adjacent system is another AS/400 system or System/36 and there is a need to have the controller activated at IPL time. (For instance, either system may need the ability to initiate a session with the adjacent node.) In this case, one of the automatically configured controller descriptions can be changed (using the CHGCTLAPPC command) to specify ONLINE(*YES) as long as the CTLOWN parameter is set to *USER.

Notes:

1. Prior to Release 3, it was recommended that APPC controllers with attached personal computers running PC Support be configured with the attributes INLCNN(*ANS) and ONLINE(*YES). This was since the AS/400 system had no need to initiate connections to personal computers. Since INLCNN(*ANS) was specified, the AS/400 system did not attempt to call every personal computer on the LAN and did not display a message for every controller stating that the remote controller was not answering the call.
2. When an AS/400 system is connected to another AS/400 system, both systems cannot be configured as INLCNN(*ANS) if both systems need to establish outgoing calls. (One or both of the systems must be configured as INLCNN(*DIAL).)

It may be appropriate to configure the model controller differently if there is one AS/400 system supporting many personal computers (in that case, INLCNN(*ANS) and ONLINE(*YES) would be acceptable), or if all of the systems on the LAN can handle incoming call requests and there is a need to have these controllers varied on at IPL time. (In that case, INLCNN(*DIAL) and ONLINE(*YES) would be acceptable.)

Note: When the AS/400 system needs to automatically vary on a controller description, it updates the controller description parameters (that is, it internally performs a CHGCTLAPPC command) so that it matches the values specified in the model controller description or the system-supplied defaults. The only parameters that are not changed when an existing controller is varied on is the INLCNN and ONLINE parameters.

How the AS/400 System Determines whether to Accept Incoming Call Requests

When the AS/400 system receives an incoming call from another system on the LAN, it first determines if there is a controller with a matching LAN address, a source service access point (SSAP), and a destination service access point (DSAP) that is in vary on pending status. If one is found, then the system proceeds with XID processing so that the controller descriptions on the two systems can become connected.

If a vary on pending controller is not found, the AS/400 system looks for a controller that is varied on but that is not in a proper state to receive an incoming call. (For example, a controller showing a status of RCYPND (recovery pending) would not be eligible to receive an incoming call.) If a controller is found, but it is not in the proper state, the incoming call request is rejected. For details on a special condition that would cause the AS/400 system to not allow an incoming call because of a previous vary off, see "Vary Off Considerations Associated with Automatic Configuration" on page 7-5.

If the system does not find a controller with a matching address that is varied on, then it checks the line from which the call was received. If the line description has AUTOCRTCTL(*YES) specified, then the system accepts the incoming call. Now the system must supply the LAN adapter with parameter values from the model controller description or the system-supplied defaults. The system does not yet have the actual controller description varied on for this connection. It needs to either create a controller description or vary on an existing controller. The system needs to perform an internal Change Controller APPC (CHGCTLAPPC) command and set the parameter values to the ones currently specified in the model controller description or to the system-supplied defaults (if it finds an existing system-controlled controller description and simply needs to automatically vary it on).

After the system has accepted the initial call, it proceeds with XID processing. Once the AS/400 system has received an exchange identifier from the adjacent system, it has the necessary information to attempt to find an existing controller description that specifies CTLOWN(*SYS). The system varies on an existing controller or creates a new controller description. When the system is attempting to create or vary on a controller description, it is also continuing on with the exchange identifier processing.

Note: If the exchange identifier received indicates that the adjacent system does not support node type 2.1 functions, then the connection is dropped. This happens if a remote work station or host controller called the AS/400 system and there is no controller description currently varied on.

Automatic Creation and Vary On of the Controller Description

Once the APPN support determines that it needs a controller description automatically varied on, it determines if there are any existing controller descriptions that follow the naming convention for automatically created APPC controllers.

The naming convention for controller descriptions is that the first controller description created has the same name as the CP name of the adjacent system. Additional controller descriptions created use the following convention:

CPNAMExx Where CPNAME is the adjacent system's control-point name and xx is some value from '00-FF'.

If the adjacent system does not send a control-point name, then the local system creates a name based on the adjacent system's EXCHID value. The format of the name is:

CIIIIIxx Where C is a constant value, IIIII is the exchange identifier (not including the three-digit block number), and xx is some value from '00-FF'.

The system does one of the following: rejects the request, varies on an existing controller, or creates a new controller. Following is how the system determines which of these three to perform:

- If a varied off APPC controller description for the LAN (that follows the naming convention described above) is found with the same RMTNETID and RMTCPNAME as in the incoming request, and the controller is owned by the user (CTLOWN(*USER)), then the request to vary on the controller is rejected and the connection with the adjacent system is not established. This can prevent a particular system from calling in, yet allow other systems to call in (and be automatically configured). If the system rejects an incoming call request, a message with this information is sent to the operator.

- If an APPC controller description for the LAN (that follows the naming convention described above) is found with the same RMTNETID and RMTCPNAME as in the incoming request and the controller is owned by the system (CTLOWN(*SYS)), then the incoming request is accepted. The same controller is varied on even if the LAN address has changed. Internally, the CHGCTLAPPC command changes the controller description to reflect the parameters used for this connection. All parameters except INLCNN and ONLINE are updated.
- If no controller owned by the system or owned by the user is found, then the system creates a new controller (using the CRTCTLAPPC command). The controller name is the first available name that follows the naming convention described above. The control owner is the system (CTLOWN(*SYS)).

After a controller description is changed or created, then APPN internally runs the VRYCFG command to vary on the controller. The system associates the VRYCFG command with the previous incoming call request. If the connection has not been established, then the controller goes to vary on pending status. If the connection has been established, the controller is varied on. Once the system-controlled controller is varied on, it functions as any other APPC controller description on a LAN.

Note: If an error occurs while the connection is being established, then the status of this controller could go to RCYPND or FAILED.

Automatic Vary Off and Deletion of the Controller Description

The automatic vary off and delete function is controlled by the AUTODLTCTL parameter in the line description. When a controller description that specifies CTLOWN(*SYS) is varied on (either manually or automatically by the system), the system copies the current value of the AUTODLTCTL parameter associated with the controller description. (It is possible that the line could be varied off and the value of AUTODLTCTL changed. However, the value used for any particular controller description is based on the AUTODLTCTL parameter value specified when the controller description is varied on.)

When a controller goes to a vary on pending status (for example, after a connection with an adjacent node ends), a timer based on the AUTODLTCTL parameter is started. If this controller remains in a vary on pending status and it is not varied off manually by the operator for the entire time specified by the AUTODLTCTL parameter, then the system automatically varies off and deletes the controller description and all of its attached APPN device descriptions (whether the device descriptions were created automatically or manually). This function is only available on controllers that specify CTLOWN(*SYS).

Vary Off Considerations Associated with Automatic Configuration

The automatic configuration support has a built-in two-minute delay. The two-minute delay is from the time a controller gets varied off to the time that an incoming call is accepted, and a controller is automatically created and varied on.

This delay is to handle instances when the adjacent system attempts to call the local system back immediately after a controller description has been manually varied off. This could occur if there were CP-CP sessions active prior to the vary off request. Without the two-minute delay, it would be possible that a line configured to support automatic configuration could again automatically create and vary on the controller description. This would be a problem if you were trying to vary off a token ring or Ethernet LAN line and all of the attached controllers.

The AS/400 system recognizes that the same system that was manually varied off within the last two minutes is trying to call in. This is based on the ADPTADR, SSAP, and DSAP parameters of the controller that was varied off.

If you want to allow a controller to be connected again prior to the two-minute delay expiring, then the controller description must be manually varied on.

Model Controller Considerations

A model controller description is defined by specifying MDLCTL(*YES) in an APPC controller description. When MDLCTL(*YES) is specified, it is treated differently than other APPC controller descriptions. Following are some considerations for model controller descriptions:

- Device descriptions cannot be attached to model controllers. There is no physical attachment with a model controller.
- A model controller can be associated with only one line description at a time. This configuration is done using the SWTLINLST parameter in the model controller. Two model controllers that specify the same line in their SWTLINLST parameter may not be varied on at the same time. This is because only one set of parameters can be used for an automatic configuration request.
- The RMTNETID, RMTCPNAME, and ADPTADR parameters are optional parameters when MDLCTL(*YES) is specified. If you supply these parameters when you create the model controller description, then the system uses the model controller RMTNETID, RMTCPNAME, and ADPTADR to create and vary on another controller description. This system-created controller description is:
  - Automatically varied on
  - Used only to establish a CP-CP session with an adjacent system if such a session is needed
  - The only controller description created by the system that uses the RMTNETID, RMTCPNAME, and ADPTADR from the model controller description

  It is important to note that this system-created controller description is different from either the model controller description or the controller description that the local system creates when an adjacent system requests a communications session (and the local system does not already have a controller description with the same ADPTADR, SSAP, and DSAP values as in the incoming request). When the local system creates a controller description because of an incoming session request from an adjacent system, the local system follows the naming convention found under "Automatic Creation and Vary On of the Controller Description" on page 7-4.

  If the local system is an end node, the adjacent system must be specified in the NETSERVER parameter of the CHGNETA command in order for the local system to establish CP-CP sessions with the adjacent system.
- Since model controller descriptions do not represent an actual connection, they are not associated with a line description when using the WRKCFGSTS

command. For the model controller description to be used by the system for supplying parameters in automatic configuration support, it must be varied on. The model controller shows a vary on pending status if it has been varied on, but the associated line is not currently available, possibly because:

- The line is varied off
- The line is in a recovery state
- The line description has AUTOCRTCTL(*NO) specified

The model controller shows a varied on status if the model is varied on and its associated line is available for use (for example, the line is varied on or active).

Connection Network Support

A *connection network* allows APPN support to find addressing information about another system on a LAN when a connection needs to be established. The connection network is an enhancement of automatic configuration since the AS/400 system determines addressing information for outgoing calls and automatically creates the associated controller description. Without connection network support, one of the two systems making a connection would be required to have the other system's LAN address and other controller information manually configured. Using connection networks, it is possible for two systems to establish direct connections instead of using intermediate routing.

A local area network (LAN), such as a token ring or Ethernet LAN, is considered a *virtual node* by all systems that are part of the connection network. The virtual node may be used during APPN route selection. Each node that participates in the connection network has a transmission group (TG) entry in the topology database that contains data link control (DLC) signaling and addressing information. For LANs this information includes a node's local adapter address and source service access point (SSAP).

At the time a route needs to be calculated, APPN route selection services determines that two nodes have connections to the virtual node. The routing information that is returned to the route requester contains the DLC signaling information of the destination. The originator can then establish a direct outgoing connection to the destination (knowing the DLC signaling information). A connection network may also be used for intermediate routing between network nodes.

Requirements to Participate in a Connection Network

To participate in an APPN connection network, a system needs to have a CP-CP session established with a network node and a model controller description configured.

Note: A System/36 does not support connection networks, so an AS/400 end node that wants to participate in a connection network must not have a System/36 listed as a possible server in its network server list.

The connection network is defined by supplying the connection network network identifier (CNNNETID) and connection network control-point name (CNNCPNAME) in the model controller description associated with the token ring or Ethernet line description. All systems connected to the same LAN (that want to participate in the connection network) must specify the same value for their CNNNETID and

CNNCPNAME parameters. The CNNNETID and CNNCPNAME parameters are used to define the name of the virtual node representing the connection network.

For a connection network defined on a LAN, the local address that is used is a combination of the LAN adapter address (taken from the token ring or Ethernet line description) and the source service access point (SSAP) (taken from the model controller description that describes the connection network).

Prior to Release 3, the AS/400 system had the ability to establish CP-CP sessions, but with automatic configuration support on the LAN, this function has been expanded. Network nodes have the ability to establish CP-CP sessions that are initiated by other nodes on the LAN. For example, if there are 30 end nodes on the LAN, an AS/400 network node need not manually configure all 30 controller descriptions to establish CP-CP sessions. An AS/400 network node simply offers its CP-CP session services to systems that call in and the AS/400 system automatically creates and varies on the controller descriptions. As discussed in "Model Controller Considerations" on page 7-6, the destination systems with which CP-CP sessions need to be established can be supplied in the model controller description (by specifying the RMTNETID, RMTCPNAME, and ADPTADR parameters).

The connection network allows the AS/400 system to communicate with any other AS/400 system on a LAN by having an operator configure one token ring or Ethernet line description and configure one model controller description that defines the connection network. (This assumes all of the systems have the same connection network defined.)

Connection Network Example

Following is an example that shows some of the important concepts in connection networks.

The physical configuration for the example is shown in Figure 7-1 on page 7-9. There are five AS/400 systems on the token-ring network. Prior to having connection network support, if any system on the token-ring wanted to have direct communications with any other system on the ring (that is, without having the network node A (NN A) performing intermediate routing), each system would be required to have one token-ring line description and four APPC controller descriptions configured. As more systems are added to the network, configuration becomes quite time-consuming and complex.

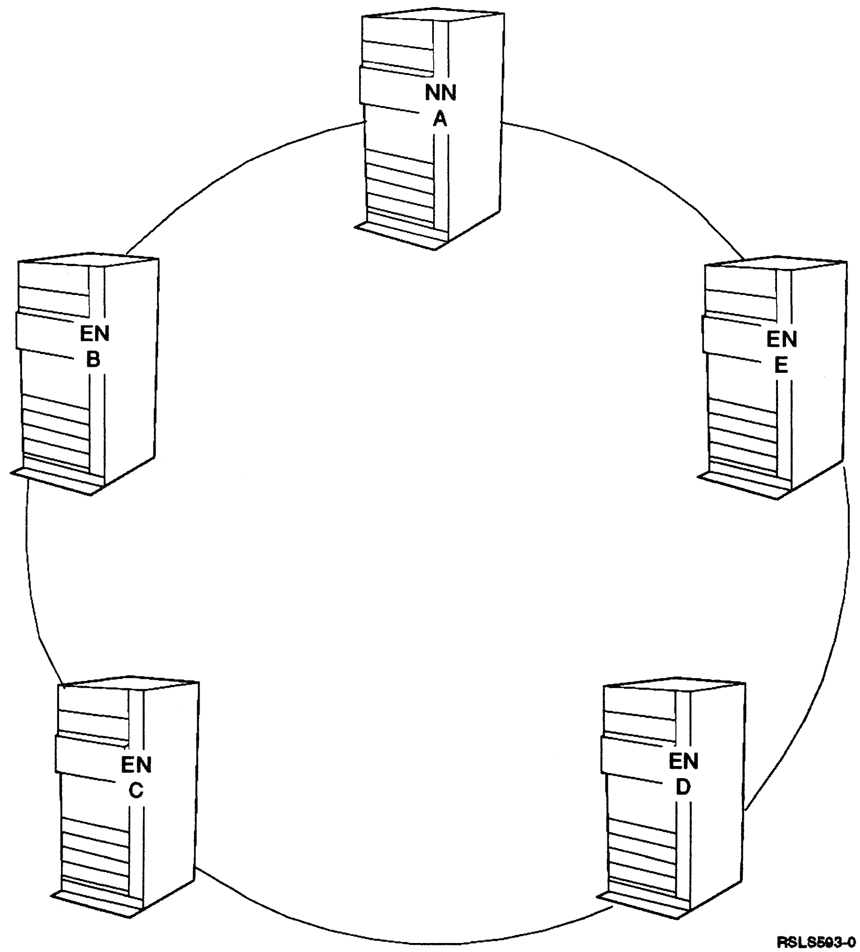


Figure 7-1. Physical Configuration of the LAN

The logical configuration of the token-ring using a connection network is shown in Figure 7-2 on page 7-10. Each system needs only a token-ring line description and one APPC model controller description manually configured. Assuming that the network identifier is the same for all nodes, each system's model would specify CNNNETID(*NETATR) and CNNCPNAME(CN1). Each end node would also supply the RMTNETID(*NETATR), RMTCPNAME(A), and ADPTADR(1) in their model controller (so that CP-CP sessions can be established with NN A). At this point, none of the end nodes have knowledge of each other's address.

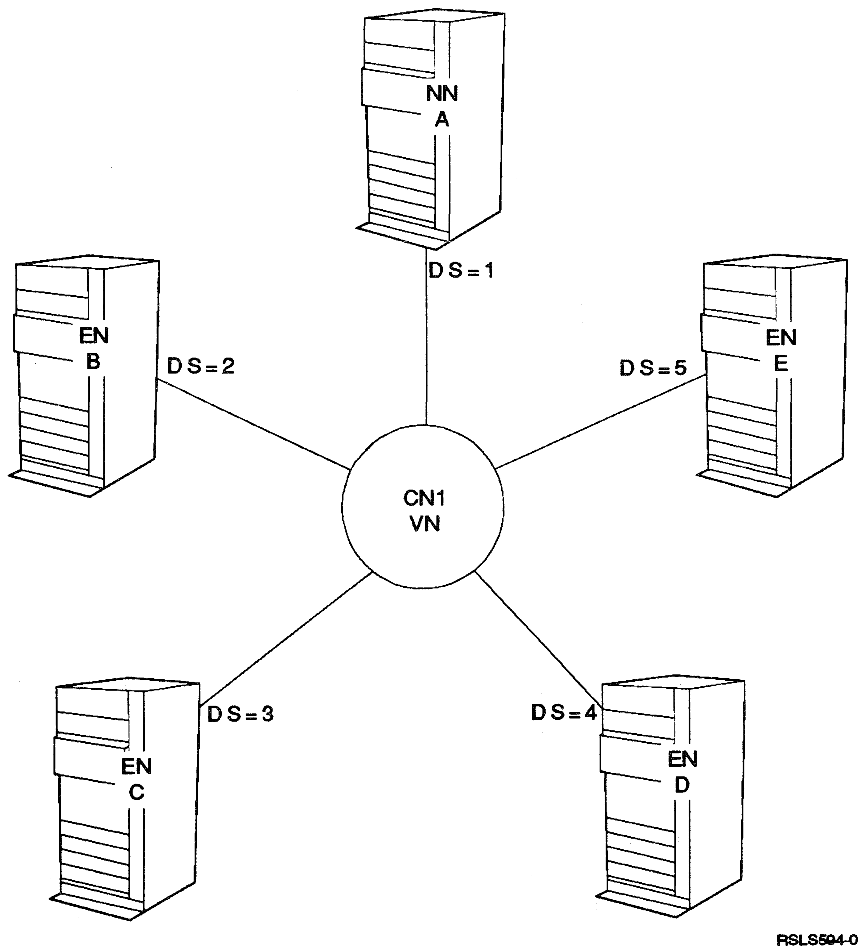


Figure 7-2. Logical Configuration of the LAN Using a Connection Network. DS = Data link control (DLC) signaling information.

Assume EN B wants to establish an LU 6.2 session with EN E. EN B, through its NN server (A), requests a route to EN E. As part of this processing, EN B reports to NN A that it has a transmission group (TG) to CN1, and the DLC signaling information associated with its connection is 2. (The DLC signaling information is actually a 6 byte adapter address and a 1 byte SSAP address, but in this example, it has been simplified to a single digit.) NN A determines that the location name searched for is on EN E, so it sends a search request to end node E (EN E). On the search reply, EN E reports its TG connections (one of which is the TG from E-CN1 that has DLC signaling information of 5). During the route calculation phase, NN A realizes that both EN B and EN E have TGs to the same connection network. Assuming that the connection through the virtual node is the least weight route, NN A informs EN B that the optimal route is EN B - CN1 - EN E. Since the route uses a virtual node, the DLC signaling information from CN1 to EN E will be supplied. EN B can now automatically create a controller description for EN E and make the outgoing call. EN E can accept the incoming call and automatically create a controller description for EN B.

Connection Network Representation in the Topology Database

What is shown in the topology database (using the Display APPN Information (DSPAPPNINF) command) depends on whether the local system is a network node or an end node. An end node shows only a TG entry from itself to the virtual node. A network node shows:

- A virtual node entry
- A TG entry from itself to the virtual node
- A TG entry from the virtual node to itself
- TG entries from other network nodes to the virtual node
- TG entries from the virtual node to other network nodes

When a connection is established (that is, the route chosen for this connection includes a virtual node) there is not an entry in the topology database showing this connection. See Figure 7-2 on page 7-10. In this example, EN B would not have a TG entry from itself to EN E in its topology database. EN E would not have a TG entry from itself to EN B in its database. Many connections are controlled by the model controller description that defines the connection network.

The connection from the local system to the virtual node is active when the model controller description is varied on and there are available connections on the line. The TG from the local system to the virtual node will not be displayed in the topology database until it becomes active. If the model controller is not varied on, or if no connections are available on the line, then the TG from the local system to the virtual node is inactive. If the TG from the local system to the virtual node is inactive because no connections are available, the system waits for 20% of all possible connections to be freed up before changing the TG to active again. This prevents continual updates to the topology database (status change of the TG from active to inactive to active, and so on).

In summary, the varying on and varying off of the model controller description affects many connections. However, the number of nodes and TG entries in the topology database are greatly reduced. Likewise, the number of topology updates that are broadcast throughout the network is reduced with connection networks.

Support of Systems that Do Not Have a Connection Network Defined

An AS/400 system that has a connection network defined on a LAN may encounter other systems on the LAN that do not have a connection network defined. The ability for a system to automatically create its controller descriptions depends on the level of support that is on these other systems. Following are some considerations regarding when a system can automatically create controller descriptions for establishing initial connections. Once two systems have their controller descriptions created and varied on, either system can initiate an outgoing connection. See Figure 7-2 on page 7-10.

- To establish an outgoing connection using automatic creation of controller descriptions, both systems must be in the same connection network.
- If EN B has a connection network defined or has automatic configuration support on the LAN and EN E does not have automatic configuration support on the LAN, then EN E must have a controller description manually configured to connect to EN B directly. That is, EN E must make the initial outgoing connection for EN B to perform the automatic creation. If EN B attempts to establish a session with EN E before it receives an incoming call

from EN E, then the session is established taking the route EN B to NN A to EN E (intermediate routing is performed).

Note: On the AS/400 system, simply varying on a LAN controller description initiates an outgoing connection. Therefore, in the previous example, EN E needs to vary on its controller description before EN B attempts to establish an LU 6.2 session to EN E. EN E does not need to establish the first LU 6.2 session.

- If neither EN B or EN E on the LAN have automatic configuration support on the LAN, then both systems need to have manually configured controller descriptions varied on to establish a direct connection. If they do not have controller descriptions varied on, they are forced to establish their sessions by taking the route EN B to NN A to EN E.

Configuration Considerations

Following are two examples showing incorrect configuration of a connection network. The correct configuration of the same example follows:

- See Figure 7-3. Parallel TGs to the same connection network are not allowed. Only one LAN line description may be associated with a connection name. (That is, only one line may be specified in the model controller's SWTLINLST parameter and only one model controller may be active on the system that uses a particular CNNNETID and CNNCPNAME.) This is required since the AS/400 system must have a unique LAN address (system-wide) for every controller description that gets varied on.

  If the system were to allow definition of multiple lines for the same connection network name, then APPN route selection services may choose one of the lines for one session initiation request, and it may choose another line for a second session initiation request to the same remote system. The connection would fail since, in both cases, the address of the remote system would be the same. (The second controller description could not be varied on for use on the second LAN line.)

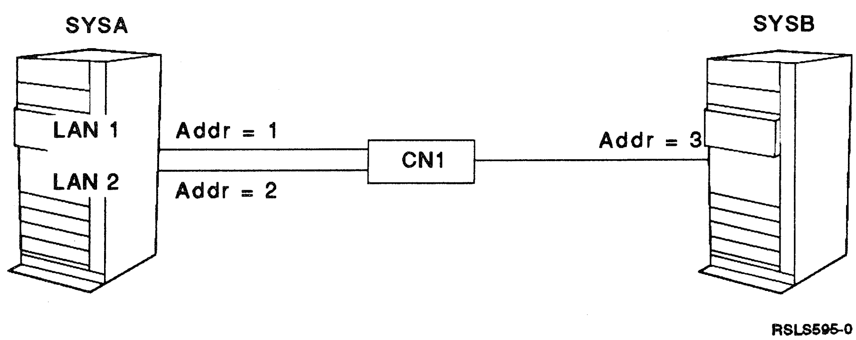


Figure 7-3. Incorrect Configuration Showing Parallel TGs to a Connection Network

- See Figure 7-4 on page 7-13. There can be only one connection network name associated with a LAN line description at any given time. Two model controllers cannot have the same SWTLINLST parameter specified and be varied on at the same time. As in the previous case, the AS/400 system must have a unique LAN address for every controller description that gets varied on.

  One AS/400 system (SYSA) has two LAN line descriptions (with a separate connection network defined on each), and another AS/400 system (SYSB) has two connection network names defined on one LAN line. If SYSA were to request multiple sessions to SYSB, the first session may go over CN1. Another session initiation request could choose CN2. However, the destination address is the same, so the second controller description could not be varied on.

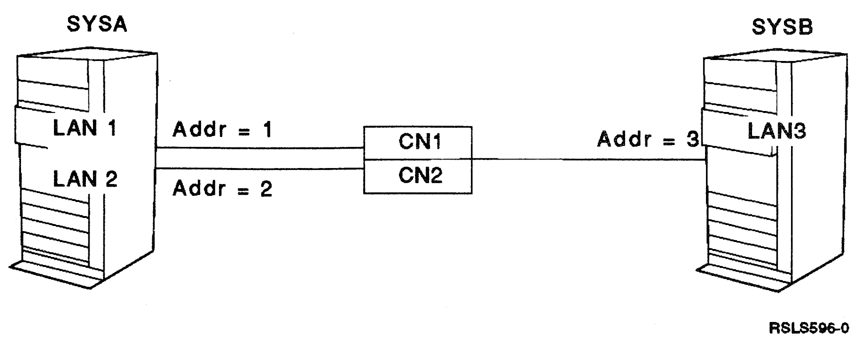


Figure 7-4. Incorrect Configuration Showing Two Connection Networks on the Same Line

- See Figure 7-5. Multiple connection networks (that have different connection network names) may be defined on separate LAN lines.

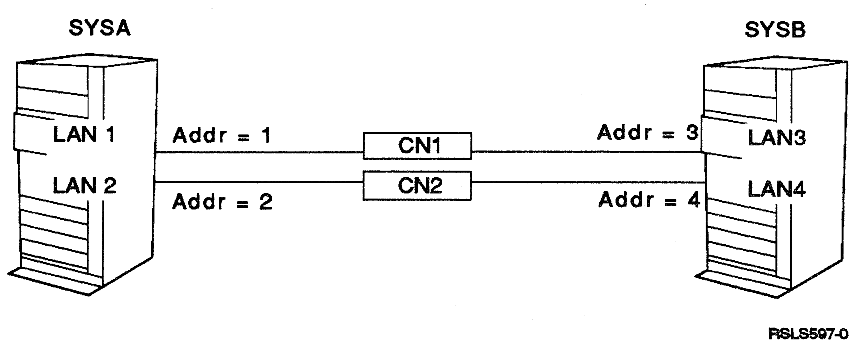


Figure 7-5. Correct Configuration Showing Two Connection Networks and Two LAN Lines

The name of a virtual node cannot be the same as the control-point name of any network node or an end node. That is, the CNNNETID and CNNCPNAME parameters cannot be the same as the RMTNETID and RMTCPNAME parameters in any controller descriptions in the entire APPN network. If this convention is not followed, unpredictable results may occur.

AS/400 Configuration Examples for Automatic Configuration and Connection Network Support

This section includes examples showing how an AS/400 network node must be configured to use automatic configuration and connection network support. Configuration for other systems (personal computers and System/36s) is not included in the examples. See the documentation for those systems for their configuration information.

Note: The following examples show personal computers configured as end nodes. In some ways, they act as end nodes since they provide their CP names when XIDs are exchanged. However, personal computers do not act as end nodes in the same way as AS/400 systems since they do not automatically create configuration resources.

AS/400 System as a Server for 30 Personal Computers

This example describes configuration for the network shown in Figure 7-6. In this network, an AS/400 system is a server for 30 personal computers running PC Support. The personal computers are on a token-ring network.

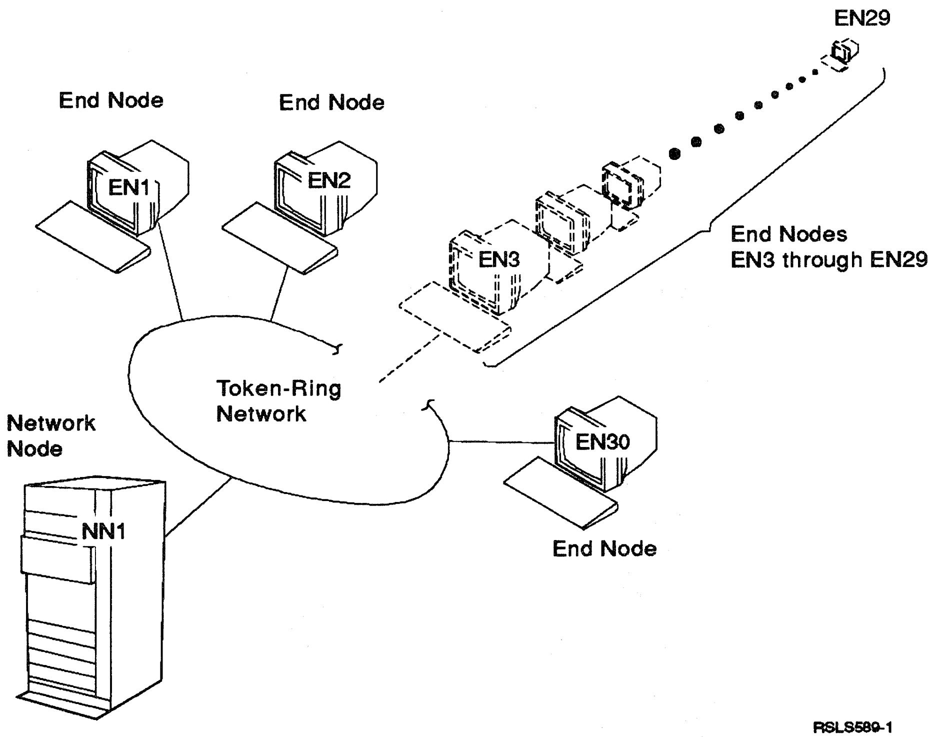


Figure 7-6. AS/400 System as a Server for 30 Personal Computers

In this example, the default timers and retry values in the automatically created controller descriptions are suitable. The configuration steps are:

1. Create the line description for the token-ring network line.

   ```
   CRTLINTRN LIND(TRN1) RSRCNAME(LIN011) AUTOCRTCTL(*YES)
   ```

   The name assigned to the line description is TRN1. The physical communications port (resource name) is LIN011.
2. Vary on the token-ring line.

   ```
   VRYCFG TRN1 *LIN *ON
   ```

   The controller descriptions can then be automatically created for the personal computers as they call in to the AS/400 system.

AS/400 System with 30 Personal Computers and Other Systems

This example describes configuration for the network shown in Figure 7-7 on page 7-15. In this network, an AS/400 system is a server for 30 personal computers running PC Support. The personal computers are on a token-ring network. In addition, there are other systems on the token-ring network.

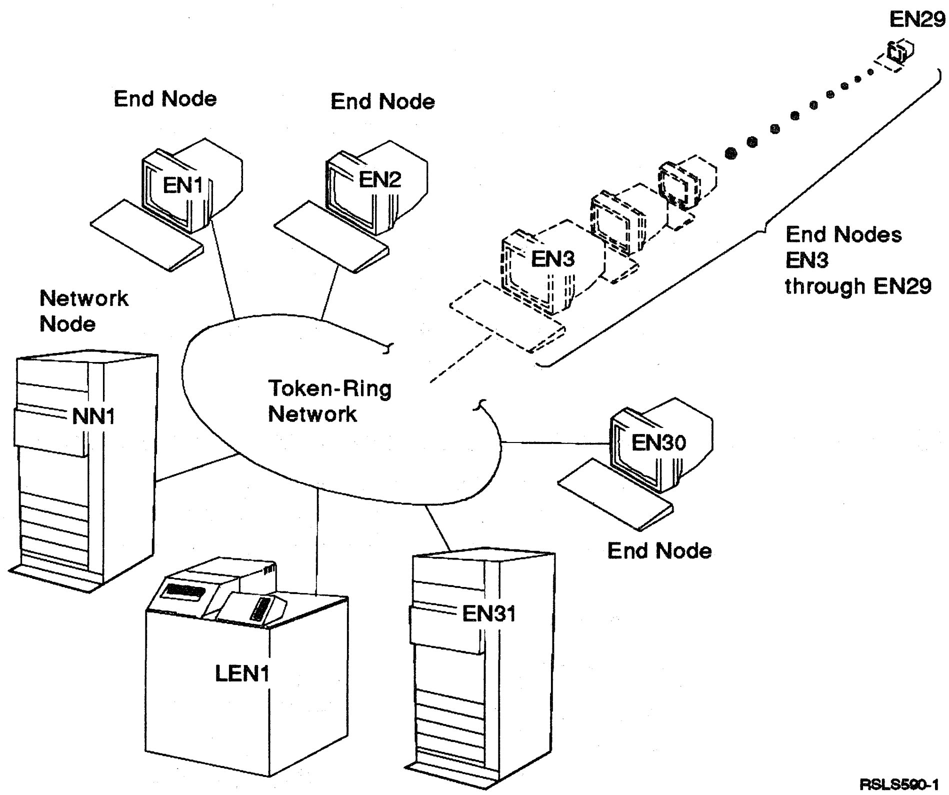


Figure 7-7. AS/400 System, 30 Personal Computers, Other Systems

In this example, the default timers and retry values in the automatically created controller descriptions are suitable for most systems. One system with a control-point name of SYSX is having problems that could be corrected by changing some token-ring parameters in its controller description. These steps are:

1. Creating the line description for the token-ring network.

   ```
   CRTLINTRN LIND(TRN2) RSRCNAME(LIN011) AUTOCRTCTL(*YES)
   ```

   The line description is named TRN2. The resource name is LIN011.

2. Vary on the line.

   ```
   VRYCFG TRN2 *LIN *ON
   ```

   The line description is named TRN2. The controller descriptions can then be automatically created as other systems call in to the AS/400 system.

3. The user determines that the controller description associated with system SYSX is SYSX.

   Note: The naming convention for controller descriptions is that the first controller description created has the same name as the CP name. Additional controller descriptions created use the following convention:

   CPNAMExx CPNAME is the adjacent system's control-point name and xx is some value from '00-FF'.

   The connection associated with the automatically created controller description SYSX is performing poorly.

4. Vary off the controller description.

   ```
   VRYCFG SYSX *CTL *OFF
   ```

5. Change the controller description.

   ```
   CHGCTLAPPC CTLD(SYSX) CTLOWN(*USER) LANMAXOUT(7)
   ```

   The user determined that performance would be improved for SYSX by changing the token-ring maximum outstanding frames (LANMAXOUT) count. To change controller SYSX, the controller owner (CTLOWN) must first be changed to *USER.

6. Vary on the controller description.

   ```
   VRYCFG SYSX *CTL *ON
   ```

   The controller description needs to be varied back on by the user for the change to take effect.

AS/400 System on a Token-Ring Network with Other Systems

This example describes configuration for the network shown in Figure 7-8. In this network, an AS/400 system is attached to other systems that have manually created configurations for connecting to this AS/400 system.

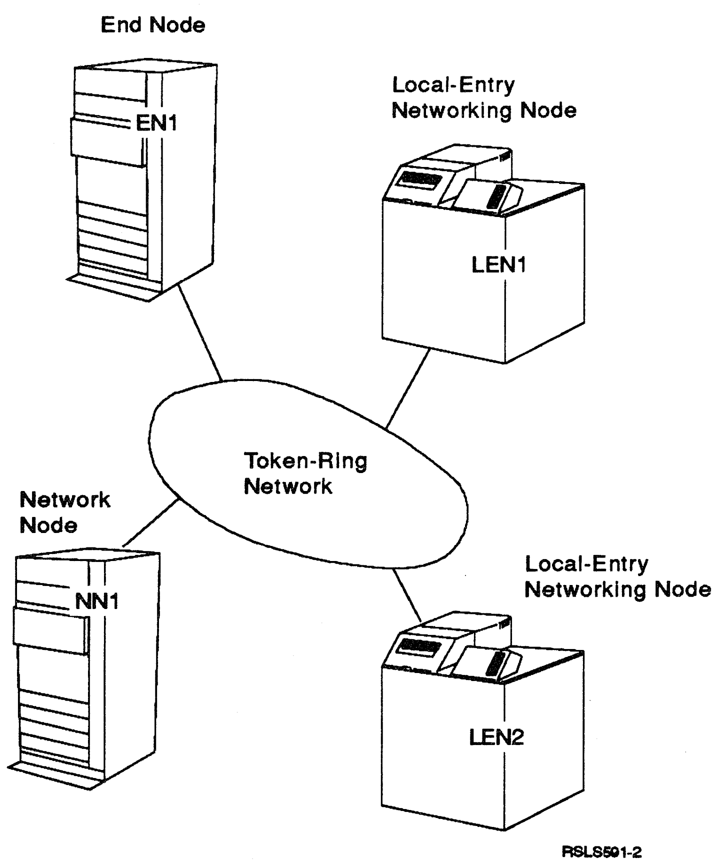


Figure 7-8. AS/400 System and Other Systems on a Token-Ring Network

For performance reasons, the customer has decided to change the system-supplied defaults for the automatically created controller descriptions. A model controller needs to be created to supply the new values. The steps to configure this setup are:

1. Creating the line description for the token-ring network.

   ```
   CRTLINTRN LIND(TRN3) RSRCNAME(LIN011) AUTOCRTCTL(*YES)
   ```

The line description is named TRN3. The resource name is LIN011. The controller descriptions can be created automatically.

2. Creating the model controller description.

```
CRTCTLAPPC CTLD(TRN3MODEL) LINKTYPE(*LAN) MDLCTL(*YES)
             SWTLINLST(TRN3) LANFRMRTY(5) LANACKFRQ(7)
```

The controller description is named TRN3MODEL. All of the automatically created controller descriptions use the defaults, except for the token-ring network frame retry (LANFRMRTY) and the token-ring network acknowledgement frequency (LANACKFRQ) parameters.

3. Vary on the model controller.

```
VRYCFG TRN3MODEL *CTL *ON
```

To make sure that all automatically created controller descriptions use values from the model controller, the model controller must be varied on before the line description is varied on.

4. Vary on the line.

```
VRYCFG TRN3 *LIN *ON
```

AS/400 Network Node with Other Systems

This example shows configuration for an AS/400 system as a network node AS/400 end nodes and System/36 low-entry networking nodes on a token-ring network. Configuration for an end node is also included.

A diagram of the example network is shown in Figure 7-9 on page 7-18.

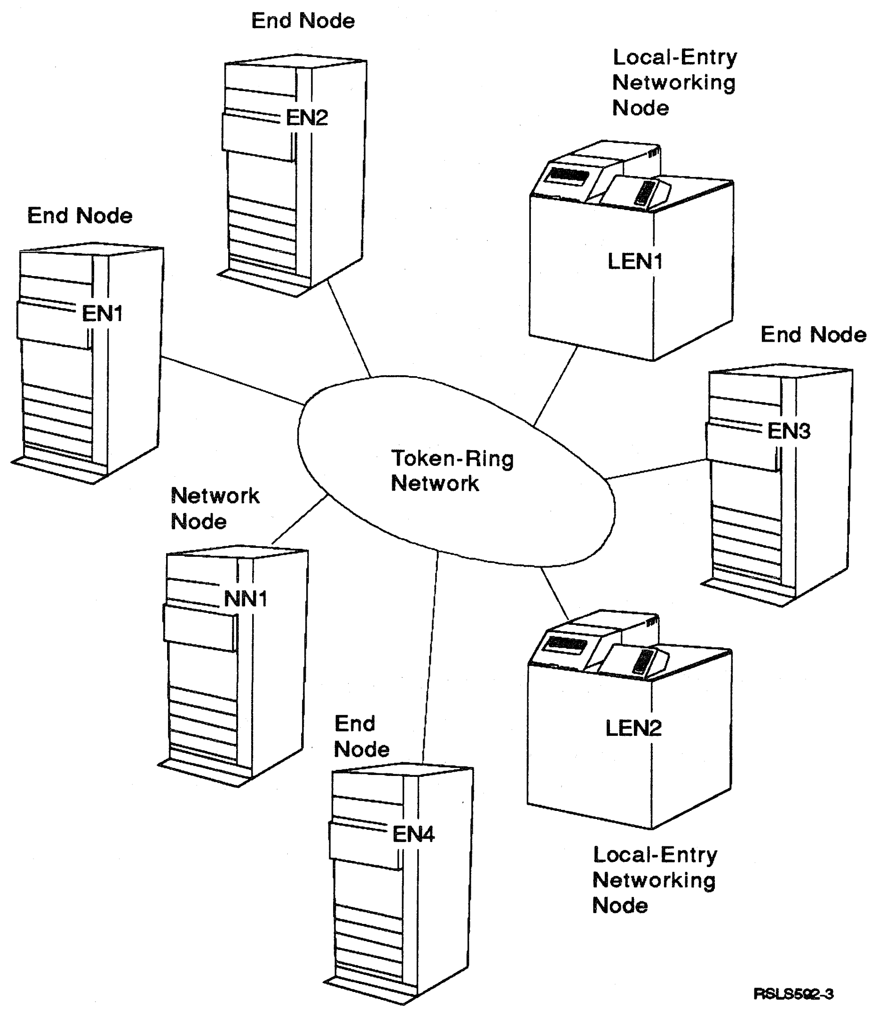


Figure 7-9. AS/400 System as a Network Node. AS/400 end nodes are attached using a connection network.

The AS/400 end nodes have connection network support, so a connection network (CN1) will be defined over the token-ring network. Since the end nodes will request CP-CP session services, the network node needs to supply RMTNETID, RMTCPNAME, or ADPTADR information. The steps to configure the network node are:

1. Creating the line description for the token-ring network.

   ```
   CRTLINTRN LIND(TRN4) RSRCNAME(LIN011)
     ADPTADR(400000000003) AUTOCRTCTL(*YES)
   ```

   The line description is named TRN4. The resource name is LIN011. The controller descriptions can be created automatically.

2. Creating the model controller description.

   ```
   CRTCTLAPPC CTLD(TRN4MODEL) LINKTYPE(*LAN) MDLCTL(*YES)
               CNNCPNAME(CN1) SWTLINLST(TRN4)
   ```

   The controller description is named TRN4MODEL. The connection network CP name is CN1. Since the CNNNETID is not supplied, the values for the network attributes are used for this field. In this example, all the systems use the same network ID.

3. Vary on the model controller.

```
VRYCFG TRN4MODEL *CTL *ON
```

To make sure that all automatically created controller descriptions use values from the model controller, the model controller must be varied on before the line description is varied on.

4. Vary on the line.

```
VRYCFG TRN4 *LIN *ON
```

Following is the configuration that one of the AS/400 end nodes uses to participate in connection network CN1 and to establish its CP-CP session with the network node NN1. The steps to configure an end node are:

1. Creating the line description for the token-ring network.

```
CRTLINTRN LIND(TRN5) RSRCNAME(LIN011) AUTOCRTCTL(*YES)
```

The line description is named TRN5. The resource name is LIN011. The controller descriptions can be created automatically.

2. Creating the model controller description.

```
CRTCTLAPPC CTLD(TRN5MODEL) LINKTYPE(*LAN) MDLCTL(*YES)
           CNNCPNAME(CN1) SWTLINLST(TRN5)
           RMTCPNAME(NN1) ADPTADR(400000000003)
```

The adapter address of the network node's token-ring network line (400000000003) must be obtained from the network node.

3. Vary on the model controller.

```
VRYCFG TRN5MODEL *CTL *ON
```

4. Vary on the line.

```
VRYCFG TRN5 *LIN *ON
```

Chapter 8. Advanced Considerations for APPN

This chapter discusses considerations that you should be aware of when planning or using your network. These considerations include:

- Network performance considerations
- Security considerations
- Switched line considerations
- How and when sessions are kept active
- Configuration requirements
- Connecting a System/370 or System/390 host to an APPN network
- Coexistence with System/36 APPN
- Directory services search processing
- Topology routing services
- Adaptive pacing
- Transmission priority

Network Performance Considerations

Network performance is affected by the following:

- **Transmission priority**

  When you create a class-of-service description (see the "Create Class-of-Service Description (CRTCOSD) Command" on page 4-33), you can define one of three transmission priorities for each class of service. You can specify, by the transmission priority (TMSPTY) parameter, that the transmission priority for any class of service is high, medium, or low.

  The transmission priority you specify is carried in the session activation request at session establishment, which allows each logical unit on the session and each routing entry along the session path to store the same transmission priority. By assigning an appropriate mode (which includes a class of service) at session activation time, better response time for the applications that require it can be ensured. Generally, interactive traffic should have a high priority and batch traffic a low priority.

  For more information, see "Transmission Priority Considerations" on page 8-32.

- **Route addition resistance**

  Route addition resistance (RAR) is a relative value that indicates how desirable one network node is, as compared to other network nodes, for having intermediate sessions routed through it.

  Changing this value and working with the different class-of-service descriptions that will be used are ways of controlling where sessions are routed.

  The RAR value is defined in the network attributes for the local AS/400 system. See the "Change Network Attributes (CHGNETA) Command" on page 4-1 for information on changing the value.

- **Maximum intermediate sessions**

  The maximum number of intermediate sessions allowed on a network node is specified by the Change Network Attributes (CHGNETA) command (see "Change Network Attributes (CHGNETA) Command" on page 4-1). When the number of intermediate sessions reaches 90% of the maximum value, the node is marked as congested. A node that is congested may or may not be used for intermediate sessions depending on the class-of-service definition. The node is not congested when the number of intermediate sessions drops below 80% of the configured value. Also, if the maximum number of intermediate sessions is reached (100%), then intermediate sessions will not be allowed through this network node until the value drops below 100%. You can limit the effect of intermediate sessions on local processing by setting an appropriate value.

- **Pacing values**

  Pacing determines how many message units (SNA RUs) can be transferred over a session before receiving an acknowledgement from the receiving system. The fewer number of pacing responses required in the network the better the performance.

  If the adjacent system does not support adaptive pacing, the pacing value is determined at session establishment time and is not changed for the duration of the session. The values used in negotiating the pacing values with the adjacent system are determined from the INPACING and OUTPACING values on the mode description (see the "Create Mode Description (CRTMODD) Command" on page 4-27). The AS/400 system will not allow these values to be negotiated to a higher value. If necessary, the receive pacing value will be negotiated to a lower value, matching the INPACING value.

  If the adjacent system does support adaptive pacing, the minimum pacing value is set at session establishment time using the INPACING and OUTPACING values. The location that starts the session establishment (BIND request) is responsible for setting the values. No negotiation of the values is performed. However, support is provided by the system to change or adapt the pacing values based on the system's buffer resources and traffic patterns in the network. The system can now allocate its session buffers automatically to efficiently use its available resources.

  The AS/400 system also has the ability to slow down the transfer of data or even stop receiving at any node of any session. This allows for more equity in the network by dynamically tuning the flow of messages on any hop for any session that may be contributing to congestion problems in the network. The values from the INPACING and OUTPACING parameters on the mode description (see the "Create Mode Description (CRTMODD) Command" on page 4-27) are used to set the values when the AS/400 system starts the session.

  For more information, see "Pacing Considerations" on page 8-30.

- **Session activation considerations**

  When a session is requested to a remote location that matches a network node control-point name, a directory search is not performed by the network node that is calculating the route. This is true if the session request is being started by a user on the network node or on an end node that the network node is providing services for. Therefore, session start requests for remote locations in end nodes and remote locations in network nodes that do not match the control-point name of the network nodes will take longer because the directory search needs to be sent and the replies need to be received.

Security Considerations

Some security aspects for AS/400 systems, System/38s and System/36s communicating using APPC and APPN are:

- Physical security surrounding the systems, modems, communication lines and terminals that can be configured in the line description and used in the route selection process.
- Location security that verifies the identity of other systems in the network
- User ID security that verifies the identity and rights of users to issue commands on their local system and remote systems
- Resource security that controls user access to particular resources, such as confidential databases

Only security for communications or multiple systems management is discussed in this section. Security needs to be consistent across all the systems in a network if inter-system access is to be controlled and yet not unnecessarily restricted.

Location, user ID, and resource security are only possible if the system Security level is set at an appropriate level. The AS/400 security levels are explained in more detail in "AS/400 Security Levels."

IBM-supplied application programs and user-written application programs have different security implementations that must be understood. An important issue is what user ID is used when communicating with the remote system. Default user IDs can be provided for some applications but not for others and customers must decide on their security reporting requirements that determine the usage of default user IDs.

AS/400 Security Levels

An understanding of the base security functions of the AS/400 system is necessary when discussing network security.

When the system is using level 10 security, the AS/400 system connects to the network as a nonsecure system. The AS/400 system will not validate the identity of a remote system during session establishment and will not require transaction security on incoming program start requests.

Note: For level 10, security information configured for the APPC remote location (LOCPWD and SECURELOC parameters of the configuration commands) will be ignored and will not be used during session or transaction establishment.

When the system is using security level 20 (or above), the AS/400 system connects to the network as a secure system. The AS/400 system can then provide both session and transaction level security functions.

The security level is a system value (QSECURITY) that can be set with the change system values (CHGSYSVAL) command or from the configuration menu as part of an initial program load (IPL) of the system and the change takes place after the next IPL of the system.

For more information on security levels, see the *Security Concepts and Planning* manual.

Physical Security

When you specify *NONE for the location password (LOCPWD) parameter during APPC configuration, the AS/400 system does not validate the identity of a remote system when a session is being established. Therefore, you are responsible for the physical security of your system when you specify *NONE for the LOCPWD parameter. However, you can still use application level security if the remote system supports it, for example, if the remote system is an AS/400 system with security level 20 (or above).

Session Level Security

Session level security is achieved by specifying a password on the LOCPWD parameter during configuration. The AS/400 system uses the password to validate the identity of the remote system during session establishment. The password must match the password specified on the remote system or the connection is not allowed. Not all systems support session level security. In particular, Series/1 RPS version 7.1 and CICS/VS release 1.6 do not. If the remote system does not support session level security, you must specify LOCPWD(*NONE) to establish the connection, and provide the necessary physical security.

In order to have more than physical security for remote locations using a device description with APPN(*YES), you must add an entry to the APPN remote location configuration list that includes security information. This information is used when you create device descriptions with APPN(*YES) and also when APPN automatically creates and varies on a device description with the same remote network ID, remote location name, and local location name as the APPN remote location configuration list entry.

Note: APPN creates location information based on the first device description that is varied on for the remote network ID, remote location name and local location name pair. In order to avoid using security information that cannot be predicted, you must ensure that all of the device descriptions with the same remote network ID, remote location name and local location name pair contain exactly the same security information.

For more information on application-level security, see the considerations chapter in the *APPC Programmer's Guide*.

APPN Line Description Security Parameter

The SECURITY parameter on the create line description commands should be understood in an APPN network. This parameter is used by APPN to determine an appropriate route through the network to satisfy the class of service (COS) requirements for APPC sessions. The parameter describes the physical environment of a communications line (for example, if the line is in underground conduit or if data encryption devices are used). This parameter is completely unrelated to AS/400 security levels and location security. For more information on the security parameter see page 4-10.

Location Security

There are two parts to location security. They are decided when the BIND occurs between two locations. First, there is the verification of a location's identity. Second, each location specifies the security information it requires from the other location for each remotely initiated APPC conversation.

A location password (specified in the remote configuration list) is used to establish the identity of a pair of locations. The network administrator defines a password (which may be null) on each system and if the two passwords are not identical the SNA BIND command fails and no sessions is possible.

In an APPN network location passwords are specified for those pairs of locations that are going to have end-to-end sessions between them. That is, location passwords need not be specified for those locations that are intermediate nodes.

Considerations for Configuration Lists

If a non-null location password is required, it is specified on the AS/400 system in a remote location configuration list when APPN is used or on the device description if APPN is not used.

There is one system-wide remote location configuration list on an AS/400 system. A central site AS/400 system can create location lists for remote AS/400 systems by sending them a CL program.

A remote location configuration list is created with the Create Configuration List (CRTCFGL) command and it contains a list of all remote locations, their location password and whether the remote location is secure. A description of secure/non-secure locations follows the discussion of the password parameter on page 4-7.

When the Display Configuration List command (DSPCFGL) is used there is no indication that a password exists. The Change Configuration List command (CHGCFGL) indicates a password exists by placing *PASSWORD in the field if a password has been entered. There is no way to display the password. If a customer has problems setting up location security they may have to re-enter the password on both systems to be sure about the passwords.

For more information on configuration lists, see "Create Configuration List (CRTCFGL) Command" on page 4-5.

Switched Line Considerations

Switched line considerations include:

- Switched controller activation
- Automatic disconnect of a switched line
- How and when sessions are kept active
- Deactivation considerations
- Using the MINSWTSTS parameter
- End node configuration when attached to multiple network nodes

Switched Controller Activation at Vary On and Controller Recovery

At certain times, the local AS/400 system must establish a connection using an APPC or host controller that specifies APPN(*YES) when the controller is varied on or following a controller failure. These reasons are:

- The controller was configured with no transmission group number (TMSGRPNBR(*CALC) specified for the controller description), and the remote node type was not *LENNODE. The transmission group number must be negotiated (during link activation) before the AS/400 APPN support will recognize this as a transmission group.

- The AS/400 system needs to establish a control-point-to-control-point session with the controller.
- The controller has been configured with the MINSWTSTS(*VRYON) option specified.

For the local AS/400 system to force this initial connection, the controller must be configured to start the connection (INLCNN(*DIAL) specified in the controller description; see the *OS/400* Communications Configuration Reference* for a description of the initial connection parameter), and one of the following conditions must be met:

- The remote controller is an APPN end node or an APPN network node, and the transmission group number TMSGRPNBR(*CALC) is specified in the controller description.
- The local AS/400 system and the remote system are network nodes (NODETYPE(*NETNODE)), and control-point-to-control-point sessions are requested (CPSSN(*YES) specified in the controller description). The connection is started if there is no other parallel transmission group active, or pending activation, that specifies CPSSN(*YES) to the same remote control point.
- The local AS/400 system is an APPN end node (NODETYPE(*ENDNODE) specified in the network attributes), the remote controller is a network node (NODETYPE(*NETNODE) specified in the controller description), CPSSN(*YES) is specified in the controller description, and the network ID and control-point name of this controller are defined in the local AS/400 network server list (using the CHGNETA command). The connection is started only if there is no other controller active or pending activation (that specifies CPSSN(*YES)) to the same remote control point (over a parallel transmission group) or to another network node that is in the network server list.
- The controller is connected on a local area network (LINKTYPE(*LAN) specified in the controller description).
- The controller has been configured with the MINSWTSTS(*VRYON) option specified.

If the reason for forcing an initial connection was because the remote controller is an APPN end node or an APPN network node and the transmission group number is not configured, then canceling a dial-out request will mean that this controller will not be picked for a route by the topology component. The AS/400 system is dependent on an XID exchange in order to negotiate a TG number with the remote controller. This XID exchange can be started by one of the following:

- The remote system forcing the call and the local system answering.
- The controller description being varied off and varied back on again to force the initial connection at vary on time.

Specifying MINSWTSTS(*VRYON) means the AS/400 system will not choose the controller for routing unless the controller is varied on or active. The local system must then dial out at vary on time or following a controller failure to make the controller available for routing. Specifying MINSWTSTS(*VRYON) causes switched connections to be treated as logically nonswitched for purposes of APPN routing.

Automatic Disconnect of a Switched Line

Automatic disconnect of switched connections occurs when there are no sessions currently active for a particular controller. Certain parameters defined during configuration determine which controllers are disconnected and which ones will stay active.

APPN Control-Point Session Support (CPSSN)

Specifies, in the controller description, whether the controller will allow control-point-to-control-point sessions to be established over the transmission group. If *YES is specified, this controller allows control-point-to-control-point session traffic, and a control-point-to-control-point session can be established over the transmission group following a successful XID exchange.

Notes:

1. Once a control-point-to-control-point session is established over a transmission group, then the number of active sessions using the transmission group will never drop to zero (meaning automatic disconnect will not take effect). The only way to drop the connection is to vary off the controller description.
2. Specifying CPSSN(*YES) makes it possible for a control-point-to-control-point session to be established over this transmission group; it does not mean a control-point-to-control-point session will always be established over this transmission group. For example, a control-point-to-control-point session would not be brought up if:
   a. There are parallel transmission groups between two control points, and the control-point session was established over another transmission group.
   b. Both transmission groups indicate control-point-to-control-point session traffic is allowed.
   c. The control points have previously established a control-point-to-control-point session over another parallel transmission group.

A control-point-to-control-point session is not started if the local AS/400 system is an end node and has already established a control-point-to-control-point session with a different network node server. The local AS/400 node type and network servers are defined in the local system attributes. (See "Change Network Attributes (CHGNETA) Command" on page 4-1 for a description of the network attributes.)

After the first XID exchange, the first transmission group will have a control-point-to-control-point session established over it. When the second transmission group is brought up, there will not be a control-point-to-control-point session established over it, so the transmission group will be able to have its session count drop to zero.

Switched Disconnect (SWTDSC)

Specifies for an APPC controller (created using the Create Controller APPC (CRTCTLAPPC) command), whether switched disconnect is allowed. The SWTDSC(*YES) must be specified for a local system to automatically disconnect a switched connection. When the session count (whether end point or intermediate) drops to zero (that is, no more traffic is required over a particular transmission group and the switched disconnect timer has ended), the local system will start an automatic disconnect of the connection.

Notes:

1. Even if switched disconnect has been specified, it is possible that a switched connection will never drop (if control-point-to-control-point sessions are traversing the transmission group) because the control-point-to-control-point session parameter (CPSSN), which controls traffic, takes precedence over the switched disconnect parameter.
2. If a link is between two network nodes and both allow control-point-to-control-point sessions on that link, then the SWTDSC(*YES) parameter is ignored.
3. SWTDSC(*YES) may not be specified if MINSWTSTS(*VRYON) is specified since MINSWTSTS(*VRYON) treats connections as logically nonswitched for purposes of APPN routing.

Also, if two network nodes configure a transmission group as supporting control-point sessions, the switched disconnect parameter will be ignored even if there is no control-point session currently active over the particular transmission group. Therefore, user sessions will not be deactivated because of this transmission group.

Disconnect Timer (DSCTMR)

Specifies for an APPC controller (created using the CRTCTLAPPC command), the amount of time to wait, in seconds, before disconnecting a switched connection. This parameter is only valid if SWTDSC(*YES) is also specified in the controller description.

This timer is set when the controller is made active. When the timer ends, a check is made to see if any sessions are active or pending activation. If there is no session activity, then the automatic disconnect process is started.

There are occasions when a switched line is brought up but there is no trigger to bring it back down. For example, at vary on controller time, an initial XID exchange may be required. After this initial XID exchange, there may or may not be any sessions that need to be established over this transmission group. The disconnect timer will be used to start the line disconnect if there are no active sessions over this transmission group. If a session is established and ended before the timer ends, the line will not disconnect until the timer ends. If the timer ends while the session is active, the line will disconnect when the session ends.

Note: The SWTDSC and DSCTMR parameters are discussed here when used with the Create Controller Description (APPC) command. These parameters are also used with the Create Controller Description (Host) command. The *OS/400* Communications Configuration Reference* discusses these parameters when they are used with the CRTCTLHOST command.

How and When Sessions Are Kept Active for Switched Lines

A link will always remain active if the number of preestablished sessions is configured to be greater than 0; therefore, you should not use a mode with an attached class of service that will select a link with switched disconnect configured. Once a session starts on the link, the link will not be automatically disconnected if the number of preestablished sessions is greater than 0.

The class-of-service descriptions shipped with the system all attempt to use a nonswitched line. The default values for the cost per connect time and cost per byte parameters in the line description are both 0 for a nonswitched SDLC line and are 128 for a switched SDLC line or for an X.25 line. All of the IBM-supplied class-of-service descriptions assign a lower weight value to the rows with 0 specified for cost of connect and cost per byte; therefore, those lines would be chosen over a switched line if all other values were equal. However, if a switched line is the only route available, it will be chosen and a preestablished session count greater than 0 will prevent the link from being automatically disconnected.

Deactivation Considerations

Because switched lines may be automatically disconnected, APPN support must know when a switched line is available for route selection. If a controller's status is vary on pending, APPN interprets this as being active, and uses this link in route calculations (if MINSWTSTS(*VRYONPND) is specified.)

A switched controller may be vary on pending if it has been automatically disconnected or if the other side has varied off its side of the link. In the first case, the link is available for use. In the second case, the link is not available for use; however, APPN will still consider the link available for use during route calculation.

Caution must be used when varying off switched controllers. Both sides of the switched link must be varied off to prevent a link that is not available for use from being chosen for a session route.

Note: If this occurs, the session request may fail with a sense code of 0806002B.

If a session initiation request fails because a call out attempt was unsuccessful, and an operator chose the cancel option to a message issued about the controller, or the operator varied off the affected controller, a sense code of 081F0001 is displayed.

If a switched disconnect is not required on some switched connections, to make sure APPN does not choose connections that are varied on pending, use the MINSWTSTS(*VRYON) option. Then APPN only chooses controllers that are varied on or active. If both connections are configured with INLCNN(*DIAL) and MINSWTSTS(*VRYON), the connection remains active until one controller is varied off or until the link is disconnected.

Using the MINSWTSTS Parameter

The MINSWTSTS parameter offers you flexibility in how AS/400 APPN support treats switched connections. This parameter allows logically switched connections to simulate a nonswitched environment.

For controller descriptions that are set to answer only, setting the MINSWTSTS parameter should be based on how the connection is to be used. If a controller configured as INLCNN(*ANS) is only to be chosen for existing connections, then MINSWTSTS(*VRYON) should be specified. If the connection requires automatic disconnect, then this could be controlled by the system that is dialing out. If the controller configured as INLCNN(*ANS) needs to initiate switched disconnect processing, then MINSWTSTS(*VRYONPND) should be specified.

If two systems are set up to always have a CP-CP session between them over a switched controller, then that controller should have MINSWTSTS(*VRYON) specified. The switched connection is not disconnected if a CP-CP session is active.

AS/400 End Node Configuration When Attached to Multiple Network Nodes

The advantages of having a control-point session between an end node and an adjacent network node need to be weighed against the additional cost which may be incurred in a switched line environment. Because the control-point session is not normally ended, the line remains active even if SWTDSC(*YES) is specified and all user sessions have ended.

An end node can have a transmission group to more than one network node in an APPN network. Each of these network nodes can be entered in the network server list as potential servers; however, an end node can only have one network node actively providing services. An end node establishes no more than one control-point-to-control-point session.

End Node with no CP-CP Session

If the decision is made to not have control-point sessions to any network node, then all the controller descriptions should be configured with CPSSN(*NO). The controller description chosen as a server for an end node must meet the following conditions:

- Be varied on or in varied on pending status (for switched controllers specifying MINSWTSTS(*VRYONPND)) that is the highest in the network server list
- Have the transmission group number configured
- Have the node type configured as a network node

All acquires for unknown locations will be routed to this network node and it will then determine the optimal route through the remainder of the network. Acquires for configured locations that are adjacent to the end node will be routed directly to that adjacent system rather than to the server.

The decision of which entry in the network server list is used to send an acquire operation for unknown locations is as follows:

- If there are no network servers with a control-point name of *ANY, then the network node chosen is the highest in the network server list. The local AS/400 system has a varied on or varied on pending controller description with the same RMTNETID and RMTCPNAME (as specified in the network server list entry).

- If only network node servers with a value of *ANY are in the server list, then all the directly attached systems are examined to determine if that system could be a server. The order that they are analyzed is based on the network qualified control-point name of that system. For example, the system with the lowest network ID and control-point name is examined first, and the highest network ID and control point name is examined last. (Lowest refers to the first character in the EBCDIC collating sequence and highest refers to any later character in that collating sequence.)

  If a system could be a server, and there is a control-point name in the server list with a value of *ANY with the same network ID as the network ID of the attached network node, and that network node is in a varied-on or varied-on-pending status, then that system is chosen. This process continues until a network server is found or until all adjacent systems have been examined.

- If both explicit network node servers and network node servers with a value of *ANY are found in the server list, then the search for an explicit server is done first. If this fails, then the search for a network server with a value of *ANY is done.

If one of the controller descriptions goes to a recovery-pending or failed status and if the second network node that is in the server list is in varied-on or varied-on pending status, it is used as the server until the controller description for the highest network node in the server list returns to varied-on or varied-on pending status. This same processing applies to all network nodes listed in the network server list in network attributes. (A total of five is allowed.)

It is also possible for an end node to use different network nodes for intermediate routing while operating in a switched line environment. This requires additional configuration work but allows one network node to be used for all unknown remote locations and other specific network nodes used for remote locations that are entered in the remote location list.

For example, suppose an end node named EN1 is attached to two network nodes named NN1 and NN2. Both network nodes should be listed in the network attributes as servers and since NN1 is the preferred network node for intermediate routing it is listed at the top position. However it is determined that NN2 should be used for access to remote locations LU1 and LU2. The remote location list support would be used to specify NN2 as the remote control point for remote locations LU1 and LU2. It is not required that LU1 and LU2 are locations that actually reside in NN2. In this scenario the network nodes perform intermediate routing for an end node transparently the same as they do for low-entry networking nodes.

End Node with a CP-CP Session

If the decision is made to have a control-point session to one of the attached network nodes, then all of the controller descriptions should be configured with CPSSN(*YES). The first network node contacted that is in the server list (either explicitly or with an entry of *ANY) will have a control-point session established and will be the end node's server (provided the network node also had CPSSN(*YES) specified).

If the OS/400 software in the adjacent network node is Version 2 Release 1 or vated, and the controller varied off and then on to make the transmission group (TG) available for control-point sessions again.

The connection to the server should be configured as SWTDSC(*NO) and 0 for both COSTCNN and COSTBYTE in the line description. The remaining connections could be switched lines with COSTCNN and COSTBYTE equal to 128 and with SWTDSC(*YES) specified. If these systems are in the server list and the connections are varied on, then the end node can use them as backup servers in case the link carrying the control-point session becomes inoperative. In this case, the new network node server that is selected is the first system in the server list for which an active transmission group (TG) exists between the network node and the end node. The end node then establishes a control-point session to the new network node server in one of two ways:

- If the new network node server is using OS/400 software at Version 2 Release 1 or later, the end node immediately establishes a control-point session to the server.
- If the new network node server is using OS/400 software prior to Version 2 Release 1, then the controller to the network node must be varied off and then varied on to establish a control-point session.

When the conversations over this switched line have ended, the user sessions will be ended. However, the link no longer automatically disconnects because of the presence of the control-point session. If the original network node server is the first node named in the network server list, you may want to establish a control-point session to it again, possibly because this connection is a non-switched link. You must first find and correct the condition that caused the link to fail. Next, vary off the controller to the current network node server. When the link to the original server becomes active, it carries the control-point session again.

Notes:

1. When a control-point session to a current server becomes inoperative, the end node tries to establish another control-point session over an active TG to an adjacent network node in the order specified in the server list. If the next server is over a switched line and is unavailable for a connection, the control-point session attempt will fail. The end node makes an attempt to establish a control-point session with each eligible network node in the server list over all active TGs which support control-point sessions. If all eligible network nodes in the server list are tried and no attempt is successful, the end node waits for five minutes and then tries again to establish a control-point session with each node in the server list. This process repeats until the end node successfully establishes a control-point session with a server. If, during a five-minute wait period, another TG becomes active to a network node in the server list, the end node attempts to establish a control-point session with that node immediately.

2. Two conditions are necessary before an end node can establish a control-point session with a network node:

   - There must be an active TG with the network node
   - The network node must be in the server list for the end node

   The network node can be entered in the server list by:

   - Adding the specific network node control-point name
   - Adding the ***ANY** entry with the appropriate network ID

The end node then tries to establish a control-point session to the network node over any currently active TG.

How and When Sessions Are Kept Active

This section discusses considerations for how and when sessions are kept active for all types of lines, including switched and nonswitched lines.

Sessions are deactivated if the session path through the network includes any link that has either end of the link configured to automatically disconnect. The decision as to whether the session will be deactivated is made by the node at the session end point that controls the session (for a locally controlled session). The decision to deactivate the session is made when the transaction that was using the session detaches from the session.

Preestablished sessions are not needed to keep sessions active. Session end points will keep sessions active if the session route does not include a switched link and if the negotiated locally controlled session limit is not exceeded. If a session does not travel over a switched link, the session end point deactivates the session if it is a locally controlled session and the negotiated locally controlled session limit is currently exceeded.

There may be cases when you require sessions to be deactivated that do not travel over a switched link. For example, sessions may need to travel through an intermediate node that has a limited number of intermediate sessions available. By configuring the locally controlled sessions (LCLCTLSSN) in the mode description as zero (0) at both session end points, all sessions for that mode are deactivated when they are not in use. This method may also be used in order to force APPN to perform route selection when a session is requested. This may be desirable if a lower weight route exists, but a higher weight route was chosen when a session was established previously, possibly because of a link outage in the lower weight route.

Configuration Requirements

Configuration requirements include:

- CP-CP sessions
- Parallel transmission groups
- Defining multiple local location names
- Maximum number of hops
- Class of service and mode definitions
- XID exchange

Control-Point-to-Control-Point Session

Between any two network nodes in a network there can only be one active control-point-to-control-point session. However, some of the transmission groups between network nodes, including those used for intermediate routing, may be configured as not supporting control-point sessions and also as utilizing the automatic disconnect feature. But by allowing a network node to have control-point sessions to more than one network node, the reliability of the network will be improved.

Note: If a network node is adjacent to one or more network nodes, it must have an active control-point-to-control-point session with at least one of the adjacent network nodes.

Control-point-to-control-point session support is configured as follows:

- If the system is a network node, control-point session support is configured in the controller description.
- If the system is an end node, control-point session support is configured in the controller description and also by specifying the serving network nodes in the network node server list in the system network attributes.
- If the system is a low-entry networking node, control-point sessions are not supported.

Parallel Transmission Groups

Parallel transmission groups exist when more than one controller description is varied on with the same remote network ID and control-point name. (The transmission group number will be different.) The connections can be IDLC, SDLC nonswitched or switched, X.25 permanent or switched virtual circuits, or LAN (token-ring or Ethernet), with any combination allowed.

Notes:

1. In order to have parallel transmission groups (TGs), you must have more than one controller configured as there is only one TG per controller.
2. The AS/400 system allows only one controller description to be varied on for a given remote network ID and control-point name that specifies a low-entry networking node (*LENNODE). This is because low-entry networking nodes do not support parallel transmission groups.

If parallel TGs are activated between two systems, explicit TG numbers should be configured in the controller descriptions on both systems (that is, do not specify TMSGRPNBR(*CALC)). If TG numbers of *CALC are used with switched connections, it is possible that the first time a connection is made, the controller on the first TG could have its TG number negotiated to 21 and the controller on the second TG could have its TG number negotiated to 22. If these controllers are varied off and varied on again, the TG numbers negotiated could be reversed. If these TGs have different link characteristics (such as security), it is possible another system in the network could calculate a route and use one of these TGs. Before the BIND is received, the controller could have been varied off and varied on again. Thus, the TG used to establish a session may not match the COS characteristics used by the system calculating the route.

Defining Multiple Local Location Names

Since a single control point can configure multiple local location names, resources associated with a certain location name can be moved without affecting the more permanent control-point name. This is possible because directory services determines the owning control point for a location. Then the topology database and route selection services calculate the path between the origin and destination control points.

Consider an example where applications access a user data file named USERINFO. This data file resides on network node-E and is associated with a location name of USERINFO (locally defined on network node-E). It is determined that network node-D would be a more appropriate system for this file to be located.

1. Using object distribution, network node-E sends the file to network node-D.
2. Network node-E deletes the local location name of USERINFO
3. Network node-D adds USERINFO as a local location name.

These steps allow remote applications to continue to access the data file USERINFO that continues to be associated with the location name USERINFO. Since the control-point tasks recognize that the location name USERINFO now resides in network node-D, and the transport network provides the routing transparently, the user and location do not need to know the actual address of the resource. The functions mentioned in the above steps could be performed from a single display station by using display station pass-through.

Note: By limiting the number of local locations defined on a system, the number of device descriptions that need to be automatically created and varied on by the APPN support for a remote location will be reduced.

Maximum Number of Hops through an APPN Network

A **hop** is a transmission from one location to the next in a network. The maximum number of hops that a session initiation request can take through an APPN network varies depending on the length of the network identifier and control-point names being used in the network.

The session initiation request (BIND) that is sent through an APPN network contains a route selection control vector (RSCV). This RSCV contains information regarding the route that is to be taken through the network.

Using smaller network identifiers and control-point names means more hops can be included in this RSCV. For example, an 8-character network identifier and 8-character control-point names allow the maximum number of hops to be 17. However, if a 1- or 2-character network identifier is specified with 1- or 2-character control-point names, the maximum number of hops is 34.

Note: If a session initiation request cannot proceed because the best route requires more hops than allowed by the RSCV, a sense code (80140005 - RSCV truncated) is returned by the system.

Class of Service and Mode Definitions on Behalf of Other Systems

When an AS/400 network node is acting as a server for an end node or low-entry networking node, then it is necessary for certain definitions to exist on that network node on behalf of these systems. These definitions are needed so that the network node can perform route selection on behalf of the adjacent system it is serving.

- If the adjacent system is an end node that has a control-point to control-point session with the AS/400 network node, then the class-of-service description that is defined on the end node must also be defined on the AS/400 network node.
- If the adjacent system is an end node that does not have a control-point to control-point session, or if it is a low-entry networking node, then the mode description being used by the end node or low-entry networking node must also be defined on the AS/400 network node.

Note: In this case, the class of service description that the network node will use to calculate a route is the one specified in the network node's mode description.

XID Exchange

Figure 8-1 explains how the RMTNETID, RMTCPNAME, EXCHID, and SSCPID parameters are used for different data link protocols when XIDs are exchanged. This table covers only controllers that indicate APPN(*YES) on APPC and host controller descriptions. For all protocols except for SDLC switched, the correct controller description has already been identified before XIDs are exchanged. Therefore, the role of RMTNETID, RMTCPNAME, EXCHID, and SSCPID are for verification only. For SDLC switched connections, the exchange ID sequence is actually used to identify the remote system through one or more of these parameters.

Figure 8-1 (Page 1 of 2). XID Configuration Matrix for APPC and HOST Controller Descriptions

	APPC Controller Description		**Host Controller Description**	
Data Link Protocol	**APPN(*YES), NODETYPE (not *LENNODE)**	**APPN(*YES), NODETYPE (*LENNODE)**	**APPN(*YES), NODETYPE (not *LENNODE)**	**APPN(*YES), NODETYPE (*LENNODE)**
Ethernet	RMTNETID - REQ RMTCPNAME - REQ EXCHID - OPTCV	RMTNETID - REQNU RMTCPNAME - REQNU EXCHID - OPTCV	RMTNETID - REQCV RMTCPNAME - REQCV SSCPID - OPT	RMTNETID - REQNU RMTCPNAME - REQNU SSCPID - OPT
IDLC	RMTNETID - REQ RMTCPNAME - REQ EXCHID - OPTCV	RMTNETID - REQNU RMTCPNAME - REQNU EXCHID - REQ	RMTNETID - REQ RMTCPNAME - REQ SSCPID - OPT	RMTNETID - REQNU RMTCPNAME - REQNU SSCPID - REQ
SDLC Nonswitched	RMTNETID - REQ RMTCPNAME - REQ EXCHID - OPTCV	RMTNETID - REQNU RMTCPNAME - REQNU EXCHID - OPTCV	RMTNETID - REQCV RMTCPNAME - REQCV SSCPID - OPT	RMTNETID - REQNU RMTCPNAME - REQNU SSCPID - OPT
SDLC Switched or SNBU	RMTNETID - REQ RMTCPNAME - REQ EXCHID - OPTCV	RMTNETID - REQNU RMTCPNAME - REQNU EXCHID - REQ	RMTNETID - REQ RMTCPNAME - REQ SSCPID - OPT	RMTNETID - REQNU RMTCPNAME - REQNU SSCPID - REQ
TDLC	RMTNETID - REQNU RMTCPNAME - REQNU EXCHID - OPTNU	RMTNETID - REQNU RMTCPNAME - REQNU EXCHID - OPTNU	n/a	n/a
Token Ring	RMTNETID - REQ RMTCPNAME - REQ EXCHID - OPTCV	RMTNETID - REQNU RMTCPNAME - REQNU EXCHID - OPTCV	RMTNETID - REQCV RMTCPNAME - REQCV SSCPID - OPT	RMTNETID - REQNU RMTCPNAME - REQNU SSCPID - OPT
X.25 PVC	RMTNETID - REQ RMTCPNAME - REQ EXCHID - OPTCV	RMTNETID - REQNU RMTCPNAME - REQNU EXCHID - OPTCV	RMTNETID - REQCV RMTCPNAME - REQCV SSCPID - OPT	RMTNETID - REQNU RMTCPNAME - REQNU SSCPID - OPT

Figure 8-1 (Page 2 of 2). XID Configuration Matrix for APPC and HOST Controller Descriptions

	APPC Controller Description		**Host Controller Description**	
Data Link Protocol	**APPN(*YES), NODETYPE (not *LENNODE)**	**APPN(*YES), NODETYPE (*LENNODE)**	**APPN(*YES), NODETYPE (not *LENNODE)**	**APPN(*YES), NODETYPE (*LENNODE)**
X.25 SVC	RMTNETID - REQ RMTCPNAME - REQ EXCHID - OPTCV	RMTNETID - REQNU RMTCPNAME - REQNU EXCHID - OPTCV	RMTNETID - REQCV RMTCPNAME - REQCV SSCPID - OPT	RMTNETID - REQNU RMTCPNAME - REQNU SSCPID - OPT

Notes:

1. The following list explains the meaning of each abbreviation used for identification and verification in the XID configuration matrix.

Abbreviation	**Description**
REQ	This parameter is required and it is used for identification and for XID or ACTPU verification.
REQCV	This parameter is required and is conditionally verified. If this parameter is received during the XID exchange, then it is verified.
REQNU	This parameter is required, but it is not used for XID verification. (This parameter is the correlation between the remote location list entries and the controller descriptions.)
OPT	This parameter is optional. If this parameter is specified in the controller description, then it is used for verification at XID or ACTPU time.
OPTCV	This parameter is optional and conditionally validated. That is, if the remote system sends in a valid block number (not '000'X or 'FFF'X), then the EXCHID is verified if this parameter has been supplied in the controller description.
OPTNU	This parameter is optional, but it is not used for XID verification.

2. The SSCPID parameter, as used for APPC controller descriptions (that is, **not** host controller descriptions) is not discussed here since it is used in the ACTPU sent by the AS/400 system (and not used for any local verification).

A Host System in an APPN Network

A System/370 or System/390 host may participate in an APPN network. However, there are a number of considerations when planning an APPN network including a host. These considerations include:

- Prerequisites
- Host routing support
- Independent and dependent locations

Prerequisites

To connect a System/370 host as a peer within an APPN network, it must run VTAM V3R2 and NCP V4R3, or V5R2, or a later release or version.

Host Routing Support

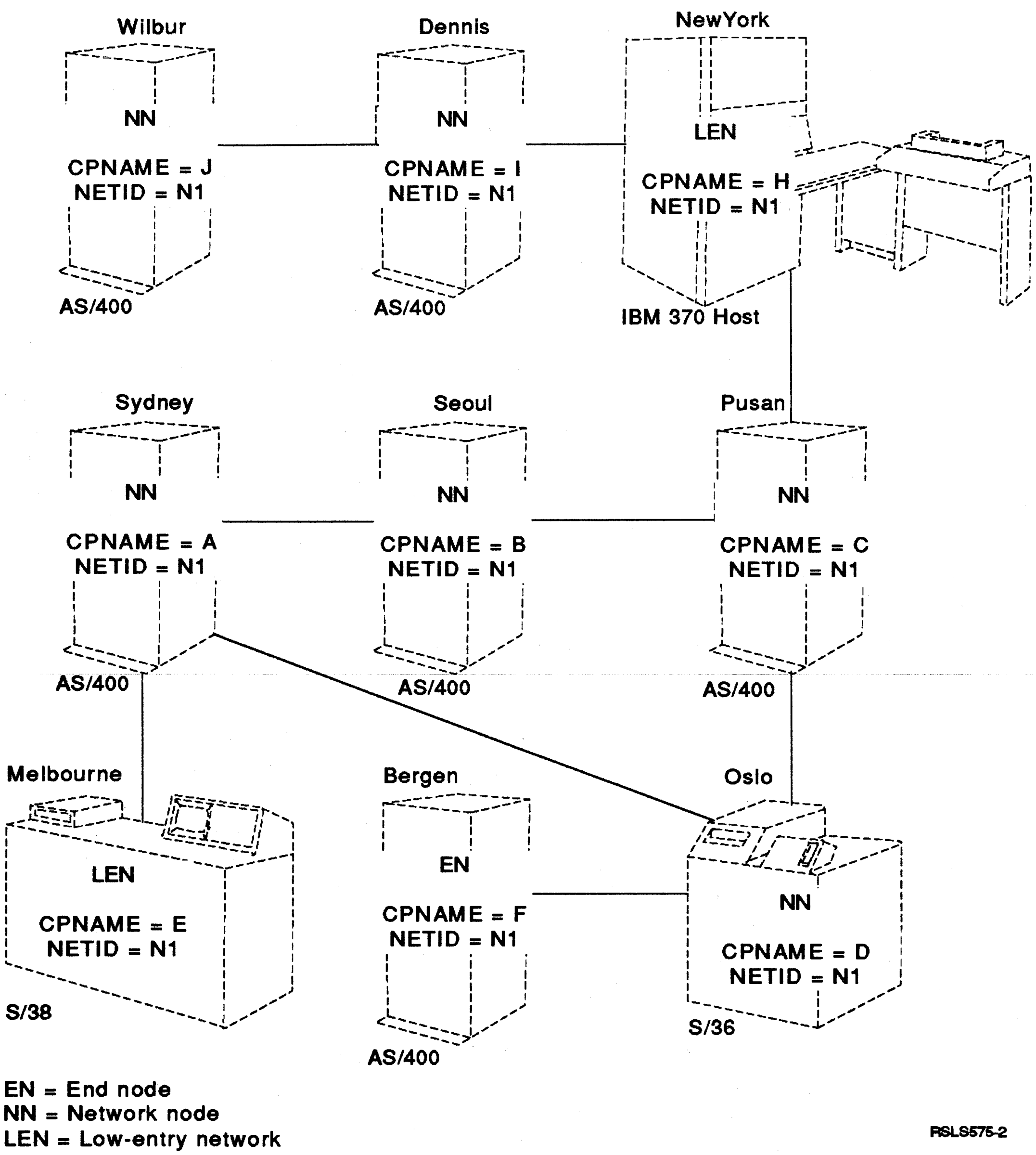
A host is not capable of supporting a CP-CP session with another node in an APPN network. A host can be thought of as a low-entry networking node in an APPN network. Therefore, all locations with which a host may wish to communicate must be defined (at the host) as remote locations that reside in the AS/400 system that is directly attached to the host. All location names that reside in the System/370 network, or locations that are in a different APPN network that the System/370 network provides routing to, must be defined by the AS/400 system that is directly attached to the host. The locations must be shown as residing in the host using the remote location list support.

See Figure 8-2 on page 8-19. If location N1.Bergen wants to establish a session with N1.J, using remote location name N1.Wilbur, then N1.C must have previously defined N1.Wilbur as a remote location name that resides in a remote control point N1.H in its remote location list. The remote control-point name in the controller description on N1.C that describes N1.H must match the remote control-point name in the remote location list entry for N1.Wilbur.

The search process is as follows:

1. N1.F sends a search request to N1.D (the network server for N1.F) to search its directory database and, if Wilbur does not exist, a broadcast search request is sent to the network. (If Wilbur exists, then N1.D sends a directed request to N1.C.)
2. The search request is returned with a positive response from N1.C (who has Wilbur configured, within its directory database, as residing within the N1.H).
3. An RSCV (containing routing information from N1.F to N1.H) is calculated by N1.D and returned to N1.F.
4. N1.F sends a BIND (with source and target names Bergen and Wilbur, respectively) with the attached RSCV. The RSCV provides the routing information to enable the BIND to reach the host.
5. The host provides a 'virtual route' through which the BIND may pass to N1.I. The host does not read the RSCV, but must have Wilbur defined as a location owned by N1.I.
6. N1.I sends a directed or broadcast search, depending on the directory information in N1.I. The search finds the location Wilbur and receives a positive response from N1.J.
7. N1.I creates a new RSCV that specifies the route information for the completion of the session establishment.

Note: The session request from Bergen to Wilbur consists of an RSCV from N1.F to N1.H, a virtual route through the host networks (one or more VTAMs and NCPs), and an RSCV from N1.I to N1.J.



| *Figure 8-2. Advanced APPN Network Including an IBM 370 Host. The APPN network illustrated is really two networks (with network ID N1). The host may participate in either of the two networks as a low-entry networking node. However, the host is also capable of routing data between the two networks.*

Independent and Dependent Locations

This section addresses the capabilities and related configuration requirements when one or more System/370 hosts have VTAM V3R2 and the communications controllers have NCP V4R3 or V5R2. This allows the transport network of the AS/400 system to send a BIND directly to the host for local APPC applications. If the host-attached AS/400 system is configured as a network node and APPN(*YES) is specified in the host controller description (on the host-attached AS/400 system), then it may provide intermediate routing into the host subarea network for nodes that are not adjacent to the host and are initiating work for APPC applications. With the level of host support mentioned above, the node type 2.1 nodes or the host may initiate sessions for APPC locations. *Independent* is used to describe this level of support.

For non-APPC type sessions (such as 3270 device emulation, SNUF, DHCF) the sessions must be started by the system directly attached to the host network. In these environments the host must always send the BIND (even though the node type 2.1 may request it) and is also responsible for error-recovery. *Dependent* describes the level of support that requires the host to always send the BIND.

Note: The same communications line may be shared between independent sessions and dependent sessions on the AS/400 system when attached to a host. The independent location may establish a session to and through the host while the dependent location may only establish a session directly with the host.

Nodes that are not directly attached to the host network may establish a display station pass-through session to the system directly attached to the host and then from the attached node the dependent session may be initiated. Note that all node types 2.1 are required to function as dependent locations with any release of VTAM prior to V3R2 and any release of NCP prior to V4R3 or V5R2.

There are no configuration requirements to enable a host to participate within an APPN network when independent support is required. However, when the dependent support is utilized some configuration requirements need to be considered.

A device description must be manually created when that device description defines communications for a dependent location. This is related to host requirements for communications with peer systems. A host requires that the location address (LOCADR) of a peer system be 00 before it allows that peer system to send a BIND to the host. If the LOCADR is not specified as 00, then only the host may send a BIND. Therefore, when including a host in an APPN network, it is necessary to create a device description, with a LOCADR not equal to 00, *if* that device description is for a dependent location. APPN automatically creates all devices with a LOCADR=00.

Generic Location Naming and *ANY Routing

To reduce the configuration requirements when the AS/400 system is attached to the host network, there are some options that may be used by the AS/400 system that is directly attached to the host.

Generic Location Naming

Generic naming is in an APPN network which includes a System/370 host with VTAM V3R2 and NCP V4R3, or V5R2 (see “Prerequisites” on page 8-17). The host appears as a low-entry networking node to the adjacent AS/400 system. It does not support CP-CP sessions. Therefore there may be many location names that need to be explicitly configured (only by the adjacent AS/400 system).

Generic location naming allows you to configure a remote location name ending in an asterisk (*). The use of the '*' implies that any name, with the same characters preceding the '*', will match this entry in the location list. Specifying a generic location name in the location list saves much work in defining remote locations. For example, all remote location names for Sydney may be specified, with a single entry in the remote location list of CP Name B, as SYD* and then all session requests for locations beginning with 'SYD' will be routed to there.

In this example, there must be no other CP in the network that owns a location name that starts with the letters 'SYD'. A positive directory search response found with a generic definition appears the same to the search origin as a location name that was completely spelled out.

*ANY Routing

An extension of generic location naming is the ability to specify a *ANY entry in a remote location list. With this any session request for a remote location name that is not found with a specific match or a generic location is assumed to reside in the CP specified (in the remote location list entry) for *ANY.

The following rules must be observed, or unpredictable results may occur.

- Only one *ANY entry may be defined in an APPN network. That is, only one node in the network may specify that all unidentified locations reside in a particular node; only one node can specify a *ANY entry in its remote location list. The node that has specified the *ANY entry in its remote location list responds positively when it receives a search request. However, this response is not used if an explicit or generic match is found elsewhere in the network.
- A *ANY entry should only be defined for locations in an adjacent node.
- The *ANY entry is intended for use with a host attached to an APPN network. *ANY entries should be used only if necessary.
- *ANY entries should not be used if a System/36 is included as a network node in the same APPN network.

Coexistence with System/36 APPN

The AS/400 system can be added to an APPN network with System/36 network nodes without disruption. The AS/400 system will not degrade the function of a System/36 APPN network. On the other hand, a System/36 used as a networking node in an AS/400 network may degrade the function of the AS/400 network, depending on the AS/400 system functions being used. A Program Temporary Fix (PTF) is required for a System/36 to coexist in an APPN network with AS/400 systems using Version 2 Release 1 or later software. For information about the PTF, contact your IBM representative.

Differences between System/36 and AS/400 System APPN

The following items are differences between the AS/400 and System/36 support of advanced peer-to-peer networking.

- A System/36 network node does not allow a connection to another network node which can be used for intermediate sessions without having a control-point session over the connection. Therefore, it is not possible to have a switched line between a System/36 network node and an AS/400 network node, or another System/36 network node that is activated for routing intermediate session traffic and is automatically disconnected when the session ends.

- Parallel transmission groups are not supported by the System/36.

- The System/36 does not allow transmission group and node characteristics to be specified by the user. There are default values that are used for these characteristics. The only class of service available to the System/36 user is a class-of-service definition that calculates a route with the least number of nodes and links. The System/36 user cannot create the equivalent of an AS/400 class-of-service description. In addition, the System/36 only supports a transmission priority of medium.

- A remote location name of *ANY should not be used in the AS/400 remote location list when there are System/36 network nodes in the network. Use of *ANY in this environment may result in the failure to find a location even though the location exists in the APPN network because System/36 does not support *ANY directory entries. (See "Directory Services" on page 2-8 for a description of generic routing; see "Defining APPN Location Lists" on page 4-4 for information on defining locations.)
- System/36 requires the exchange of the entire topology database after being connected to another network node. This exchange results in more traffic over the line than would occur between AS/400 network nodes.
- The AS/400 system allows multiple local locations at each control point whereas System/36 allows only one local location name (which is also used as the local control-point name).
- System/36 can be a low-entry networking node or an APPN network node, but not an APPN end node.
- A network of System/36s using APPN may not be as large as a network of AS/400 systems using APPN. This is because of System/36 internal size limitations.
- The maximum number of intermediate sessions at the System/36 is 100 and is not configurable. The maximum number on the AS/400 system is 2000 and is configurable in the network attributes.
- When a session is requested from the System/36, the remote location name is used to find the location. Therefore, the System/36 cannot distinguish between locations that have the same remote location names but that are in different networks. On the AS/400 system, the remote network ID is used as well as the remote location name.

  If a System/36 network node is included in an APPN network, all of the nodes in that network should use the same network identifier.

  AS/400 network nodes using Version 2 and later software can provide additional routing services to nodes that cannot supply the remote network ID when they request sessions. For more information, see "Multiple Network Coexistence" on page 8-38.
- The topology and directory databases are saved across initial program loads on the AS/400 system. On the System/36 they are deleted and are built again when the system is connected with the network again.
- A System/36 does not support connection networks. Therefore, an AS/400 system that wants to participate in a connection network must not have the System/36 listed as a possible server in its network server list.
- A System/36 cannot be used to link two adjacent APPN networks that have different network IDs.

Directory Services Search Processing for End Nodes and Network Nodes

Directory services (DS) searches are processed according to a logic that enables it to make decisions about questions such as whether a directed or broadcast search is required or whether a search is required at all. The logic for these decisions will vary according to the node type: end node or network node.

In this section, the decision trees of both end node and network node search processing are described.

End Node Search Processing

Once a session is requested to a remote location, the end node first searches its local directory database. The search results in one of the following:

- The remote location is found.
- The remote location is not found.

Refer to Figure 8-3.

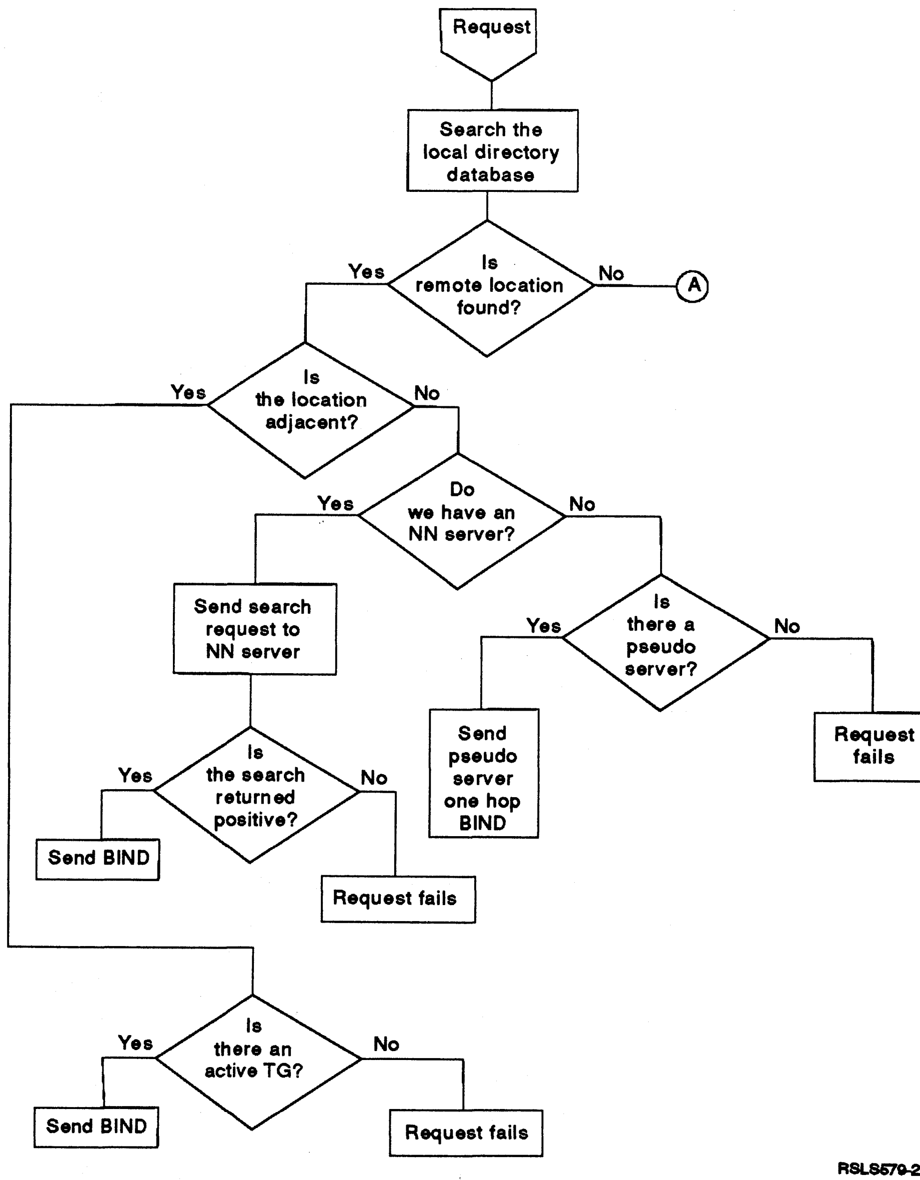


Figure 8-3 (Part 1 of 2). End Node Decision Tree

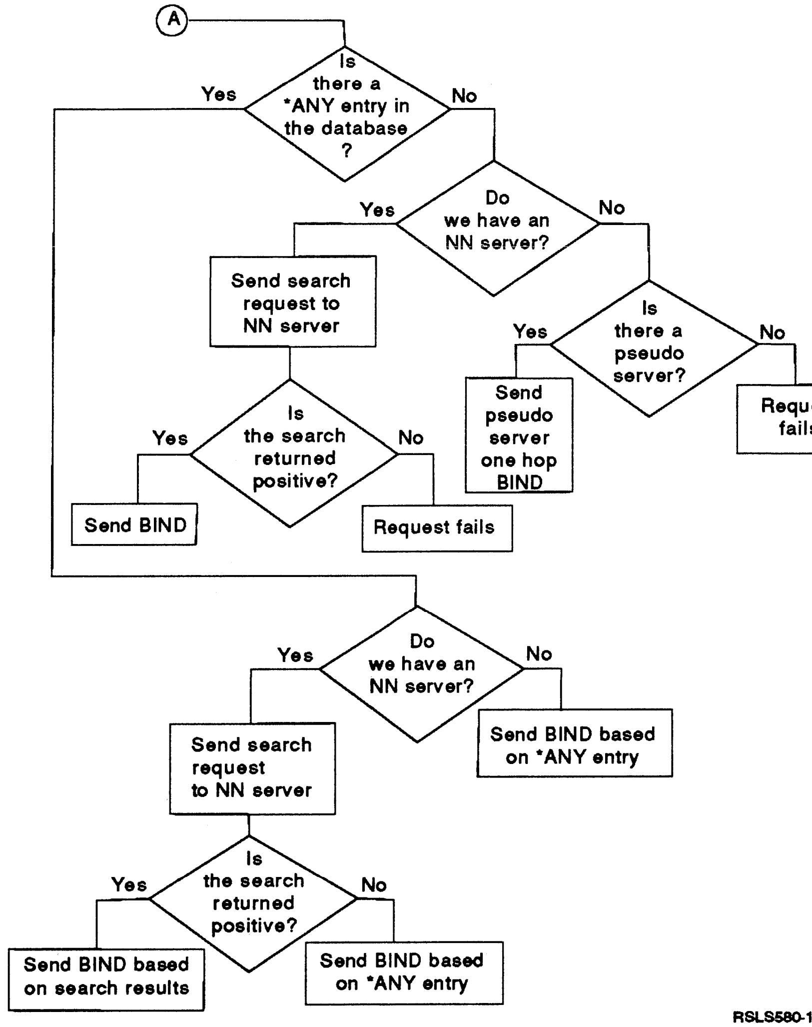


Figure 8-3 (Part 2 of 2). End Node Decision Tree

If the Remote Location is Found...

If the remote location is found in the directory database of the end node (either an explicit match or a generic match, other than the *ANY generic name, cause the remote location to be found), then directory services (DS) checks whether the location is an adjacent node with an active link to the local end node.

If yes: Then the end node sends a BIND to establish the session directly with the node in which the remote location resides.

If not: Then the end node checks to see if there is a network node server defined. If there is a network node server (with CP session to the end node), then it is capable of performing the necessary network searches on behalf of the end node. The end node sends the search request to the network node server. If the network node server finds the remote location, it returns the search request to the end node along with an RSCV.

If the end node does not have a CP-CP session with a network node, then it attempts to calculate a 'one-hop' route to any adjacent network node that will act as a 'pseudo-server' in performing search requests for the end node (provided it is defined in the network node server list). If a suitable network node pseudo-server is found, the BIND is sent in the same way as a low-entry networking node (or end node without CP-CP session capability), to a pseudo server.

If no pseudo server is found then a sense code

```
FFFF0003 - Network node services were not available
```

is sent.

This sense code is common and occurs when an end node, although having CPSSN(*YES) specified in one or more controller descriptions, does not have the network node defined in its network node server list.

If the Remote Location is not Found...

If the remote location requested is not found in the end node's directory database, then directory services searches for a *ANY match.

A *ANY Entry is found...: If a *ANY entry is found, then the end node checks to see if it has a network server (with CP session established) defined and, if so, sends the search request to the server (since the server may be able to find an explicit match for the remote location).

If there is no network node server defined, then the BIND is sent to the node specified by the *ANY entry in the directory database.

A *ANY Entry is not found... If a *ANY entry is not found, then the logic followed by directory services is the same as if the location is found but is not adjacent and active. That is, if a network node server exists, it is used to send a search request. If not, the end node attempts to find a pseudo-server to perform the search.

Network Node Search Processing

Network node search processing must provide the logic to support session requests from either an end node, for which the network node is a server, from another network node forwarding a search request, or from the local node. If a request is from an adjacent end node, the network node stores any information that the end node sends regarding other links to which it is adjacent; if a request is from the local node, there is no need to store (or cache) such information (end point TG vectors). A **cache** is a high-speed buffer storage used to reduce access time of frequently used instructions and data.

However, first the directory services checks the topology database to find out if the requested location name is a CP name of a node in the network. If it is, no search request need be performed by DS and session activation is performed more quickly than if a search of the network was required. If the requested location name is not a CP name, DS searches its local directory database. It will find that either:

- The remote location is found.
- The remote location is not found.

Refer to Figure 8-4 on page 8-26.

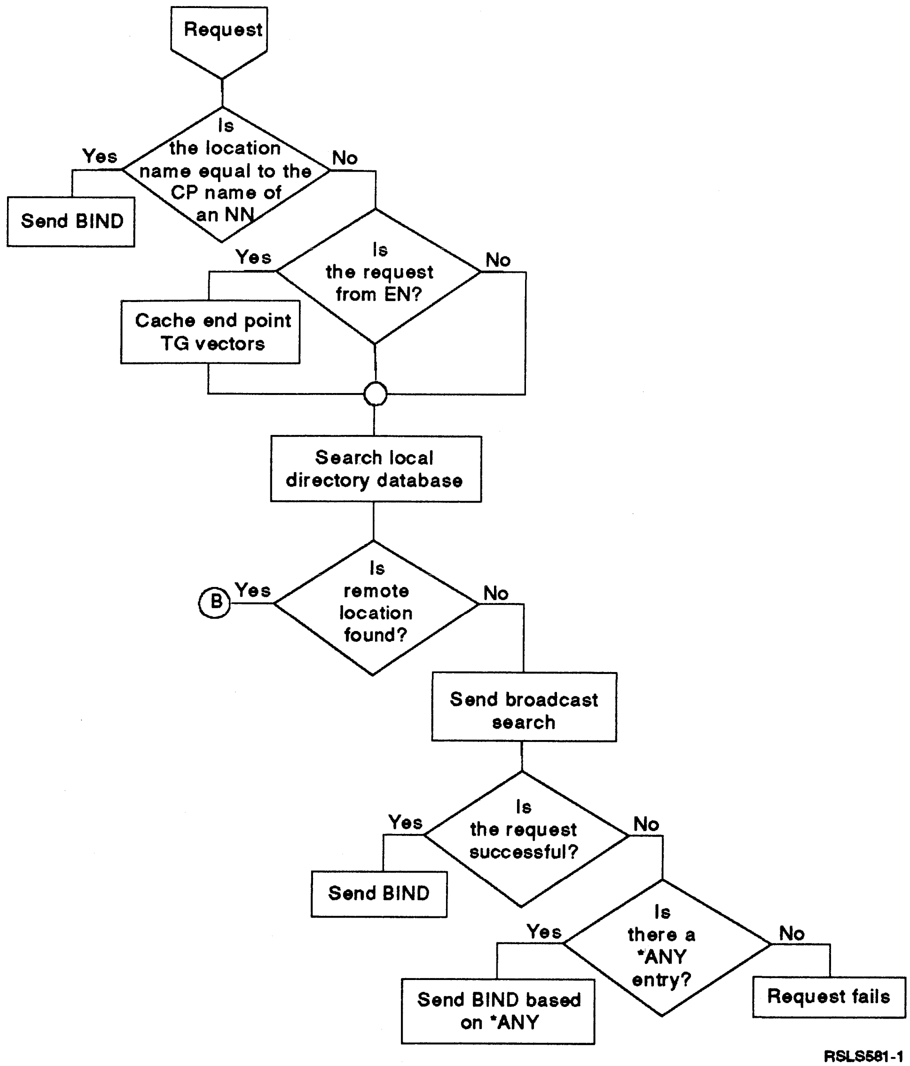


Figure 8-4 (Part 1 of 2). Network Node Decision Tree

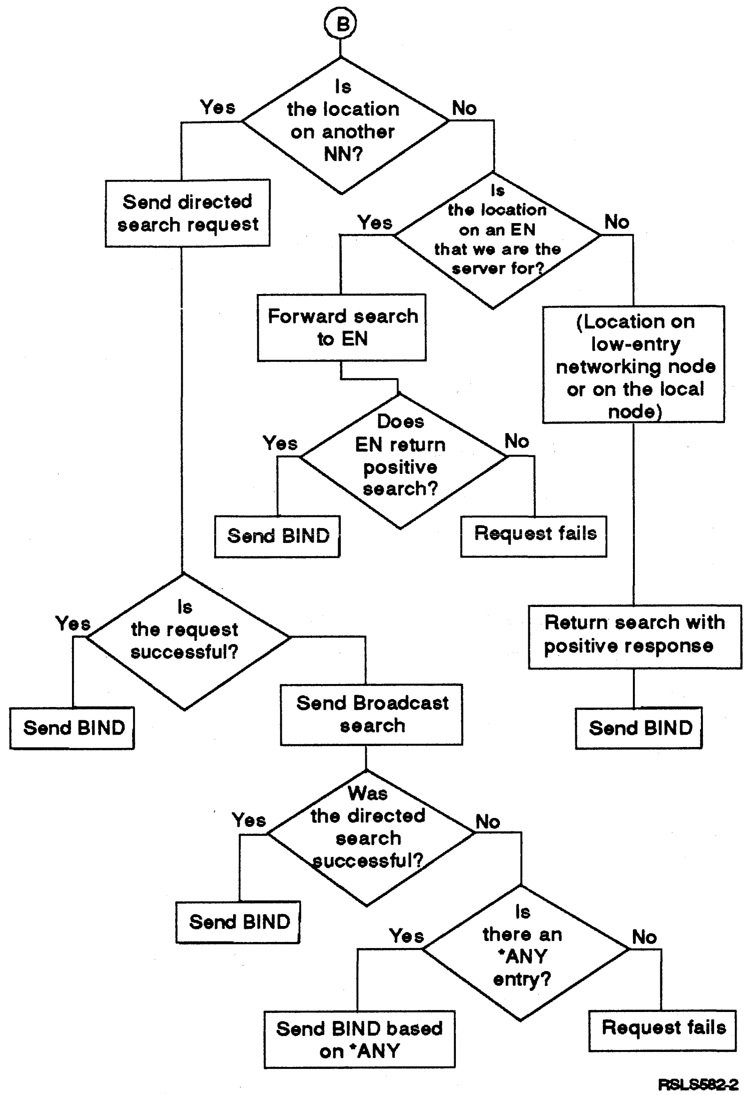


Figure 8-4 (Part 2 of 2). Network Node Decision Tree

If the Remote Location is not Found...

If the remote location is not found in the local directory database of the network node (which may be performing serving functions for an adjacent end node), a broadcast search is sent to the network to find the remote location.

If the Remote Location is Found...

If the remote location is found in the local directory database of the network node, one of three cases apply:

- The remote location exists on a network node other than the local node. The network node sends a directed search to the node in which the requested remote location resides.
- The remote location exists on an end node (with CP-CP session). The network node sends the search request to the end node (in order to check that the remote location still resides on that end node). The end node returns the search request along with information about its other links (end point TG vectors) that the network node returns with the search request so that the initiating node or server may store it and use it in route calculation.

- The remote location exists on a low-entry networking node (no CP-CP session) for which the local node may perform some server functions (or exists on the local network node). The network node returns the search request with a positive response. The initiating node will calculate the preferred route through the node that returned the request.

Topology Routing Services (TRS) Considerations

Once directory services has been performed by a network node, the next function that is automatically performed by APPN is determining the route (determining the links and node that need to be traveled) to reach the remote location found by directory services.

Topology routing services (TRS) contains the following:

- Topology database
- Route selection services
- Class of service

The functions provided by topology routing services (TRS) each time a session is requested to a remote location (either by a network node or an end node using the services of a network node) are summarized, in the order in which they are performed within the local network node. The network node checks for the following:

1. That the COS table specified is valid
2. Which intermediate nodes are acceptable
3. Which links (TGs) are acceptable
4. That the route selection control vector (RSCV) is valid

For each of the checks performed by TRS, an appropriate sense code is sent. Therefore, for problem determination, a discussion of each check and the sense codes are provided.

Once TRS has performed all of the checks listed above and decided which routes are acceptable to a destination node, it calculates the route and creates an RSCV.

COS Table is not Valid (Sense Code - 08610002)

When a session is requested to a remote location, a COS table is specified (through the mode) to be used for route selection. The first function of TRS is to check that the COS table is valid (that is, exists as an entry in the COS database for the local network node).

The COS database reflects information about a COS table. When a class-of-service (COS) table is created, updated or deleted, a message is sent to TRS, informing it of the change to COS information.

If the COS table is valid, TRS continues to perform its next function. If the COS table is not valid, then the following sense code is issued:

```
08610002- COS is not valid
```

The two most likely cases in which the COS table specified in the mode may not exist are:

- When an end node uses the services of a network node server.

When an end node requests a session with a remote location, it sends a search request to the network node server. With the search request the end node specifies a mode (and therefore the COS to be used in route selection). The COS table specified by the end node must exist on the network node server. If not, the server responds that the COS is not valid.

Network node servers also perform route selection for low-entry networking nodes. However, a low-entry networking node cannot send a COS to the server (since COS tables are only available on AS/400 systems). In this case, the mode specified by the low-entry networking node must exist on the server and the mode on the server specifies a COS to be used.

- When a COS table is deleted.

  If a mode points to a particular COS table to be used, and that table is deleted from the system, then the mode may still be used but TRS will indicate that the COS table is not valid.

Intermediate Nodes are not Acceptable (Sense Code - 80140001)

An intermediate node is considered to be acceptable if the weight for the node (as determined by the COS table specified) is less than infinite. That is, the node must satisfy the conditions in at least one row of the COS table in order to be acceptable.

If the above condition is not satisfied, the following sense code is returned:

```
80140001 - route not available
```

Links (TGs) are not Acceptable (Sense Code - 80140001)

In the same way that intermediate nodes must be acceptable, the links along any chosen route to the destination node must also be acceptable. A link is considered acceptable if all of the following are true:

- The link is active.
- The link is not in a 'disable pending' status (System/36).
- The local node has received consistent information about the link from other nodes in the TG network.
- The weight determined by comparing the link characteristics and the COS specified is not infinite (that is, a row of the COS table is selected).

If any of the above conditions are not satisfied, the following sense code is returned:

```
80140001 - route not available
```

RSCV is not Valid (Sense Code - 80140005)

Once TRS has determined which nodes and links are acceptable, it calculates, from those acceptable, the most preferred route to the destination end node. The most preferred route is specified in a control vector called the route selection control vector (RSCV).

An RSCV is a 255 byte vector that is attached to the BIND at session initiation. The RSCV is passed by the initiating system (or network node server for an end node without CP session capability) onto the first adjacent node specified in the RSCV; this node then passes the BIND with RSCV onto the next node specified in the RSCV (and so on until the BIND reaches the destination end point).

Since the RSCV is 255 bytes (a finite number), there is a physical limitation to the number of hops over which a BIND may be routed from source to target. The limitation is dependent on the length of the CP names specified for each node in the route. (The shorter the names, the more possible hops.)

Therefore, TRS checks to see that the RSCV created has not been truncated because of the 255 byte limit; if it has, then the BIND is not sent and the following sense code is returned:

```
80140005 - RSCV truncated
```

Removal of Obsolete Topology Entries

The APPN topology database is automatically checked for obsolete entries, and such entries are deleted from the database. An obsolete entry is considered to be an entry for an inactive node or TG which has not been updated for 15 days. Every AS/400 node in an APPN network maintains information on the age of each entry in the topology database. The age count is reset to 15 days whenever an entry has a local status change (such as a link becoming active or inactive), if an update is received from the node the entry describes, or an update is received from another network. Once a day, the APPN component in an AS/400 system checks the age count for each entry in the topology database. Any node or TG entry that has not been updated for 15 days is deleted from the database. TG entries that are associated with deleted node entries are also deleted.

To prevent the local system from being deleted from the topology databases in other nodes in the network, the local system broadcasts a topology database update about itself once every five days and every time a CP-CP session is established with another network node.

It is possible for obsolete entries to remain in the database for periods longer than 15 days. One or more of the following conditions can cause nearly obsolete entries to be reset, or previously deleted entries to be created again:

- A System/36 in the network always requests the entire topology database, and transmits the entire topology database to the rest of the network.
- A new network node entering the APPN network requests and transmits the entire topology database.
- If the APPN topology database on a system is deleted and created again, the system enters the network as a new node, and the entire topology database is requested and transmitted. For example, the database is deleted and created again if the Change Network Attributes (CHGNETA) command is used to change the system from an end node to a network node.

Pacing Considerations

There are two ways to influence data flow on LU-LU sessions:

- Pacing
- Transmission priority (discussed in "Transmission Priority Considerations" on page 8-32)

Pacing controls the flow of data and prevents queues from growing too large. The AS/400 system uses three methods to control flow of data:

- Withholding pacing windows
- Adjusting the window size

- Slow down the sending application

Withholding Pacing Windows

If the receiving application has not issued a receive operation, incoming data is copied out of link buffers into data buffers and queued. The sender requests another window by setting the pacing indicator to on in the first request/response unit (RU) for a new window. If the RU with the pacing indicator is queued as unrequested data, a pacing response (allowing another window) is not sent. This continues until the RU is removed from the queue and passed to the application in the receive operation.

Withholding pacing responses effectively blocks the sending application from sending any more data, after the current window is used.

Adjusting Window Size

The tuning window size may be adjusted as required. (The tuning window size is controlled by adjusting the INPACING and OUTPACING parameters in the mode description.) The next window granted to the sender is determined by the request large window indicator and queue condition. The request large window indicator is set by the sender in the first RU of a window, when a larger window is desired. The queue condition is determined by comparing the queue length to the tuning window size and classified as SHORT, OK, or LONG. The queue length is equal to the number of queued RUs at the time the first request of new window is received. The queue condition is determined as follows:

SHORT Queue length less than tuning window size

OK Queue length equals tuning window size

LONG Queue length greater than tuning window size

How window size is changed:

Effect	How Window is Changed
Increased	Increased by the value of `tuning window size minus queue length`, when the queue condition is SHORT and the request large window indicator is specified.
Decreased	Decreased by the value of `queue length minus tuning window size`, when the queue condition is LONG.
Unchanged	The window is not changed when the queue condition is OK, or the queue condition is SHORT and the request large window indicator is not specified.

Note: For intermediate sessions, the window always increases and decreases by one (1).

Slowing Down the Sending Application

The OUTPACING parameter in the mode description is used to slow down the sending application. OUTPACING limits the maximum number of frames on a given session that may be queued by the data link control. The data link control queue depth for a session will not exceed the value of `(2 * OUTPACING) - 1`. A small OUTPACING value can be specified for large batch jobs to help improve interactive response time when both types of jobs share the same line.

Both the OUTPACING parameter and the INPACING parameter in the mode description affect the transmission rate at an intermediate node. The location that initiates the session establishment (BIND request) is responsible for setting the values of the parameters.

Transmission Priority Considerations

Each time a session is established, a class of service (COS) is specified so that the appropriate route may be calculated from session source to session target. A transmission priority is also specified with each COS. Therefore, each time a session is established, it takes on a priority that determines the order data from that session is sent (when competing against data from other sessions). If there is only one session established from a system on a particular controller description, then transmission priority is not relevant (though it is still specified through the COS).

This section discusses how transmission priority works in the AS/400 system and considerations for its use.

Note: Transmission priority relates to a particular APPC controller description. If multiple controller descriptions share a line, each controller schedules its data independently of the others. Performance may be effected since all controller descriptions compete for bandwidth on the line.

Transmission Priority Scheduling

Prior to APPN, the SNA transport layer (node type 2.1) sent data over the physical line on a first in, first out basis. Therefore, large batch jobs, for example, used a large portion of the line and slowed down the response time for other users, in particular, interactive users.

With the APPN additions to node type 2.1, users may specify three priorities for data transmission:

- High
- Medium
- Low

The relationship between the transmission priority and the algorithm for scheduling data to be sent to a remote system is discussed in the following sections.

Priority Number

In order to give an appropriate level of service to a session that is using a particular transmission priority, a relative number called a priority number is assigned to the data.

Each of the transmission priorities is assigned a priority number as follows:

- High=0
- Medium=50
- Low=200

Arrival Number

The priority number is not sufficient to define the scheduling algorithm since it may be possible for a low-priority session to never send any data as there may always be higher-priority traffic. Therefore, the algorithm also includes an arrival number. Each time data is queued to be sent across a link, the arrival number is assigned in addition to the priority number. The arrival number is assigned each time a new unit of data is queued. The arrival number the data is assigned is one higher than the previous data unit queued.

Service Number

The algorithm is defined as follows:

```
service number = priority number + arrival number
```

The service number provides the sequence for sending data. Units of data with the lowest service number are sent across the line first. The later a unit of data is queued, the higher the arrival number, and the earlier the data is queued, the lower the arrival number.

For example, a low priority unit of data is queued and assigned an arrival number of 1 and a priority number of 200. Therefore, its service number is 201. A high priority unit of data is assigned a priority number of 0 and an appropriate arrival number. Therefore, any high priority unit of data with an arrival number of less than 201 is sent before the low priority unit of data originally queued. In this example, 201 high priority units are sent before the original low priority unit of data is sent. In this way, data may be prioritized, but not to the extent that some data is never sent.

Limiting Medium and Low Priority Frames

In addition to priority queuing, the maximum number of outstanding medium and low priority frames is limited to prevent the high priority response time from being degraded. When the response time of a high priority frame is unacceptable, the maximum number of outstanding medium and low priority frames is reduced. After all high priority jobs have completed, the limit on medium and low priority frames is removed.

Positioning Transmission Priority

Positioning transmission priority includes:

- Flow of data from an APPC program to the communications line
- Transmission priority queue
- Intermediate routing

Data Flow from APPC

Refer to Figure 8-5 on page 8-34 for the data flow and terminology for this discussion.

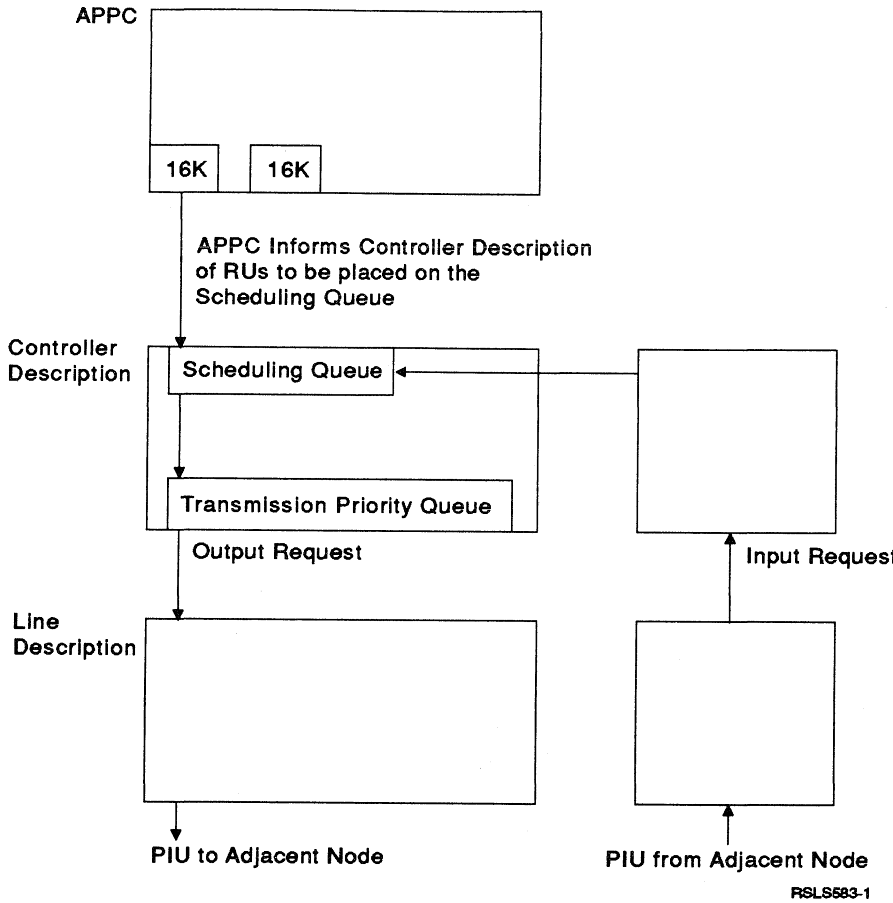


Figure 8-5. Data Flow From an APPC Program and Transmission Priority

In Figure 8-5, data travels from an APPC program buffer through a controller description, to a line description, and across the appropriate physical line. Transmission priority is managed by two queues within the controller description: the scheduling queue and the transmission priority queue. When a node is performing intermediate routing, data flows in from the line up to one controller description and is passed across to the scheduling queue for a different controller description so that priority processing may be performed.

APPC contains two buffers where multiple requests from an APPC program (for example, multiple SEND requests) can be stored before being sent down to the associated controller description. In this example, the APPC buffer size is 16K bytes. The buffers are divided into request units (RUs). The size of an RU for SDLC can be 2K, in which case there would be 8 RUs per APPC buffer. When, for example, an APPC-program SEND is received into an APPC buffer, APPC informs the appropriate controller description of RUs to be placed on the scheduling queue.

Scheduling Queue

A new RU is placed at the bottom of a scheduling queue within a particular controller description. The scheduling queue receives all of the RUs from APPC and places them into frames on the transmission priority queue. The frames are called **path information units (PIUs)** and represent the SNA information sent across the link. (Data link control (DLC) is also added by the DLC layer of SNA.)

Note: If the RU size (specified in the mode description) matches the PIU size (specified in the controller description), then RUs are not divided into multiple PIUs. Therefore, it is recommended that you use the *CALC default for the RU size parameter in the Create Mode Description (CRTMODD) command. *CALC allows APPN to make the RU size for a session match the PIU size specified in any controller description that a session uses (no matter which adjacent remote system a session is established to or through).

The scheduling queue schedules RUs such that each session gets a turn to send an RU to the transmission priority queue and is not given another turn until all other sessions have had a turn. This scheduling ensures that large batch jobs, which send many RUs, cannot have each RU sent sequentially to the transmission priority queue while locking out RUs from other jobs associated with the same controller description.

The scheduling queue allows only a limited number of RUs to be sent to the transmission priority queue. The transmission priority queue allows a limited number of PIUs (SNA frames) to be sent down to the line description at one time. The line description handles PIUs sent from several controller descriptions and sends them across the link as they are received.

Transmission Priority Queue

The transmission priority queue applies an algorithm where RUs entering the queue have a service number calculated and are placed in the queue according to the sequence of that service number.

The number of PIUs on the transmission priority queue per APPC program transaction is not allowed to exceed an upper limit. When one of the PIUs associated with a single transaction is sent to the line description, it may be replaced by another PIU from the same transaction. This process continues until there are no more RUs and PIUs to be sent.

Intermediate Routing

When a node is performing intermediate session routing, it must handle PIUs received from adjacent nodes. The PIU is received by the line description and sent to the controller description. The controller description reassembles the PIU if the PIU size does not equal the RU size. The controller description can send an RU to the scheduling queue of the appropriate outgoing controller description. The process is reversed when a controller description receives an RU from APPC.

Once the RU is on the scheduling queue, it is treated the same as if it were sent from APPC.

The priority of the intermediate routing data is sent along with the BIND, so the system doing intermediate routing knows what priority to assign to any frame of data (PIU) received from an adjacent node (without referring to the COS table on the intermediate node).

Multiple Network Connectivity

Additional network connectivity support is available on the AS/400 system with Version 2 Release 1 and later of the OS/400 licensed program.

Connecting Networks Together

The AS/400 system using Version 2 Release 1 and later of the OS/400 licensed program has the following capabilities:

- An AS/400 system can locate resources, establish sessions, and provide intermediate routing capabilities to systems that have a different network identifier than the local AS/400 system. It is not necessary for the remote LUs to be manually defined in the local system.
- Previously separate APPN networks that have different network IDs can be connected with no configuration changes other than in the connecting AS/400 network nodes.
- A large or hard-to-manage APPN network can be broken into multiple networks that are easier to manage.
- The APPN class-of-service functions are retained when a session is established across networks with different network IDs.

Notes:

The following are considerations for linked networks:

1. The multiple network routing capability does not allow routing through an intermediate network.
2. An SNA subarea network does not accept a session initiation request (BIND) that originates from a node with a network ID that is different from the network ID of the node (adjacent to the SNA subarea) that routes the request to the SNA subarea.

The following figure shows how two network nodes in adjacent APPN networks that have different network IDs can link the two networks together. Any node in either network can establish a session with any other node in either network. Network nodes 3 and 7 provide routing services inside their own networks and also to the connected network.

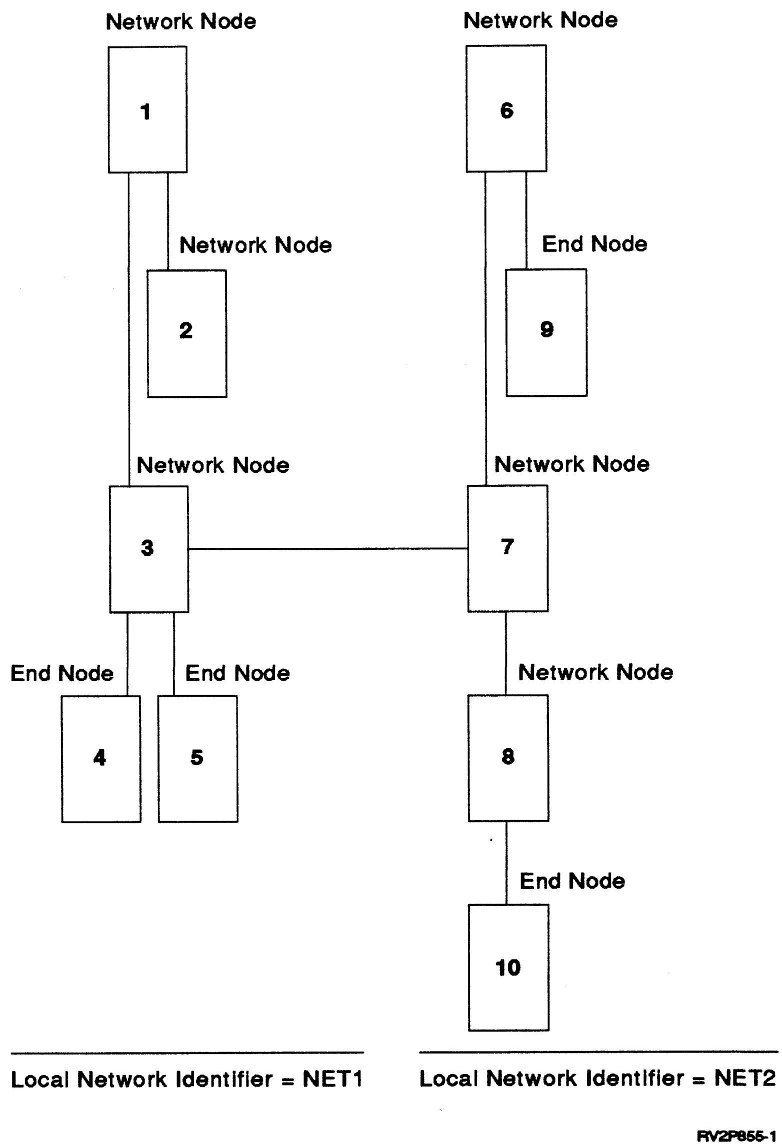


Figure 8-6. AS/400 Systems Used to Link Two APPN Networks

Multiple Network Class-of-Service Considerations

An APPN network may have class-of-service and transmission priority descriptions which do not coincide with the class-of-service and transmission descriptions in an adjacent network. If the networks are connected together by AS/400 network nodes with software at Version 2 Release 1 and later, unknown or conflicting class-of-service and transmission priority descriptions are handled as follows:

Unknown Class-of-service: If the class-of-service on the request is unknown to the receiving AS/400 network node, the class-of-service defined in the default mode description on the receiving network node is used.

Mismatched Transmission Priority: The transmission priority of the receiving AS/400 network node is used if the transmission priority descriptions are different.

An alert is sent which shows the class-of-service descriptions of the two networks which have conflicting transmission priority descriptions.

The unknown class-of-service or mismatched transmission priority is replaced in the response which is returned to the node from which the class-of-service or transmission priority originated.

Multiple Network Coexistence

A system which cannot provide a network ID when it requests a session initiation requires special configuration if the destination location is not in the same network as the network node providing services to the requesting system. Systems not providing a network ID could be a personal computer using DOS, a System/36, or a System/38. If there is no network ID specified with the destination location, the AS/400 network node assumes that the destination is within the local network.

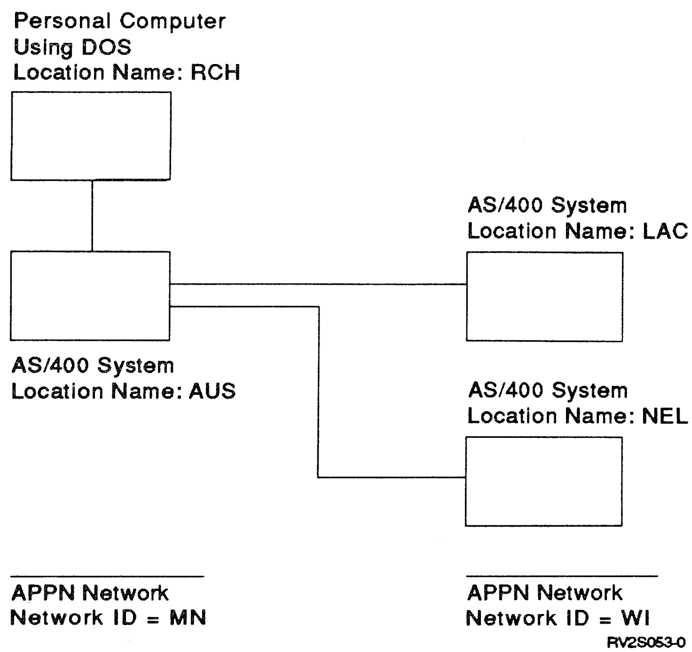


Figure 8-7. Multiple Network Coexistence

If the destination is located in a different network than the AS/400 network node, one of the following procedures can be used:

APPN Remote Location List: Locations that exist in a non-local network can be explicitly configured on the AS/400 network node (must be using Version 2 Release 1 or later software) that links the two networks together.

In the local network, a directory entry must be defined which associates the destination location with the network node that links the adjacent network to the local network. This directory entry must have the local network ID configured as the remote location network ID. Also, the adjacent linked network ID must be configured as the remote control-point network ID.

CP sessions between the local network node and the network node in the adjacent linked network, that are specified as the remote control point in the directory entry, must not be active. However, CP sessions can still be active between the local network node and other network nodes in the adjacent linked network.

In Figure 8-7, if the personal computer using DOS (location name, RCH) needs to establish a session with the AS/400 system (location name, LAC), the following directory entry is added to the remote location list of the network node with the location name of AUS:

APPN Remote Locations

Remote Location	Remote Network ID	Local Location	Remote Control Point	Control-Point Net ID	Secure Loc
LAC	MN	AUS	LAC	WI	*NO

Note: The CP session between location AUS and LAC must not be active, but a CP session between AUS and NEL could be active.

Generic Entry in the APPN Remote Location List: Locations that exist in a non-local network can be reached by specifying a generic routing entry (*ANY) in the APPN remote location list on the AS/400 system (must be using Version 2 Release 1 or later software) that links the two networks together.

In Figure 8-7 on page 8-38, if the personal computer using DOS (location name, RCH) needs to establish a session with the AS/400 system (location name, LAC), the following directory entry is added to the remote location list of the network node with the location name of AUS:

APPN Remote Locations

Remote Location	Remote Network ID	Local Location	Remote Control Point	Control-Point Net ID	Secure Loc
*ANY	MN	AUS	LAC	WI	*NO

The method of using a generic routing entry has the advantage that no CP-CP sessions need to be made inactive when a session is established between the networks. A disadvantage of this method is that requests for locations unknown within the local network are routed to the remote network, which can add to network congestion.

Note: If either of the above procedures is used, all destination locations must have unique location names if they are to be accessed by a system that cannot supply a network ID when requesting a connection. That is, systems in linked networks must not have the same location name.

Multiple Network Configuration Considerations

The APPN enhancement at Version 2 Release 1 and later allows adjacent APPN networks with different network IDs to be connected, but this connectivity does not extend to non-adjacent networks. The connection possibilities are shown by the following figure.

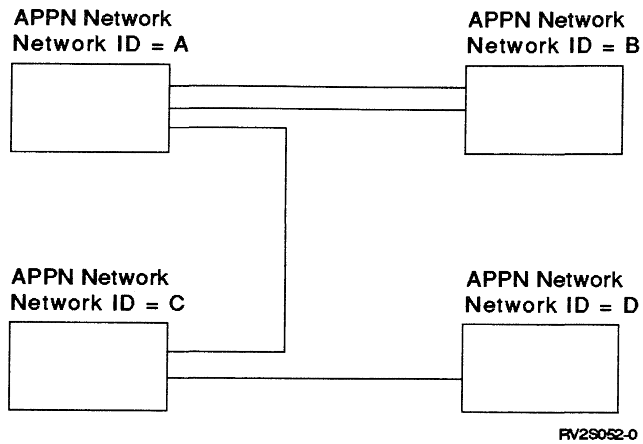


Figure 8-8. APPN Network Connectivity

Communications between locations in networks A, B, C, and D are possible as follows:

- Any location in network A can communicate with any location in networks A, B, or C, but not in D.
  - Note the two connections between networks A and B. More than one node in adjacent APPN networks can establish links between the networks.
  - Locations in network A cannot communicate with locations in network D because network C is an intermediate network between A and D. The APPN multiple network connectivity does not provide the function to connect two networks through an intermediate network. Only adjacent networks can be connected.
- Any location in network B can communicate with any location in networks A or B, but not in networks C or D.
- Any location in network C can communicate with any location in networks A, C, or D, but not in network B.
- Any location in network D can communicate with any location in networks C or D, but not in networks A or B.

Note: If the AS/400 network node in the adjacent network that provides the link to the local network is using software prior to Version 2 Release 1, the following applies:

1. A PTF is required on the AS/400 network node (using software prior to Version 2) in the adjacent network.
2. If the Display APPN Information (DSPAPPNINF) command is used on an AS/400 node using software prior to Version 2 that is directly attached to an AS/400 node using Version 2 or later software that is in a different network, the AS/400 using Version 2 or later is displayed as an end node.

Chapter 9. Displaying APPN Information

AS/400 APPN information is a utility that provides you with information that can be used to assist in problem solving, tailoring your class-of-service descriptions, determining where locations are in your network, and many other ways that will assist you in your network maintenance.

APPN information is accessed either by selecting option 6 (Display APPN information) on the Network Management menu or by typing the Display APPN Information command (DSPAPPNINF) and pressing F4 (Prompt).

You may also access APPN information by typing the DSPAPPNINF command along with associated parameters on the command line of any display.

The degree to which the information supplied by APPN information is used depends on your needs. The following list provides the most common uses of the available information.

Network configuration information (*TOPOLOGY)
: Provides you with the information you can use to tailor your class-of-service descriptions. It displays the characteristics of all the nodes and links in your topology database.

  The network topology information also displays whether a link is active or inactive. This information may be useful in determining the cause of network problems.

Directory function (*LCLNODE)
: This function can be used to determine what locations are known by the local node. It shows locations configured on the local node and locations found by previous searches.

Session function (*SSN)

  Endpoint sessions
  : This function can be useful when a session problem occurs, or when performance is unsatisfactory, to determine the route taken by a session. This function, when used with the *TOPOLOGY function, can assist you in identifying the location of a problem in the network.

  Intermediate sessions
  : This function provides the only method of determining whether there are active intermediate sessions being routed through the local system. You may, for example, want to vary off a controller, but need to know whether it is being used for intermediate sessions. This function shows which controller descriptions are associated with an intermediate session. It also shows the origin and destination of the session, as well as additional information.

APPN Information Display

The Display APPN Information display is shown when you select option 6 (Display APPN information) on the Network Management menu or type the command DSPAPPNINF on a command line and press F4 (Prompt). The information to be displayed, printed, or stored depends on the options you select. Additional options are displayed, based on previous options selected.

In this example, the type of information (*SSN), session type (*INMSSN), and the output (*OUTFILE) selected, show the following display:

```
                      Display APPN Information (DSPAPPNINF)

 Type choices, press Enter.
   Type of information . . . .  *SSN              *TOPOLOGY, *LCLNODE, *SSN
   Session type. . . . . . . .  *INMSSN           *ENDPNT, *INMSSN
   Controller description. . .  *ALL              Name, *ALL
   Output. . . . . . . . . . .  *OUTFILE          *, *PRINT, *OUTFILE
   File to receive output. . .  APPNINMSSN        Name
     Library . . . . . . . . .    APPNLIB         name, *LIBL, *CURLIB
   Output member options:
     Member to receive output.  *FIRST            Name, *FIRST
     Replace or add records. .  *REPLACE          *REPLACE, *ADD

                                                                      Bottom
 F3=Exit  F4=Prompt  F5=Refresh  F12=Cancel   F13=How to use this display
 F24=More keys
```

Figure 9-1. Display APPN Information

You may display, print, or save information for the following values:

Type of information

*TOPOLOGY
: Displays or prints all nodes in your topology database along with their characteristics. For each node, the set of link destination nodes and the characteristics of the connecting links are also displayed. *TOPOLOGY is the default.

*LCLNODE
: Displays or prints the contents of the local directory. This includes the local node and the names of all locations in the node. In addition, the directory includes the names of all remote control points for which there is information along with their locations.

*SSN
: Displays or prints information about sessions for which the local node is a session endpoint. You may also display or print information about intermediate sessions.

Nodes
: Specifies which set of nodes is displayed. This parameter is valid only when INFTYPE(*TOPOLOGY) is specified.

*ALL
: Specifies that information about all nodes in the network is provided. *ALL is the default.

*ACTIVE
: Specifies that only information about nodes which have at least one active link to a link destination is provided.

To be considered active, the link must have at least one logical connection (transmission group) with an active status as viewed by both the origin system and the link destination.

*INACTIVE
: Specifies that only information about nodes which have no active link to a link destination(s) is provided.

Session type
: This prompt is displayed only if *SSN is specified as the type of information. It can be one of the following values:

*ENDPNT
: Specifies that information about sessions for which the local node is a session endpoint is to be provided. *ENDPNT is the default.

*INMSSN
: Specifies that information about intermediate sessions being routed through the local node is to be provided.

Job
: This prompt is displayed only if *ENDPNT is specified for session type. Specify the qualified name of the job for which session information is to be provided. If * is specified for the OUTPUT parameter, and no job name is specified, a list of the most recent APPC jobs that are using APPN configurations and have run since the last initial program load (IPL) of the system is displayed. You may then select a job name from the displayed list.

The qualified job name consists of the following fields:

Job name
: Displays the name portion of the job name.

User
: Displays the user portion of the job name.

Number
: Displays the number portion of the job name.

If you specify *PRINT or *OUTFILE for the OUTPUT parameter, and you do not specify a job name, the session information for all logged jobs is printed or stored in a specified output file.

Controller description
: Specifies the controller description name for which intermediate session information is to be provided. This parameter value is only valid if INFTYPE(*SSN) and SSNTYPE(*INMSSN) are specified.

*ALL
: Specifies that intermediate session information for all controllers is to be provided. *ALL is the default.

controller description name
: Specify the name of the controller description for which intermediate session information is to be provided.

Output
: Specifies how output is to be handled. Valid values are:

*
: The requested data is shown on the display station. This is the default.

*PRINT
The requested data is printed on a designated printer.

*OUTFILE
The requested data is stored in an output file on the system.

File to receive output
Specify the name of the file that is to receive the APPN information. If this file does not already exist, a new file, with the specified name, will be created. This parameter is only displayed when *OUTFILE is specified for the OUTPUT parameter.

Library
Specify the name of the library that contains the file. Can be one of the following values:

*LIBL
Specifies that the library list is to be searched for the output file. *LIBL is the default value.

*CURLIB
Specifies that the output file is stored in the current library.

library name
Specifies the name of the library in which the output file is stored.

Four **DDS**[1] record formats are defined for output file processing when you specify OUTPUT (*OUTFILE). The formats correspond to the four types of APPN data that can be retrieved:

- Topology
- Directory
- Intermediate sessions
- Endpoint sessions

Although several members can be saved in an output database file, only one type of data can be saved per file. For the record formats for the four types of data, see Appendix D, "Record Formats for Output Files."

Member to receive output
Specifies the name of the member to receive output. This prompt is only displayed if *OUTFILE is specified for the OUTPUT parameter. Valid values are:

*FIRST
Specifies that APPN data is stored in the first member of the specified output file. The member name is the same as the file name. *FIRST is the default.

member name
Specify the name of the output member into which the APPN data is stored.

The data can replace existing data or be added to an existing member.

1 Data description specifications (DDS) describe a database or device file that is entered into the system in a fixed form. The description is then used to create files.

*REPLACE

If the member exists, the old information is cleared and the new information is added. *REPLACE is the default.

*ADD

If a member exists, the new information is added to the end of the existing member.

The displays that follow are shown if * is specified for the OUTPUT prompt. The requested data is displayed on the display station.

Display Topology Information

The following display is shown when *TOPOLOGY is specified for the type of information on the APPN Information display. It displays the list of all nodes in the topology database along with their characteristics. You may display all the nodes attached by a link to a displayed node by selecting option 5 (Display link destination nodes), and pressing the Enter key.

If the local node is an end node, only the local node is shown on the Display Nodes display.

```
                                 Display Nodes
                                                          System:   RCHAS377
Position to  . . . . . . . .   ________  Control point
  Network ID . . . . . . . .     ________

Type options, press Enter.
  5=Display link destination nodes

     Control    Network    Node  Routing       Route Addition  Valid Routing
Opt  Point      ID         Type  Congestion      Resistance     Information
 _   PCRCH01    PCNET      *EN
 _   PCRCH02    PCNET      *EN
 5   RCHAS110   RCHNET     *NN   High                255          Yes
 _   RCHAS320   RCHNET     *NN   Low                 128          No
 _   RCHAS338   RCHNET     *EN
 _   RCHAS377   RCHNET     *NN   Low                 128          Yes
 _   RCHAS536   RCHNET     *NN   Low                 128          Yes
 _   RCHAS796   RCHNET     *NN   Low                   0          Yes
 _   VN1        RCHNET     *VN   Low                 128          Yes
 _   RCHAS001   NEWNET     *NN   Low                   0          Yes
                                                                       More...
F3=Exit   F5=Refresh   F6=Print information   F12=Cancel
```

Figure 9-2. Display Nodes

Field definitions:

Position to

Specify all or part of the control-point name at which to start the list of control-point names.

Control point

Displays the control-point names of all the nodes in the topology database.

Network ID

Displays the network identifier (ID) associated with the control-point name.

Note: A network node that has a different network ID than the local system network ID is a network node that connects two adjacent APPN networks. In this case, routing congestion, route addition resistance, and valid routing information do not have meaning because they apply to single routes. The route selection process builds two separate routes between two APPN networks. Therefore, the route going through the network node connecting the two networks is not a single route.

Node Type
: Indicates whether the node is a network node (*NN), an end node (*EN), or a virtual node (*VN).

Routing Congestion
: Can be one of the following values:

  HIGH
  : Indicates that this node is congested with intermediate session traffic.

  LOW
  : Indicates that this node is not congested with intermediate session traffic.

  This field applies to network nodes and virtual nodes; no value is displayed for end nodes.

Valid Routing Information
: Indicates with a Yes or No whether the routing information for this control point is valid. If a NO is indicated for a control point, this means that the control point is not used for routing. This field applies to network nodes and virtual nodes; no value is displayed for end nodes.

  Note: If a system in the APPN network was a network node at one time, but has changed to an end node, then some nodes in the network may indicate that the routing information for this control point is not valid. This simply means that the other nodes in the network will not use the end node for intermediate session routing purposes. In Figure 9-2, RCHAS320 could be an example of this occurrence.

Route Addition Resistance
: Displays a value from 0 through 255 that indicates the relative desirability of using this node in a route. The lower the value, the more desirable this node is for intermediate routing. This field applies to network nodes and virtual nodes; no value is displayed for end nodes.

When option 5 (Display link destination nodes) is selected on the Display Nodes display, the Display Link Destination Nodes display is shown. It displays the list of all nodes attached to a link to the selected node, and also displays certain characteristics of the links. You may display additional characteristics of a displayed link by selecting option 5 (Display link characteristics), and pressing the Enter key.

```
                        Display Link Destination Nodes
                                                              System:   RCHAS377
Origin control point . . . . . . . . . . . :   RCHAS110
  Origin network ID . . . . . . . . . . . :     RCHNET

Position to . . . . . . . .    ________  Control point
  Network ID . . . . . . . .     ________

Type options, press Enter.
  5=Display link characteristics

      Control    Network      TG      Link       Disconnect    Valid Routing
Opt   Point      ID         Number    Active     in Process     Information
 _    RCHAS377   RCHNET         1     Yes         No              Yes
 5    RCHAS536   RCHNET        21     Yes         No              Yes
 _    RCHAS796   RCHNET        21     No          No              Yes




                                                                         Bottom
F3=Exit   F5=Refresh   F6=Print information   F12=Cancel
```

Figure 9-3. Display Link Destination Nodes

Field definitions:

Origin control point
: Displays the control-point name of the node selected on the Display Nodes display for which the link destinations are to be displayed.

Origin network ID
: Displays the network ID of the node selected on the Display Nodes display for which the link destinations are to be displayed.

Position to
: Specify all or part of the control point name at which to start the list of control-point names.

Control Point
: Displays the control-point names of the nodes attached by a link to the selected node.

Network ID
: Displays the network identifier (ID) associated with the control-point name.

TG Number
: Displays the transmission group (TG) number that identifies a logical connection on this link.

Link Active
: Indicates whether the local system views this link is active.

  To be considered active, the link must have at least one logical connection (transmission group) with an active status as viewed by both the origin system and the link destination.

Disconnect in Process
: Indicates whether the link is being disconnected.

Valid Routing Information
: Indicates whether the routing information for this link is valid. If NO is indicated for a link, this means that the link is not used for routing.

Note: When you display the status of the links connecting network nodes, you may find some inconsistencies. For example, the link destination nodes are requested for RCHAS110 (your system node) on Figure 9-2 on page 9-5. Figure 9-3 shows the list of all nodes attached by link to RCHAS110. On Figure 9-3 on page 9-7, the link between RCHAS110 (the origin control point) and RCHAS536 is shown as active (Yes). If the link between RCHAS110 and RCHAS536 goes down, a display of link destination nodes using RCHAS110 as the origin control point would show a link active status of No. However, if you were to request, on your system, the link destination nodes using RCHAS536 as the origin control point, the status of the link from RCHAS536 to RCHAS110 may still show a link active status of Yes.

This is caused by the inability of control point RCHAS110 to update the status information at control point RCHAS536 because there is no alternative route from RCHAS110 to RCHAS536. If alternative routing is available, a topology database update is sent to RCHAS536, and the link active status is accurate.

If inconsistencies do occur, you should assume that the values shown when your system is the origin control point (RCHAS110 in this example) are accurate.

If you selected option 5 (Display link characteristics) on the Display Link Destination Nodes display, the Display Link Characteristics display is shown. It displays additional characteristics of the selected link.

```
                         Display Link Characteristics
                                                     System:   RCHAS377
Link origin control point . . . . . . . . . . . . :  RCHAS110
  Link origin network ID . . . . . . . . . . . . . :    RCHNET
Link destination control point . . . . . . . . . . :  RCHAS536
  Link destination network ID  . . . . . . . . . . :    RCHNET
Controller . . . . . . . . . . . . . . . . . . . . :

Link speed . . . . . . . . . . . . . . . . . . . . :  4M
Cost per connect time  . . . . . . . . . . . . . . :  0
Cost per byte  . . . . . . . . . . . . . . . . . . :  0
Security . . . . . . . . . . . . . . . . . . . . . :  *NONSECURE
Propagation delay  . . . . . . . . . . . . . . . . :  *LAN
User defined:
  1  . . . . . . . . . . . . . . . . . . . . . . . :  3
  2  . . . . . . . . . . . . . . . . . . . . . . . :  128
  3  . . . . . . . . . . . . . . . . . . . . . . . :  128

                                                                 More...
Press Enter to continue.

F3=Exit   F5=Refresh   F6=Print information   F12=Cancel
```

Figure 9-4 (Part 1 of 2). Display Link Characteristics

```
                       Display Link Characteristics
                                                             System:   RCHAS377
Link origin control point  . . . . . . . . . . . . . :   RCHAS110
  Link origin network ID . . . . . . . . . . . . . . :     RCHNET
Link destination control point . . . . . . . . . . . :   RCHAS536
  Link destination network ID  . . . . . . . . . . . :     RCHNET
Controller . . . . . . . . . . . . . . . . . . . . . :

Signaling information (hex). . . . . . . . . . . . . :
```

Figure 9-4 (Part 2 of 2). Display Link Characteristics

Field definitions:

Link origin control point
: Displays the control-point name of the node at the origin of the link.

Link origin network ID
: Displays the network ID of the node at the origin of the link.

Link destination control point
: Displays the control-point name of the node at the destination of the link.

Link destination network ID
: Displays the network ID of the node at the destination of the link.

Controller description
: Displays the name of the controller description object associated with this link. This field is left blank if your system is not the link origin, or link destination, or the controller description has been deleted.

Link speed
: Displays the speed of the link in bits per second.

Cost per connect time
: Displays a value from 0 through 255 that represents the relative cost of connection for this link.

Cost per byte
: Displays a value from 0 through 255 that represents the relative cost per byte of sending and receiving data on this link.

Security
: Displays the security level of the link.

- *NONSECURE: Unsecure
- *PKTSWTNET: Packet-switched network
- *UNDGRDCBL: Underground cable
- *SECURECND: Secure conduit
- *GUARDCND: Guarded conduit
- *ENCRYPTED: Encrypted
- *MAX: Guarded conduit, protected against physical and radiation tapping

Propagation delay
: Displays the level of propagation delay for this link.

- *MIN: Negligible
- *LAN: Local area network
- *TELEPHONE: Terrestrial
- *PKTSWTNET: Packet-switched network

- *SATELLITE: Satellite
- *MAX: Long

User defined (1,2,3)
: Each field displays a value from 0 through 255 as defined by the user.

Signaling information
: Contains the data link control signaling information needed to be accessed through a virtual node.

Display Location Information

The following display is shown when *LCLNODE is specified for the type of information on the Display APPN Information display. It displays the local network node and the names of all locations residing in that node.

```
                          Display Local Locations
                                                          System:   RCHAS377
Local control point  . . . . . . . . . . . :   RCHAS377
  Local network ID . . . . . . . . . . . . :     RCHNET

Position to  . . . . .   _______

Location       Type of Entry
LOC1           Home
LOC2           Home
LOC3           Home
LOC377         Cached






                                                                      Bottom
Press Enter to continue.

F3=Exit   F5=Refresh   F6=Print information
F11=Display remote control points   F12=Cancel
```

Figure 9-5. Display Local Locations

Field definitions:

Local control point
: Displays the control-point name of the local node.

Local network ID
: Displays the network ID of the local node.

Position to
: Specify all or part of the location name at which to start the list of location names.

Location
: Displays the names of all the locations residing in the local node.

Type of entry
: Can be one of the following:

  Home
  : This location name was configured in the APPN local location list in the local system.

Cached
: This location was configured as either the control-point name or as the default local location name in the local system, using the CHGNETA command.

The following display is shown when F11 (Display remote control points) is pressed from the Display Local Locations display. It displays the names of all remote control points for which information exists in the local directory.

You may select option 5 (Display locations) for a selected control point. Type your options and press the Enter key.

```
                        Display Remote Control Points
                                                          System:   RCHAS377
Local control point  . . . . . . . . . . . :    RCHAS377
  Local network ID . . . . . . . . . . . . :      RCHNET

Position to  . . . . . . . .    _______    Control point
  Network ID . . . . . . . .      _______

Type options, press Enter.
  5=Display locations

Opt      Control Point      Network ID     Node Type
 _          PCRCH01           PCNET            *EN
 _          PCRCH02           PCNET            *EN
 _          RCHAS110          RCHNET           *NN
 _          RCHAS320          RCHNET           *NN
 _          RCHAS338          RCHNET           *EN
 5          RCHAS536          RCHNET           *VN
 _          RCHAS796          RCHNET           *NN
 _          RCHAS001          NEWNET           *NN
                                                                    Bottom
F3=Exit   F5=Refresh   F6=Print information   F12=Cancel
```

Figure 9-6. Display Remote Control Points

Field definitions:

Local control point
: Displays the control-point name of the local node. This is the name that was displayed for the *Control point* prompt of the Display Local Locations display.

Local network ID
: Displays the network ID of the local node. This is the same ID displayed for the *Network ID* prompt of the Display Local Locations display.

Position to
: Specify all or part of the control-point name at which to start the list of control-point names.

Control Point
: Displays the control-point names of all remote control points for which information exists in the local directory.

Network ID
: Displays the network ID associated with the control-point name.

Node Type
: can be one of the following values:

*NN
: The node is a network node

*EN
: The node is an end node

The following display is shown when option 5 (Display locations) is specified for one or more of the control points on the Display Remote Control Points display. It displays the names and entry type of the locations residing in the selected control point.

```
                              Display Locations
                                                       System:   RCHAS377
Remote control point . . . . . . . . . . . . . . . :   RCHAS536
  Remote control point network ID . . . . . . . . :     RCHNET

Position to  . . . . . . . .   _______     Location
  Network ID . . . . . . . .    _______


Location      Network ID     Type of Entry
LOC110         RCHNET        Cached
LOC338         RCHNET        Registered
LOC377         RCHNET        Cached
LOC536A        RCHNET        Home
LOC536B        RCHNET        Home
LOC536C        RCHNET        Home
LOC536D        RCHNET        Home
LOC536E        RCHNET        Home
                                                                  Bottom
Press Enter to continue.

F3=Exit   F5=Refresh   F6=Print information   F11=Sort by type of entry
F12=Cancel
```

```
                              Display Locations
                                                       System:   RCHAS377
Remote control point . . . . . . . . . . . . . . . :   RCHAS536
  Remote control point network ID . . . . . . . . :     RCHNET

Position to  . . . . . . . .   _______     Location
  Network ID . . . . . . . .    _______
  Type of entry  . . . . . .    1          1=Home, 2=Registered, 3=Cached

Location      Network ID     Type of Entry
LOC536A        RCHNET        Home
LOC536B        RCHNET        Home
LOC536C        RCHNET        Home
LOC536D        RCHNET        Home
LOC536E        RCHNET        Home
LOC338         RCHNET        Registered
LOC110         RCHNET        Cached
LOC377         RCHNET        Cached
                                                                  Bottom
Press Enter to continue.

F3=Exit   F5=Refresh   F6=Print information   F11=Sort by location
F12=Cancel
```

Figure 9-7. Display Locations

Field definitions:

Remote control point
: Displays the control-point name of the control point for which the location names are displayed.

Remote control point network ID
: Displays the network ID of the control point selected on the Display Remote Control Points display for which the location names are to be displayed.

Position to
: Specify the location name at which to start the list of location names.

Type of Entry
: This prompt is only displayed if you press the F11 (Sort by type of entry) function key. It can be one of the following values:

  1=Home
  2=Registered
  3=Cached

  When the Sort by type of entry option is active, you may specify the type of location for the Position to function.

Location
: Displays the names of the locations that reside in the selected control point.

Network ID
: Specifies the network ID associated with the location in the selected control point.

Type of Entry
: It can be one of the following values:

  Home
  : Indicates that this location name was configured in the APPN remote location list in the local system.

  Registered
  : Indicates that an end node has registered its local location with the network node server. If the CP-CP session between the registering end node and serving network node ends, this location is deleted from the local directory.

  Cached
  : Indicates that this location was previously found through the search process or was dynamically added.

Display Endpoint Session Information

The following display is shown when *SSN is specified for the type of information on the Display APPN Information display, *ENDPNT is specified for the session type, and no job name was specified. It displays the list of the most recent APPC jobs that are using APPN configurations and have run since the most recent system initial program load (IPL). You may select option 5 (Display session PCIDs) to display the procedure correlation identifiers (PCIDs) associated with the selected job name.

```
                              Display APPN Jobs
                                                                System:   RCHAS377
 Type options, press Enter.
   5=Display session PCIDs

 Opt      Job            User           Number
  5       WS1200         PGMR1          028434
  _       RCHAS536       QSNADS         028430
  _       RCHAS536       QSNADS         028429
  _       DSP06          JDOE           028386
  _       WS2201         PGMR4          028322
```

Figure 9-8. Display APPN Jobs

Field definitions:

Job
: Displays the name portion of the job name.

User
: Displays the user portion of the job name.

Number
: Displays the number portion of the job name.

The following display is shown when option 5 (Display session PCIDs) is specified for one or more job names on the Display APPN Jobs display or when a job name is specified for the job name parameter on the Display APPN Information display. It presents the list of fully qualified procedure correlation identifiers (PCIDs) associated with the selected job name, including the associated network ID and control-point name.

```
                           Display Session PCIDs
                                                               System:   RCHAS377
 Job:    WS1200          User:    PGMR1          Number:    028434


 Type options, press Enter.
   5=Display route   8=Display formatted BIND   9=Display error data...



                            Control     Network
 Opt   PCID                 Point       ID          Mode        Status
  _    F1D7566A0A24E0B3     RCHAS536    RCHNET      #INTER      Active
  5    F1D7566A0A24E0AE     RCHAS377    RCHNET      BLANK       Active
  _    F1D7566A0A24E0AA     RCHAS536    RCHNET      #BATCH      Failed
  _    F1D7566A0A24E0A6     RCHAS377    RCHNET      BLANK       Ended
  _    F1D7566A0A24E0A2     RCHAS377    RCHNET      BLANK       Ended



                                                                          Bottom
 F3=Exit      F5=Refresh    F6=Print information    F12=Cancel    F17=Top
 F18=Bottom   F23=More options
```

Figure 9-9 (Part 1 of 2). Display Session PCIDs

```
                        Display Session PCIDs
                                                          System:   RCHAS377
 Job:   WS1200        User:   PGMR1          Number:   028434


 Type options, press Enter.
   10=Display PIUs   11=Display pacing information
   12=Display start/end time...


                          Control    Network
 Opt   PCID               Point      ID         Mode       Status
 _     F1D7566A0A24E0B3   RCHAS536   RCHNET     #INTER     Active
 5     F1D7566A0A24E0AE   RCHAS377   RCHNET     BLANK      Active
 _     F1D7566A0A24E0AA   RCHAS536   RCHNET     #BATCH     Failed
 _     F1D7566A0A24E0A6   RCHAS377   RCHNET     BLANK      Ended
 _     F1D7566A0A24E0A2   RCHAS377   RCHNET     BLANK      Ended



                                                                     Bottom
 F3=Exit      F5=Refresh   F6=Print information   F12=Cancel   F17=Top
 F18=Bottom   F23=More options
```

Figure 9-9 (Part 2 of 2). Display Session PCIDs

Field definitions:

Job
: Displays the name portion of the job name.

User
: Displays the user portion of the job name.

Number
: Displays the number portion of the job name.

PCID
: Displays the list of PCIDs that identify the sessions associated with the selected job. These PCIDs are assigned by the system and cannot be changed.

Control point
: Displays the control-point name of the node that created this PCID.

Network ID
: Displays the network identifier of the node that created this PCID.

Mode
: Displays the mode name associated with this PCID.

Status
: Indicates the status of the session. This can be one of the following values:

  Active
  : The session is active.

  Ended
  : The session ended normally.

  Failed
  : The session ended due to an error.

You may select the following options from the Display Session PCIDs display.

5 Displays the route over which the data associated with this PCID is transmitted.

8 Displays the BIND command that activated the session identified by this PCID.

9 Displays any error data associated with this session. If present, the data consists of the sense code from a negative response to a BIND or the hex format of an UNBIND with the sense code extracted. This option is valid only if the session ended with an error (the value for Status field is Failed).

10 Displays the last ten PIUs sent or received on this session. The PIUs displayed consist of the TH, RH (if it exists), and first six bytes of the RU (if it exists).

11 Displays the current pacing values associated with this session.

12 Displays the date and time that this session was started, and also the end date and time if the session has ended (normally or due to an error).

Options 10 and 11 are valid only for active sessions and the last five failed sessions. A message is issued if one of these options is specified and the requested data is not available for the selected session.

Note: The job names and associated session PCIDs are accessed from an internal table to which they have been logged. This table holds a maximum of 200 entries. If this number is exceeded, the table will wrap, with the oldest entry being replaced by each new entry. This means that the sum of the session PCIDs for all jobs will not exceed 200. If the most recent 200 sessions are associated with the same job name, only one job name would be shown on the Display APPN Jobs display.

The following display is shown when option 5 (Display route) is specified for one or more PCIDs on the Display Session PCIDs display. It presents a formatted version of the route selection control vector (RSCV) contained in the BIND command associated with the session identified by the selected PCID.

```
                                Display Route
                                                          System:   RCHAS377
PCID . . . . . . . . . . . . . . :    F1D7566A0A24E0AE
  Control point  . . . . . . . . :      RCHAS377
  Network ID . . . . . . . . . . :      RCHNET

        Control       Network        TG
Hop     Point         ID           Number
  1     RCHAS536      RCHNET          21




                                                                      Bottom
Press Enter to continue.

F3=Exit   F6=Print information   F12=Cancel
```

Figure 9-10. Display Route

Field definitions:

PCID

Displays the PCID identifying the session with which this route is associated. This is the PCID that was selected on the Display Session PCIDs display.

Control point (first)

Displays the source control-point name associated with this PCID (also shown on the Display Session PCIDs display).

Network ID (first)

Displays the network ID associated with this PCID (also shown on the Display Session PCIDs display).

Hop

Indicates a particular step along the route taken by the session to the session destination node.

Control Point (second)

Displays the control-point name of the node that is the destination of this hop.

Network ID (second)

Displays the network ID of the node that is the destination of this hop.

TG Number

Displays the transmission group (TG) number over which the session is routed.

Note: For sessions that cross network boundaries, only the route up to the connecting network node of the adjacent network is displayed. This is because complete routing information is not shared between two separate APPN networks.

The following display is shown when option 8 (Display formatted BIND) is specified for one or more PCIDs on the Display Session PCIDs display. It displays a formatted view of the BIND command that activated the session associated with the selected PCID.

```
                          Display Formatted BIND
                                                          System:   RCHAS377
PCID . . . . . . . . . . . . . . :    F1D7566A0A24E0AE
  Control point  . . . . . . . . :      RCHAS377
  Network ID . . . . . . . . . . :      RCHNET

BIND type  . . . . . . . . . . . . . . . . :    Negotiable
FM profile (hex) . . . . . . . . . . . . . :    13
TS profile (hex) . . . . . . . . . . . . . :    07
FM usage (hex):
  Primary protocols  . . . . . . . . . . . :    B0
  Secondary protocols  . . . . . . . . . . :    B0
  Common protocols . . . . . . . . . . . . :    51B3
TS usage (hex) . . . . . . . . . . . . . . :    038388888303
PS profile (hex) . . . . . . . . . . . . . :    06
PS usage (hex) . . . . . . . . . . . . . . :    0200000000000000902300
Cryptography options (hex) . . . . . . . . :    00

                                                                 More...
Press Enter to continue.

F3=Exit   F6=Print information   F11=Display unformatted BIND   F12=Cancel
F15=Display details   F16=Display route
```

```
                          Display Formatted BIND
                                                          System:   RCHAS377
PCID . . . . . . . . . . . . . . :    F1D7566A0A24E0AE
  Control point  . . . . . . . . :      RCHAS377
  Network ID . . . . . . . . . . :      RCHNET

Primary NS LU name:
  LU name  . . . . . . . . . . . . . . . . :    RCHAS377
  Network ID . . . . . . . . . . . . . . . :    RCHNET
User data fields:
  Unformatted data (hex) . . . . . . . . . :

  Mode name  . . . . . . . . . . . . . . . :    BLANK
  Session instance ID (hex)  . . . . . . . :    00E61CB3CD4000A3
  PLU network name:
    LU name  . . . . . . . . . . . . . . . :    RCHAS377
    Network ID . . . . . . . . . . . . . . :    RCHNET

                                                                 More...
Press Enter to continue.

F3=Exit   F6=Print information   F11=Display unformatted BIND   F12=Cancel
F15=Display details   F16=Display route
```

Figure 9-11 (Part 1 of 2). Display Formatted BIND

```
                         Display Formatted BIND
                                                        System:   RCHAS377
PCID . . . . . . . . . . . . . . :     F1D7566A0A24E0AE
  Control point  . . . . . . . . :       RCHAS377
  Network ID . . . . . . . . . . :       RCHNET

  SLU network name:
    LU name  . . . . . . . . . . . . . . . :
    Network ID . . . . . . . . . . . . . . :
  Random data (hex)  . . . . . . . . . . . :
  Enciphered data (hex)  . . . . . . . . . :
URC (hex)  . . . . . . . . . . . . . . . . :
Secondary NS LU name:
  LU name  . . . . . . . . . . . . . . . . :   RCHAS536
  Network ID . . . . . . . . . . . . . . . :   RCHNET
Transmission priority  . . . . . . . . . . :   Medium
Class of service . . . . . . . . . . . . . :   #CONNECT

                                                              Bottom
Press Enter to continue.

F3=Exit   F6=Print information   F11=Display unformatted BIND   F12=Cancel
F15=Display details   F16=Display route
```

Figure 9-11 (Part 2 of 2). Display Formatted BIND

The *SNA Format and Protocol Reference Manual: Architecture Logic for LU Type 6.2*, contains detailed descriptions for the fields on this display.

Field definitions:

PCID
: Displays the PCID identifying the session started by this BIND.

Network ID
: The Network ID associated with this procedure correlation identifier (PCID).

Control point
: The control-point name associated with this procedure correlation identifier (PCID).

BIND type
: The type of BIND request used to activate this session. The type is always specified as negotiable.

FM profile (hex)
: Some of the session protocols, for example, for request and response control modes, **brackets**,[2] and pacing, are selected at session activation. Specific combinations of these protocol options are known as profiles.

  The profiles that refer to data flow control and function management data services options are called function management profiles. The function management profiles are specified at the time of session activation through parameters in the BIND request and response.

TS profile (hex)
: The profiles that refer to transmission control options are called transmission services profiles. The transmission services profiles are specified

[2] In SNA, brackets are one or more chains of request units and their responses, representing a complete transaction, exchanged between two LU half-sessions.

at the time of session activation through parameters in the BIND request and response.

FM Usage
: Function management (FM) usage includes the following sequencing rules for requests and responses used for managing the network, transferring data, and synchronizing the states of network components:

- *Primary protocols*, as they apply to the primary logical unit (LU)
- *Secondary protocols*, as they apply to the secondary logical unit
- *Common protocols*, as they apply to those rules that affect both the primary logical unit and the secondary logical unit

TS usage (hex)
: The transmission services usage field describes the use of the transmission services profile for LU-to-LU sessions to type 2.1 nodes. If the transmission services usage field in BIND specifies a value for a parameter, that value is used unless it conflicts with a value specified by the transmission services profile. The transmission services profile overrides the transmission services usage field.

PS profile (hex)
: The profiles that refer to presentation services options are called presentation services profiles. PS is the component of the logical unit with which transaction programs interact directly. The presentation services profiles are specified at the time of session activation through parameters in the BIND request and response.

PS usage (hex)
: The presentations services (PS) usage field describes the level of support provided by the LU type 6 LU.

Cryptography options (hex)
: This field specifies whether session-level mandatory cryptography is supported for the session, and if so, the cryptography options to be used.

Primary NS LU name
: The primary network services logical unit name is identified by the following:

- *LU name* that specifies the name of the primary LU for the session.
- *Network ID* that specifies the primary network ID.

Unformatted data (hex)
: Unformatted data is one of the structured subfields of the user data field. Each subfield starts with a one-byte binary length field and is identified by a subfield number in the following byte. The length does not include the length byte itself. When more than one subfield is included, they appear in ascending order by subfield number.

The unformatted data subfield shows installation-specified data and is identified as X'00'.

Mode Name
: The mode name subfield specifies the type of service required for the session and is identified as X'02'.

Session instance ID (hex)
: The session instance identifier subfield is used to uniquely identify the session from among multiple sessions between the primary LU and the secondary LU and is identified as X'03'.

PLU network name
: The primary LU name allows the primary LU to identify itself to the secondary LU and is identified as X′04′.

  The following fields identify the primary LU network name:

  - LU name
  - Primary LU network ID

SLU network name
: The secondary LU network name allows the secondary LU to identify itself to the primary LU and is identified as X′05′.

  The following fields identify the secondary LU network name:

  - LU name
  - Secondary LU network ID

Random data (hex)
: The random data subfield is used when LU-LU verification is active and is identified as X′11′.

Enciphered data (hex)
: The enciphered data subfield is present in the BIND response when session-level security verification is in effect. This subfield contains the enciphered version of the clear data received in BIND and is identified as X′12′.

URC (hex)
: This field specifies the user request correlation value for the session when the secondary LU initiates the session. The secondary LU uses the user request correlation value to correlate the BIND with the INIT-SELF it sent. When the secondary LU does not initiate the session, the primary LU omits the user request correlation value from the BIND. The primary LU omits the user request correlation by specifying 0 for the length of the user request correlation.

  This field applies to host environments only.

Secondary NS LU name
: The secondary network services logical unit name is identified by the following:

  - *LU name* that specifies the secondary LU name.
  - *Network ID* that specifies the secondary LU network ID.

Transmission priority
: Transmission priority is one of several transmission characteristics of the logical links within a transmission group or a connection network. These characteristics identify important attributes and values that are used to choose an appropriate route to transmit data.

  Transmission priority specifies the relative importance of this data for this transmission group in relationship to the other data in the network. Values are low, medium, or high.

Class of service
: The class of service specifies the transmission characteristics used when determining a route through the network to connect the session end points of a session. Multiple modes can refer to the same class-of-service definition.

The following display is shown when F11 (Display unformatted BIND) is pressed on the Display Formatted BIND display. It displays the hexadecimal form of the BIND command that activated the session associated with the selected PCID.

```
                           Display Unformatted BIND
                                                              System:   RCH38377
PCID . . . . . . . . . . . . . . . :   F1D7566A0A24E0AE
  Control point  . . . . . . . . . :     RCHAS377
  Network ID . . . . . . . . . . . :     RCHNET

------------------BIND (hex)-------------------
31001307     B0B051B3     03838888     83030602        [[éfi chhc
00000000     00000090     2300000F     D9C3C8D5            °    RCHN
C5E34BD9     C3C8C1E2     F3F7F726     00090240     ET.RCHAS377
40404040     40404009     0300E61C     B3CD4000               W fiô
A31004D9     C3C8D5C5     E34BD9C3     C8C1E2F3     t  RCHNET.RCHAS3
F7F7000F     D9C3C8D5     C5E34BD9     C3C8C1E2     77  RCHNET.RCHAS
F5F3F660     18F1D756     6A0A24E0     AE0FD9C3     536- 1Pî]  \‡ RC
C8D5C5E3     4BD9C3C8     C1E2F3F7     F72C0A01     HNET.RCHAS377
087BC3D6     D5D5C5C3     E32B1801     01164614      #CONNECT      ã
80150FD9     C3C8D5C5     E34BD9C3     C8C1E2F5     Ø  RCHNET.RCHAS5
F3F6                                                36
                                                                   Bottom
Press Enter to continue.

F3=Exit   F6=Print information   F11=Display formatted BIND   F12=Cancel
```

Figure 9-12. Display Unformatted BIND

Field definitions:

PCID
: Displays the PCID identifying the session that was activated by this BIND command. This is the PCID that was selected on the Display Session PCIDs display.

Control point
: Displays the control-point name associated with this PCID (also shown on the Display Session PCIDs display).

Network ID
: Displays the network ID associated with this PCID (also shown on the PCID display).

BIND (hex)
: Displays the hexadecimal format of the BIND command that activated the session associated with this PCID. This includes the route selection control vector that describes the route over which data for this session is being sent. The BIND command can be up to 512 bytes (1024 screen characters) in length. You may refer to *IBM SNA Formats*, for additional information about the BIND layout.

This display is shown when the cursor is positioned on the FM Usage field on the Display Formatted BIND display and F15 (Display details) key is pressed. It provides the bit-level field definitions within the FM Usage field of the BIND.

```
                          Display FM Usage
                                                      System:   RCHAS377
Primary protocols:
  RU chaining . . . . . . . . . . . :   Multiple chains
  Request mode  . . . . . . . . . . :   Immediate
  Chain response  . . . . . . . . . :   Definite or exception
  Send end bracket  . . . . . . . . :   No
Secondary protocols:
  RU chaining . . . . . . . . . . . :   Multiple chains
  Request mode  . . . . . . . . . . :   Immediate
  Chain response  . . . . . . . . . :   Definite or exception
  Send end bracket  . . . . . . . . :   No





                                                                More...
Press Enter to continue.

F3=Exit   F6=Print information   F12=Cancel
```

```
                          Display FM Usage
                                                      System:   RCHAS377
Common protocols:
  Whole BIUs required . . . . . . . :   No
  FM header usage . . . . . . . . . :   FM headers allowed
  Brackets usage  . . . . . . . . . :   Used, reset INB
  Bracket termination . . . . . . . :   Conditional
  Alternate code set  . . . . . . . :   Not used
  BIND queuing  . . . . . . . . . . :   Allowed
  Normal flow mode  . . . . . . . . :   HDX flip-flop
  Recovery owner  . . . . . . . . . :   Symmetric
  Contention winner . . . . . . . . :   Primary
  Alternate code ID . . . . . . . . :
  Control vectors . . . . . . . . . :   Included
  HDX-FF reset states . . . . . . . :   Primary send



                                                                 Bottom
Press Enter to continue.

F3=Exit   F6=Print information   F12=Cancel
```

Figure 9-13. Display FM Usage

The *SNA Format and Protocol Reference Manual: Architecture Logic for LU Type 6.2*, contains detailed descriptions for the fields on this display.

Field definitions:

Primary protocols:

RU chaining

The primary logical unit (LU) protocols for the RU chaining specifies the primary LU's use of chains that it sends to the secondary LU. Multiple RU chains is the only use defined for LU 6.2. Chains can consist of one or more RUs. The maximum size RU that the primary LU sends and the verbs that the transaction program issues to the primary LU determine the number of RUs that make up the chain.

Request mode
: The request control mode specifies the primary LU's protocol for sending chains. Immediate-request mode is the only protocol defined for LU 6.2. The primary LU waits for a response to a definite-response chain before it sends another chain.

Chain response
: The chain response specifies the primary LU's protocol for requesting responses to chains. Definite or exception response requested is the only protocol defined. A chain indicating a definite-response requested requires a response from the secondary LU; the response can be positive or negative. A chain indicating an exception-response requested requires a response from the secondary LU only when the response is negative. A positive response is not returned.

Send end bracket
: This field specifies that the primary LU does not send end bracket (EB) chains.

Secondary protocols:

RU chaining
: The secondary logical unit (LU) protocols for the RU chaining specifies the secondary LU's use of chains that it sends to the primary LU. Multiple RU chains is the only use defined for LU 6.2. Chains can consist of one or more RUs. The maximum size RU that the secondary LU sends and the verbs that the transaction program issues to the secondary LU determine the number of RUs that make up the chain.

Request mode
: The request control mode specifies the secondary LU's protocol for sending chains. Immediate-request mode is the only protocol defined for LU 6.2. The secondary LU waits for a response to a definite-response chain before it sends another chain.

Chain response
: The chain response specifies the secondary LU's protocol for requesting responses to chains. A definite-response requested or an exception-response requested is the only protocol defined. A chain indicating a definite-response requested requires a response from the primary LU; the response can be positive or negative. A chain indicating an exception-response requested requires a response from the primary LU only when the response is negative. A positive response is not returned.

Send end bracket
: This field specifies that the secondary LU does not send end bracket (EB) chains.

Common protocols:

Whole BIUs required
: This field specifies whether receiving segmented basic information units (BIUs) on the session is supported by the logical unit. Support for session-level segmenting of BIUs depends on the implementation. When both the primary LU and the secondary LU specify in the BIND request and the BIND response that they support session segmenting, then the RUs can be segmented on the session. Otherwise, segmenting of RUs does not occur.

FM header usage
: This field specifies that the function management (FM) headers are used on the session.

Brackets usage
: This field specifies that brackets are used on the session and that the bracket reset state for the session is in-bracket (INB); that is, the session is in the in-bracket state following successful activation.

Bracket termination
: This field specifies that conditional termination is used on the session. The sender of the end-bracket chain determines whether the bracket is to end conditionally or unconditionally. If conditional, the receiver is allowed to reject the end-bracket chain and thereby keep the session in the in-bracket state.

Alternate code set
: This field indicates whether the alternate code set is used.

BIND queuing
: This field specifies whether the logical unit is allowed to queue or hold the bind response for an indefinite period.

Normal flow mode
: This field specifies that the send and receive protocol for the function management data requests on the normal flow is half-duplex flip-flop.

Recovery owner
: This field specifies the responsibility for recovery from an error within the session. Symmetric recovery is the only value defined for LU 6.2. The sender of a negative response is responsible for recovery, regardless of whether the sender is the primary LU or the secondary LU.

Contention winner
: The logical units at each end of a session could both try to start a conversation at the same time. To avoid this situation, the LU operator specifies, for each session, which transaction program logical units are allowed to use the session. From the local logical unit viewpoint, a session for which that logical unit is designated to win an allocation race is called a contention winner session, and the logical unit would be the contention winner.

  This field specifies whether the primary LU or the secondary LU is the contention winner for the session. This field depends on whether the session is a parallel or single session.

Alternate code ID
: This field identifies the alternate code.

Control vectors
: A control vector is a common structured subfield of an SNA RU that is used to pass additional information relative to the associated RU. This field indicates whether control vectors are added to the BIND.

HDX-FF reset states
: The logical unit normally allows transaction programs to exchange data in only one direction at a time; one sends and the other receives until the sending transaction program gives up the right to send. This exchange of data is called the half-duplex flip-flop.

  This field specifies the half-duplex flip-flop reset states for the primary LU and the secondary LU following successful activation on the session. The reset states are *send* and *receive*.

This display is shown when the cursor is positioned on the TS Usage field on the Display Formatted BIND display and F15 (Display details) is pressed. It provides the bit-level field definitions within the TS Usage field of the BIND.

```
                              Display TS Usage
                                                           System:   RCHAS377
 Secondary to primary staging . . . . . . . . :   One-stage
 Secondary send window size . . . . . . . . . :   3
 Adaptive pacing . . . . . . . . . . . . . . . :   Supported
 Secondary receive window size . . . . . . . . :   3
 Maximum send RU size:
   Secondary . . . . . . . . . . . . . . . . . :   2048
   Primary . . . . . . . . . . . . . . . . . . :   2048
 Primary to secondary staging . . . . . . . . :   One-stage
 Primary send window size . . . . . . . . . . :   3
 Primary receive window size . . . . . . . . . :   3








 Press Enter to continue.

 F3=Exit   F6=Print information   F12=Cancel
```

Figure 9-14. Display TS Usage

The *SNA Format and Protocol Reference Manual: Architecture Logic for LU Type 6.2*, contains detailed descriptions for the fields on this display.

Field definitions:

Secondary to primary staging
: This field specifies whether pacing of normal flow requests from the secondary LU to the primary LU occurs in one stage or more than one stage.

Secondary send window size
: This field specifies whether pacing of normal flow requests sent by the secondary LU occurs. If one-stage pacing from the primary LU to the secondary LU is specified for the session, this specification is the same as that for the Primary receive window size field.

Adaptive pacing
: Adaptive session pacing permits AS/400 nodes to control the amount of data that is sent and received during normal session operation. Session pacing allows the receiving system to control the rate at which it receives data into its session buffers. In an APPN environment, multiple sessions require a dynamic pacing device to allocate resources to a session that has a burst of activity, and reclaim unused resources from sessions that have no activity. Adaptive session pacing allows the receiving node to efficiently use its available buffer resources.

Secondary receive window size
: This field specifies whether pacing of normal flow requests received by the secondary LU occurs.

Maximum send RU size
: These fields specify the maximum-size RU that the secondary LU and the primary LU can send to its partner LU on the normal flow.

Primary to secondary staging
: This field specifies whether pacing of normal flow requests from the primary LU to the secondary LU occurs in one stage or more than one stage.

Primary send window size
: This field specifies whether pacing of normal flow requests sent by the primary LU occurs. If one-stage pacing from the primary LU to the secondary LU is specified for the session, this specification is the same as that for the Secondary receive window size field.

Primary receive window size
: This field specifies whether pacing of normal flow requests received by the primary LU occurs.

This display is shown when the cursor is positioned on the PS Usage field on the Display Formatted BIND display and F15 (Display details) is pressed. It provides the bit-level field definitions within the PS Usage field of the BIND.

```
                              Display PS Usage
                                                          System:   RCHAS377
LU-6 level . . . . . . . . . . . . . :   2
Access security data . . . . . . . . :   Accepted on FMH5
Already verified . . . . . . . . . . :   Not accepted on FMH5
Synchronization level . . . . . . . . :   Confirm
Session reinitiation . . . . . . . . :
Parallel sessions . . . . . . . . . . :   Supported
CNOS GDS variable flow . . . . . . . :   Supported











Press Enter to continue.

F3=Exit   F6=Print information   F12=Cancel
```

Figure 9-15. Display PS Usage

The *SNA Format and Protocol Reference Manual: Architecture Logic for LU Type 6.2*, contains detailed descriptions for the fields on this display.

Field definitions:

LU-6 level
: This specifies the level of LU type 6. Level 2 is the LU type 6 level defined for LU 6.2.

Access security data
: This field specifies whether a logical unit supports a security manager for receiving a user ID, password, or already-verified indication, and profile ID on FMH-5 (function management header) Attach commands from its partner LU.

Already verified

This field specifies whether a logical unit accepts the user ID already verified indication on the FMH-5 Attach commands from its partner LU.

Synchronization level

This field specifies the level of synchronization support for the session. One of two levels of support can be specified:

- Confirm
- Confirm, sync point, and backout

All LU implementations support the confirm level. Support for sync point and backout depends on the implementation.

Session reinitiation

An active session between two logical units can be interrupted by a failure of one or both of the logical units, by a reset of one or both of their half-sessions, or by a failure of the path that connects the logical units. If such a situation occurs, session reinitiation can be requested if the number of active sessions decreases below a minimum number.

This field specifies the responsibility for reinitiation of a session following a session outage. This parameter applies only to sessions for which parallel sessions and change number of sessions (CNOS) are not supported. Four levels of responsibility are defined:

- Operator controlled means that neither LU automatically attempts to reinitiate the session.
- Primary half-session reinitiates the session.
- Secondary half-session reinitiates the session.
- Either half-session can reinitiate the session.

Parallel sessions

Only one transaction program pair at a time can use a particular session. To allow many transactions to occur at the same time, some parallel-session logical units allow two or more sessions at the same time. Any session between a pair of logical units that both provide parallel sessions is called a parallel session, even if only one such session is currently active.

Contrast parallel session with single session. Some logical units can have only one active LU-LU session at a time. Any session involving a single-session logical unit is called a single session.

This field specifies whether parallel sessions are supported between the primary LU and the secondary LU.

CNOS GDS variable flow

For a logical unit that supports parallel sessions, transaction services components exist for the control operator. These logical units contain a change-number-of-session (CNOS) service transaction program. When processing CNOS verbs, the transaction program at one logical unit exchanges general data stream (GDS) variables with the CNOS service transaction program at its partner to reach mutual agreement about limits on the number of parallel sessions between them.

This field specifies whether the primary LU and the secondary LU support this protocol.

The following display is shown when option 9 (Display error data) is specified for one or more PCIDs on the Display Session PCIDs display. If the session did not end normally, it displays the hexadecimal form of the sense code indicating the error. If an UNBIND command ended the session, the hex format of the UNBIND is also shown.

In some cases, there may be no sense code or UNBIND data available. The fields will be blank.

```
                              Display Error Data
                                                        System:   RCHAS377
PCID . . . . . . . . . . . . . . . :    F1D7566A0A24E0AA
  Control point  . . . . . . . . . :     RCHAS377
  Network ID . . . . . . . . . . . :     RCHNET

Sense code (hex) . . . . . . . . . . . . . . . . :   08640002

UNBIND origin control point  . . . . . . . . . . :   RCHAS377
  UNBIND origin network ID . . . . . . . . . . . :     RCHNET

----------------UNBIND (hex)-----------------
32FE0864     00026018     F1D7566A     0A24E0AA      Û Â  - 1Pî]  \ï
0FD9C3C8     D5C5E34B     D9C3C8C1     E2F3F7F7      RCHNET.RCHAS377
35170864     00020C00     0FD9C3C8     D5C5E34B        Â      RCHNET.
D9C3C8C1     E2F3F7F7     00                        RCHAS377


                                                               Bottom
Press Enter to continue.

F3=Exit   F6=Print information   F12=Cancel
```

Figure 9-16. Display Error Data

Field definitions:

PCID
: Displays the PCID identifying the session that failed. This is the PCID that was selected on the Display Session PCIDs display.

Control point
: Displays the control-point name associated with this PCID (also shown on the Display Session PCIDs display).

Network ID
: Displays the network ID associated with this PCID (also shown on the PCID display).

Sense code
: If present, displays the sense code that indicates why the session failed. This sense code is obtained from either a negative response to the BIND or from the UNBIND command.

UNBIND origin control point
: Contains the control-point name of the node which generated the UNBIND.

UNBIND origin network ID
: Contains the network ID of the node which generated the UNBIND.

UNBIND
: Displays the hexadecimal format of the UNBIND command if this command ended the session. The UNBIND command can be up to 90 bytes (180 screen characters) in length. If the session was not ended by an UNBIND, the UNBIND field is displayed with blanks.

This display is shown when option 10 (Display PIUs) is specified for one or more active or failed PCIDs on the Display Session PCIDs display. It displays the hexadecimal format of the TH, RH and the first 6 bytes of the RU for each of the last 10 PIUs sent or received on the selected session.

```
                               Display PIUs
                                                        System:   RCHAS377
PCID . . . . . . . . . . . . . . . :    F1D7566A0A24E0AE
  Control point  . . . . . . . . . :      RCHAS377
  Network ID . . . . . . . . . . . :      RCHNET

Type options, press Enter.
  5=Display formatted PIU

Opt  PIU  Direction            TH            RH       RU
 5     1  Sent                 2C000B01004B  039020   001112A00000
 _     2  Received             2C00010B000A  039120   030512A00000
 _     3  Sent                 2D000B010000  830100   000004
 _     4  Sent                 2C000B01004C  039020   005A12A00000
 _     5  Received             2C00010B000B  039020   036412A00000
 _     6  Sent                 2C000B01004D  039120   002812A00000
 _     7  Received             2D00010B0000  830100   000007
 _     8  Received             2C00010B000C  039020   003012A00000
 _     9  Sent                 2C000B01004E  039020   000A12A00000
 _    10  Received             2C00010B000D  039020   03C012A00000
                                                                Bottom
F3=Exit   F5=Refresh   F6=Print information   F11=Display EXP PIUs
F12=Cancel
```

Figure 9-17. Display PIUs

Field definitions:

PCID
: Contains the PCID identifying the selected session. This is the PCID which was selected on the Display Session PCIDs display.

Control point
: Contains the control-point name associated with this PCID (also shown on the Display Session PCIDs display).

Network ID
: Contains the Network ID associated with this PCID (also shown on the PCID display).

PIU (path information unit)
: Indicates which PIU in the sequence of 10 (first,second, and so on, up to tenth) is shown in a given list entry.

Direction
: Indicates whether this PIU was sent to or received from a remote system.

TH (transmission header)
: Contains the 6-byte transmission header associated with the selected PIU. All PIUs have an associated TH.

RH (request/response header)
: Contains the 3-byte request/response header associated with the selected PIU. An RH exists as part of each PIU that contains the first (or only) segment of a segmented RU. For a PIU that is not the first or only segment, blanks are displayed in the RH field.

RU (request unit)
Contains the first 6 bytes of the RU associated with the selected PIU. The whole RU may be shorter than 6 bytes, or there may be no RU present, in which case blanks are displayed in the RU field.

Display Formatted PIU

This display is shown when option 5 (Display formatted PIU) is specified for one or more PIUs on the Display PIUs display. This display shows the individual fields within the PIU and the value of each field.

```
                          Display Formatted PIU
                                                        System:   RCHAS377
PIU:   1          Direction:   Sent

TH :   2C000B01004B    FID :   2   MPF :   Only              ODAI:   0
                       DAF':   0B  OAF':   01                SNF :   004B

                       ----------------------Active------------------------
RH :   039020          REQ     FMD     BCI     ECI     DR1I    ERI     CDI


RU :   001112A00000

RU length . . . . . . . . . . :   17

Logged date/time . . . . . . . :   11/28/89   09:09:43

Press Enter to continue.

F3=Exit   F6=Print information   F12=Cancel   F14=Display previous PIU
```

Figure 9-18. Display Formatted PIU

Field definitions:

PIU (path information unit)
Contains a value from 1-10 indicating which PIU in the sequence of PIUs on the Display PIUs display was selected.

Note: This display is also used to show other types of PIUs. This field contains a different type of value in those situations.

Direction
Indicates whether this PIU was sent to or received from a remote system.

TH (transmission header)
Shows the values of the individual fields within the TH. These fields are as follows:

FID
Format identification

MPF
Mapping field (BIU segment indicator)
Only
First
Middle
Last

ODAI
: OAF′/DAF′ assignor indicator. This field indicates which node assigned the OAF′ and DAF′ values.

EFI
: Expedited flow indicator

  Indicates expedited flow data (if present); normal flow data (if not present)

DAF′
: Destination address field

OAF′
: Origin address field

SNF
: Sequence number field

RH (request/response header)
: Shows the values of the individual fields active within the RH. The following fields may be present:

  REQ
  : Request indicated by RRI (request/response indicator)

  RSP
  : Response indicated by RRI (request/response indicator)

  NC
  : RU category is network control

  SC
  : RU category is session control

  DFC
  : RU category is data flow control

  FMD
  : RU category is function management data

  The remaining RH fields are 1-bit indicators. If an indicator name is present, the bit is ′ON′; if an indicator name is not present, the bit is ′OFF′ (or not applicable for this RH).

  FI
  : Format indicator

  SDI
  : Sense data included

  BCI
  : Begin chain indicator (request only)

  ECI
  : End chain indicator (request only)

  DR1I
  : Definite response 1 indicator

  DR2I
  : Definite response 2 indicator

  ERI
  : Exception response indicator (request only)

  RTI
  : Response type indicator (response only)

  RLWI
  : Request larger window indicator

  QRI
  : Queued response indicator

  PI
  : Pacing indicator

BBI
: Begin bracket indicator (request only)

EBI
: End bracket indicator (request only)

CDI
: Change direction indicator (request only)

CSI
: Code selection indicator (request only)

EDI
: Enciphered data indicator (request only)

PDI
: Padded data indicator (request only)

CEBI
: Conditional end bracket indicator (request only)

RU (request unit)
: Shows the first six bytes of the request/response (RU) unit. If the RU is a command, the command is specified.

RU length
: Contains the total length of the RU included in this PIU. (The RU may include many PIUs).

Logged date/time
: Specifies the date and time that this PIU was processed.

This display is also used (as follows) when F11 (Display Expedited PIUs) is pressed on the Display PIUs display to show the last expedited PIU sent on the selected session. The F11 key can then be pressed again to show the last expedited PIU received. Note that the PIU field indicates the type of PIU being presented on this display.

```
                             Display EXP PIUs
                                                        System:   RCHAS377
PIU:    Last EXP PIU sent

TH :    2D000B010000   FID :   2    MPF :   Only             ODAI:    0     EFI
                       DAF':   0B   OAF':   01               SNF :    0000

                       ----------------------Active------------------------
RH :    830100         RSP      FMD      BCI      ECI      +RSP     PI



RU :    000004


RU length  . . . . . . . . . . :    3

Logged date/time . . . . . . . :    11/28/89    09:15:43

Press Enter to continue.

F3=Exit   F5=Refresh   F6=Print information
F11=Display last EXP PIU received   F12=Cancel
```

Figure 9-19. Display Expedited PIUs

This display is shown when option 11 (Display pacing information) is specified for one or more active or failed PCIDs on the Display Session PCIDs display. It shows pacing information for the selected PCID(s).

```
                          Display Pacing Information
                                                           System:   RCHAS377
PCID . . . . . . . . . . . . . . . :   F1D7566A0A24E0AE
  Control point  . . . . . . . . . :     RCHAS377
  Network ID . . . . . . . . . . . :     RCHNET

Pacing type  . . . . . . . . . . . . . . :   *ADAPTIVE
Pacing queue size  . . . . . . . . . . . :   0
Next window size:
  Send . . . . . . . . . . . . . . . . . :   7
  Receive  . . . . . . . . . . . . . . . :   3
Residual pacing count:
  Send . . . . . . . . . . . . . . . . . :   4
  Receive  . . . . . . . . . . . . . . . :   2




Press Enter to continue.

F3=Exit   F5=Refresh   F6=Print information   F12=Cancel
```

Figure 9-20. Display Pacing Information

Field definitions:

PCID
: Contains the PCID identifying the selected session. This is the PCID that was selected on the Display Session PCIDs display.

Control point
: Contains the control-point name associated with this PCID (also shown on the Display Session PCIDs display).

Network ID
: Contains the network ID associated with this PCID (also shown on the PCID display).

Pacing type
: Specifies the type of pacing used for this session. This can be one of the following:

  *NONE
  : No pacing is used

  *FIXED
  : Fixed pacing (next window size is always the same)

  *ADAPTIVE
  : Adaptive pacing (next window size is adjusted by receiver)

Pacing queue size
: Specifies the number of PIUs that are waiting to be sent.

Next window size (send)
: Specifies the number of PIUs that can be sent in the next window.

Next window size (receive)
: Specifies the number of PIUs that the remote system can send in the next window.

Residual pacing count (send)
: Specifies the number of PIUs that can still be sent in the current window.

Residual pacing count (receive)
: Specifies the number of PIUs that the remote system can send in the current window. Once the current window is used, the residual pacing count is set to the next window size.

Display Session Start/End Time

This display is shown when option 12 (Display start/end time) is specified for one or more PCIDs on the Display Session PCIDs display. It shows the date and time that the selected session was started and ended (if the session is still active only the start time will be displayed).

```
                         Display Start/End Time
                                                            System:   RCHAS377
PCID . . . . . . . . . . . . . . . :   F1D7566A0A24E0AA
  Control point . . . . . . . . . :     RCHAS377
  Network ID  . . . . . . . . . . :     RCHNET

                                       Date           Time
Session start time  . . . . . . . :   11/28/89       07:27:50
Session end time  . . . . . . . . :   11/28/89       08:45:54
```

Figure 9-21. Display Start/End Time

Field definitions:

PCID
: Contains the PCID identifying the selected session. This is the PCID which was selected on the Display Session PCIDs display.

Control point
: Contains the control-point name associated with this PCID (also shown on the Display Session PCIDs display).

Network ID
: Contains the Network ID associated with this PCID (also shown on the PCID display).

Session start time
: Displays the date and time that the selected session was started.

Session end time
: Displays the date and time that the selected session was ended. If the session is still active, blanks will be displayed in this field.

Note: F5 (Refresh) is enabled on this display only if the session is active.

Display Intermediate Session Information

The following display is shown when *INMSSN is specified for the *Session type* prompt on the Display APPN Information display. It displays the PCIDs of all intermediate sessions that are being routed through the local node for a specified controller or for all controllers, and provides options to display additional information for each session. You may select any of the following for a selected PCID:

- Option 5 (Display session information)
- Option 10 (Display PIUs)
- Option 11 (Display pacing information)
- Option 12 (Display start time)

Type your options and press the Enter key.

```
                         Display Intermediate Sessions
                                                           System:   RCHAS377
 Number of intermediate sessions . . . . . . . . . . . . :   7
 Number of sessions in use . . . . . . . . . . . . . . . :   4
 Controller . . . . . . . . . . . . . . . . . . . . . . . :   *ALL

 Type options, press Enter.
   5=Display session information   10=Display PIUs
   11=Display pacing information...

                          --Session Origin---
                          Control    Network
 Opt   PCID               Point      ID         Mode       Status
 5     F1D7566A0A24DF16   RCHAS110   RCHNET     BLANK      In use
 _     F1D7566A0A24DF13   RCHAS110   RCHNET     BLANK      In use
 _     F1D7566A0A24DF11   RCHAS110   RCHNET     BLANK      In use
 _     F1D7566A0A24DF0D   RCHAS110   RCHNET     BLANK      Active
 _     F1D7566A0A24DF07   RCHAS110   RCHNET     BLANK      Ending
 _     F1D7566A0A241D23   RCHAS536   RCHNET     SNASVCMG   Starting
 _     F1D7566A0A241D22   RCHAS536   RCHNET     SNASVCMG   In use
                                                                       Bottom
 F3=Exit      F5=Refresh   F6=Print information   F12=Cancel   F17=Top
 F18=Bottom   F23=More options
```

```
                         Display Intermediate Sessions
                                                           System:   RCHAS377
 Number of intermediate sessions . . . . . . . . . . . . :   7
 Number of sessions in use . . . . . . . . . . . . . . . :   4
 Controller . . . . . . . . . . . . . . . . . . . . . . . :   *ALL

 Type options, press Enter.
   12=Display start time...


                          --Session Origin---
                          Control    Network
 Opt   PCID               Point      ID         Mode       Status
 5     F1D7566A0A24DF16   RCHAS110   RCHNET     BLANK      In use
 _     F1D7566A0A24DF13   RCHAS110   RCHNET     BLANK      In use
 _     F1D7566A0A24DF11   RCHAS110   RCHNET     BLANK      In use
 _     F1D7566A0A24DF0D   RCHAS110   RCHNET     BLANK      Active
 _     F1D7566A0A24DF07   RCHAS110   RCHNET     BLANK      Ending
 _     F1D7566A0A241D23   RCHAS536   RCHNET     SNASVCMG   Starting
 _     F1D7566A0A241D22   RCHAS536   RCHNET     SNASVCMG   In use
                                                                       Bottom
 F3=Exit      F5=Refresh   F6=Print information   F12=Cancel   F17=Top
 F18=Bottom   F23=More options
```

Figure 9-22. Display Intermediate Sessions

Field definitions:

Number of intermediate sessions
: Displays the total number of intermediate sessions being routed through the local node. The sessions may be:

- Starting
- Active
- In use
- Ending

Number in use
: The number of sessions that have an active conversation (in use).

Controller description
: The controller description specified on the DSPAPPNINF command to make a subset of the intermediate session list. Only those sessions whose primary or secondary session stage use the specified controller description will be displayed. *ALL means that sessions for all controllers are displayed.

PCID
: Displays the list of PCIDs representing the intermediate sessions.

Control point
: Displays the control-point name of the node that created this PCID.

Note: The node that creates the PCID for a session is considered the session origin node, except for low-entry networking nodes, in which case the network node server determines the PCID.

Network ID
: Displays the network ID of the node that created this PCID.

Mode
: Displays the mode name associated with this PCID.

Status
: The current status of the session. It can have the following values:

Starting
: The session is being activated. A BIND has been received and forwarded to the next node on the session path, but the BIND response has not been returned.

Active
: The session is active but not in use. That is, there is no conversations using the session.

In Use
: The session is active with a conversation.

Ending
: UNBIND is in process for the session.

The following display is shown when option 5 (Display session information) is specified for one or more PCIDs on the Display Intermediate Sessions display. It displays the session endpoints (session origin and session destination) for the intermediate session associated with the selected PCID. The two controller description names associated with this session are also displayed.

```
                     Display Session Information
                                                      System:   RCHAS377
PCID . . . . . . . . . . . . . . . . . . . . . . . :   F1D7566A0A24DF16
  Control point . . . . . . . . . . . . . . . . . :     RCHAS110
  Network ID . . . . . . . . . . . . . . . . . . . :     RCHNET

Session origin:
  Location . . . . . . . . . . . . . . . . . . . . :   LOC110
  Network ID . . . . . . . . . . . . . . . . . . . :   RCHNET

Session destination:
  Control point . . . . . . . . . . . . . . . . . :   RCHAS536
  Network ID . . . . . . . . . . . . . . . . . . . :   RCHNET
  Location . . . . . . . . . . . . . . . . . . . . :   LOC536A
  Network ID . . . . . . . . . . . . . . . . . . . :   RCHNET

Primary controller . . . . . . . . . . . . . . . . :   APPNCTL1
Secondary controller . . . . . . . . . . . . . . . :   APPNCTL2

Press Enter to continue.

F3=Exit   F6=Print information   F12=Cancel
```

Figure 9-23. Display Session Information

Field definitions:

PCID
: Displays the selected PCID of the intermediate session for which the session information is to be displayed.

Control point
: Displays the control-point name of the node that created the selected PCID.

Network ID
: Displays the network ID of the node that created the selected PCID.

Session origin:

Location
: Displays the name of the location that originated the intermediate session associated with the selected PCID.

Network ID
: Displays the network ID associated with the location that originated the intermediate session associated with the selected PCID.

Session destination:

Control point
: Displays the control-point name of the node that is the destination of the intermediate session associated with the selected PCID.

Network ID
: Displays the network ID associated with the name of the session destination control point that is the destination of the intermediate session associated with the selected PCID.

Location
: Displays the name of the location that is the destination of the intermediate session associated with the selected PCID.

Network ID
: Displays the network ID associated with the name of the location that is the destination of the selected session.

Primary controller
: Displays the name of the controller description associated with the origin control point. The BIND request was received on the link associated with this controller description.

Secondary controller
: Displays the name of the controller description associated with the destination control point. The BIND request was sent out on the link associated with this controller description.

This display is shown when option 10 is specified for one or more PCIDs on the Display Intermediate Sessions display. It displays the hexadecimal format of the TH, RH and first 6 bytes of the RU for the last PIUs sent and received for both the primary and secondary controllers.

```
                              Display PIUs
                                                      System:   RCHAS377
PCID . . . . . . . . . . . . . . :   F1D7566A0A24DF16
  Control point  . . . . . . . . :     RCHAS110
  Network ID . . . . . . . . . . :     RCHNET

Type options, press Enter.
  5=Display formatted PIU

Opt  Controller  Direction          TH            RH      RU
 5   APPNCTL1    Sent               2E0005010004  019020  F8F94B404040
 _   APPNCTL1    Received           2E0001058000  832000
 _   APPNCTL2    Sent               2D000B010000  830100  000007
 _   APPNCTL2    Received           2C00010B0004  019020  F8F94B404040




                                                                Bottom
F3=Exit   F5=Refresh   F6=Print information   F12=Cancel
```

Field definitions:

PCID
: Contains the PCID identifying the selected session. This is the PCID which was selected on the Display Session PCIDs display.

Control point
: Contains the control-point name associated with this PCID (also shown on the Display Session PCIDs display).

Network ID
: Contains the Network ID associated with this PCID (also shown on the PCID display).

Controller
: Indicates the name of the controller that processed this PIU.

Direction
: Indicates whether this PIU was sent to or received from a remote system.

TH (transmission header)
: Contains the 6-byte transmission header associated with the selected PIU. All PIUs have an associated TH.

RH (request/response header)
: Contains the 3-byte request/response header associated with the selected PIU. An RH exists as part of each PIU that contains the first (or only) segment of a segmented RU. For a PIU that is not the first or only segment, blanks are displayed in the RH field.

RU (request unit)
: Contains the first 6 bytes of the RU associated with the selected PIU. The whole RU may be shorter than 6 bytes, or there may be no RU present, in which case blanks are displayed in the RU field.

This display is shown when option 5 (Display formatted PIU) is specified for one or more PIUs on the Display PIUs display. This display shows the individual fields within the PIU and the value of each field.

```
                             Display Formatted PIU
                                                           System:   RCHAS377
PIU:   Last PIU sent                           Controller:   APPNCTL1

TH :   2E0005010004    FID :   2   MPF :   Only            ODAI:   1
                       DAF':   05  OAF':   01              SNF :   0004

                       ----------------------Active------------------------
RH :   019020          REQ     FMD     ECI     DR1I    ERI     CDI



RU :   F8F94B404040

RU length  . . . . . . . . . . :   8

Logged date/time . . . . . . . :   11/29/89   09:35:46

Press Enter to continue.

F3=Exit   F6=Print information   F12=Cancel
```

Figure 9-24. Display Formatted PIU

Except for the following, the fields for this display are described in "Display Formatted PIU" on page 9-31.

Field definitions:

Controller
: Indicates the name of the controller that processed this PIU.

When option 11 is selected for a specific intermediate session, pacing information is displayed for the primary and secondary stage of the intermediate session.

```
                         Display Pacing Information
                                                          System:   RCHAS377
PCID . . . . . . . . . . . . . . . :    F1D7566A0A24DF16
  Control point  . . . . . . . . . :      RCHAS110
  Network ID . . . . . . . . . . . :      RCHNET

                                        Primary              Secondary
Controller . . . . . . . . . . . . :    APPNCTL1             APPNCTL2
Pacing queue size  . . . . . . . . :    0                    0
Pacing type:
  Send . . . . . . . . . . . . . . :    *ADAPTIVE            *ADAPTIVE
  Receive  . . . . . . . . . . . . :    *ADAPTIVE            *ADAPTIVE
Next window size:
  Send . . . . . . . . . . . . . . :    0                    127
  Receive  . . . . . . . . . . . . :    63                   7
Residual pacing count:
  Send . . . . . . . . . . . . . . :    3                    63
  Receive  . . . . . . . . . . . . :    61                   4

Press Enter to continue.

F3=Exit   F5=Refresh   F6=Print information   F12=Cancel
```

Field Definitions:

PCID
: A unique number that identifies a session.

Control point
: The APPN control-point name of the node that generated the PCID.

Network ID
: The APPN network identifier of the node that generated the PCID.

Controller
: The name of the controller description associated with the primary and secondary stages of the intermediate session.

Pacing queue size
: Number of PIUs that are waiting to be sent.

Pacing type
: The type of pacing used for the session stage. It can be one of the following:

  *NONE
  : No pacing is used

  *FIXED
  : Fixed pacing (next window size is always the same)

  *ADAPTIVE
  : Adaptive pacing (next window size is adjusted by receiver)

Next window size (send)
: Number of PIUs that can be sent in the next window.

Next window size (receive)
: Number of PIUs the remote system can send in the next window.

Residual pacing count (send)
: Numbers of PIUs that can be sent in the current window.

Residual pacing count (receive)
: Numbers of PIUs the remote system can send in the current window. Once the current window is used the residual pacing count is set to the next window size.

This display is shown when option 12 (Display start/end time) is specified for one or more PCIDs on the Display Session PCIDs display. It shows the date and time that the selected session was started. Since only active intermediate sessions are displayed, the session end time is not shown.

```
                              Display Start Time
                                                           System:   RCHAS377
PCID . . . . . . . . . . . . . . . :   F1D7566A0A24DF16
  Control point . . . . . . . . . . :     RCHAS110
  Network ID . . . . . . . . . . . :     RCHNET

                                       Date          Time
Session start time  . . . . . . . . :  11/29/89      09:35:02
```

Figure 9-25. Display Start/End Time

Field definitions:

PCID
: Contains the PCID identifying the selected session. This is the PCID which was selected on the Display Session PCIDs display.

Control point
: Contains the control-point name associated with this PCID (also shown on the Display Session PCIDs display).

Network ID
: Contains the Network ID associated with this PCID (also shown on the PCID display).

Session start time
: Displays the date and time that the selected session was started.

DSPAPPNINF Example

The following example uses the network shown in Figure 2-5 on page 2-3. You are located at Chicago (CHICAGO), and you start a pass-through session from Chicago to Distribution (DISTRIB). Information about this session can be shown by typing

```
DSPAPPNINF *SSN SSNTYPE(*ENDPNT)
```

on Chicago to display endpoint session information. The following display is shown.

```
                          Display APPN Jobs
                                                    System:   CHICAGO
Type options, press Enter.
  5=Display session PCIDs

Opt     Job           User          Number
 5      DSP03         QSECOFR       003260











                                                               Bottom
F3=Exit   F5=Refresh   F6=Print information   F12=Cancel   F17=Top
F18=Bottom
```

Figure 9-26. Display Job Names

Typing option 5 (Display session PCIDs) for the displayed job name shows the PCID representing the pass-through session. Figure 9-27 shows this PCID.

```
                         Display Session PCIDs
                                                    System:   CHICAGO
Job:   DSP03         User:   QSECOFR        Number:   003260


Type options, press Enter.
  5=Display route   8=Display formatted BIND   9=Display error data...



                              Control    Network
Opt   PCID                    Point      ID         Mode       Status
5     F5F34490190393F8        CHICAGO    APPN       BLANK      Active






                                                               Bottom
F3=Exit      F5=Refresh   F6=Print information   F12=Cancel   F17=Top
F18=Bottom   F23=More options
```

Figure 9-27. Display Session PCIDs

If option 5 (Display route) is then typed on this display, the route taken by the session from Chicago to Distribution is displayed on Figure 9-28 on page 9-44.

```
                               Display Route
                                                             System:    CHICAGO
PCID . . . . . . . . . . . . . . . :    F5F34490190393F8
  Control point  . . . . . . . . . :      CHICAGO
  Network ID . . . . . . . . . . . :      APPN

        Control       Network        TG
Hop     Point         ID            Number
  1     MPLS          APPN             1
  2     DISTRIB       APPN             1









                                                                      Bottom
Press Enter to continue.

F3=Exit   F6=Print information   F12=Cancel
```

Figure 9-28. Display Route

Figure 9-28 shows that this route consists of two hops:

- The first from Chicago to Minneapolis (MPLS)
- The second from Minneapolis to Distribution (Minneapolis is the intermediate node)

This can be verified on Minneapolis by typing

```
DSPAPPNINF *SSN SSNTYPE(*INMSSN)
```

to display intermediate session information. Intermediate session information is shown in Figure 9-29, and this display shows the same PCID that was shown in Figure 9-27 on page 9-43.

```
                         Display Intermediate Sessions
                                                             System:    MPLS
Number of intermediate sessions  . . . . . . . . . . . . . :   1
Number of sessions in use  . . . . . . . . . . . . . . . . :   1
Controller . . . . . . . . . . . . . . . . . . . . . . . . :   *ALL

Type options, press Enter.
  5=Display session information   10=Display PIUs
  11=Display pacing information...

                           --Session Origin---
                           Control    Network
Opt   PCID                 Point      ID          Mode        Status
5     F5F34490190393F8     CHICAGO    APPN        BLANK       In use






                                                                      Bottom
F3=Exit      F5=Refresh    F6=Print information   F12=Cancel   F17=Top
F18=Bottom   F23=More options
```

Figure 9-29. Display Intermediate Sessions

Typing option 5 (Display session information) shows Figure 9-30 on page 9-45. This display shows that the session origin is Chicago and the destination is Distribution.

Note: If it is not possible or convenient to directly access Minneapolis, you can start a pass-through session from Chicago to Minneapolis to run jobs on Minneapolis.

```
                      Display Session Information
                                                        System:   MPLS
PCID . . . . . . . . . . . . . . . . . . . . . . . . :   F5F34490190393F8
  Control point  . . . . . . . . . . . . . . . . . . :     CHICAGO
  Network ID . . . . . . . . . . . . . . . . . . . . :     APPN

Session origin:
  Location . . . . . . . . . . . . . . . . . . . . . :   CHICAGO
  Network ID . . . . . . . . . . . . . . . . . . . . :   APPN

Session destination:
  Control point  . . . . . . . . . . . . . . . . . . :   DISTRIB
  Network ID . . . . . . . . . . . . . . . . . . . . :   APPN
  Location . . . . . . . . . . . . . . . . . . . . . :   DISTRIB
  Network ID . . . . . . . . . . . . . . . . . . . . :   APPN

Primary controller . . . . . . . . . . . . . . . . . :   CHICAGOL
Secondary controller . . . . . . . . . . . . . . . . :   DISTRIB

Press Enter to continue.

F3=Exit   F6=Print information   F12=Cancel
```

Figure 9-30. Display Session Information

While performing jobs on Distribution using the pass-through session, you suddenly lose access to Distribution and you receive a message saying `Communications failure for device DISTRIB`. Now that you know what route was taken by the session, you should determine the status of the links over which the session traveled. This topology information can be displayed by typing:

```
DSPAPPNINF *TOPOLOGY
```

Specifying this for Chicago shows Figure 9-31 on page 9-46 and Figure 9-32 on page 9-46. These indicate that the link between Chicago and Minneapolis is still active.

```
                              Display Nodes
                                                         System:   CHICAGO
 Position to . . . . . . . .   _______  Control point
   Network ID . . . . . . . .   _______

 Type options, press Enter.
   5=Display link destination nodes

      Control   Network   Node  Routing      Route Addition  Valid Routing
 Opt  Point     ID        Type  Congestion     Resistance     Information
  5   CHICAGO   APPN      *NN   Low               128             Yes
  _   MPLS      APPN      *NN   Low               128             Yes

                                                                       Bottom
 F3=Exit   F5=Refresh   F6=Print information   F12=Cancel
```

Figure 9-31. Display Nodes

```
                       Display Link Destination Nodes
                                                         System:   CHICAGO
 Origin control point . . . . . . . . . . . :   CHICAGO
   Origin network ID  . . . . . . . . . . . :     APPN

 Position to . . . . . . . .   _______  Control point
   Network ID . . . . . . . .   _______

 Type options, press Enter.
   5=Display link characteristics

      Control    Network      TG     Link      Disconnect    Valid Routing
 Opt  Point      ID         Number   Active    in Process     Information
  _   MPLS       APPN          1     Yes         No              Yes
  _   MPLS       APPN          3     Yes         No              Yes
  _   NEWYORK    APPN          1     Yes         No              Yes

                                                                       Bottom
 F3=Exit   F5=Refresh   F6=Print information   F12=Cancel
```

Figure 9-32. Display Link Destination Nodes Connected to Chicago

Determining the status of the link between Minneapolis and Distribution, in this example, requires that you run the DSPAPPNINF command for Minneapolis (because Distribution is a nonadjacent end node that is not known to Chicago and the link between Minneapolis and Distribution will not show up in Chicago's topology information).

When the DSPAPPNINF command has been run on Minneapolis, Figure 9-33 on page 9-47 is shown.

```
                              Display Nodes
                                                            System:   MPLS
Position to . . . . . . . .   _______   Control point
  Network ID . . . . . . . .    _______

Type options, press Enter.
  5=Display link destination nodes

     Control   Network    Node  Routing      Route Addition  Valid Routing
Opt  Point     ID         Type  Congestion     Resistance     Information
 _   CHICAGO   APPN       *NN   Low               128            Yes
 _   DISTRIB   APPN       *EN
 _   LOSANGEL  APPN       *EN
 5   MPLS      APPN       *NN   Low               128            Yes
 _   PAYROLL   APPN       *EN
 _   PURCH     APPN       *EN



                                                                    Bottom
F3=Exit   F5=Refresh   F6=Print information   F12=Cancel
```

Figure 9-33. Display Nodes

When option 5 (Display link destination nodes) is selected for MPLS, Figure 9-34 is shown. Figure 9-34 indicates that the link between Minneapolis and Distribution is no longer active, which explains the cause of the session failure.

```
                      Display Link Destination Nodes
                                                            System:   MPLS
Origin control point . . . . . . . . . . . :   MPLS
  Origin network ID . . . . . . . . . . . :     APPN

Position to . . . . . . . .   _______   Control point
  Network ID . . . . . . . .    _______

Type options, press Enter.
  5=Display link characteristics

     Control   Network      TG     Link      Disconnect   Valid Routing
Opt  Point     ID         Number   Active    in Process    Information
 _   CHICAGO   APPN          1     Yes         No            Yes
 _   CHICAGO   APPN          3     Yes         No            Yes
 _   DISTRIB   APPN          1     No          No            Yes
 _   LOSANGEL  APPN          1     Yes         No            Yes
 _   PAYROLL   APPN          1     No          No            Yes
 _   PURCH     APPN          1     No          No            Yes

                                                                    Bottom
F3=Exit   F5=Refresh   F6=Print information   F12=Cancel
```

Figure 9-34. Display Link Destination Nodes Connected to Minneapolis

The next step is to determine why the link is not active and have it started again.

Appendix A. Sense Codes

Request Reject (Category Code = X'08')

This category indicates that the request was delivered to the intended component and was understood and supported, but not run.

Category and modifier (in hexadecimal):

0801 Resource Not Available: The LU, PU, link station, or link specified in an RU is not available.

Bytes 2 and 3 following the sense code contain sense code specific information. Settings allowed are:

0000	No specific code applies.
0001	Independent LU Does Not Receive ACTLU: An ACTLU has been sent by the SSCP to an independent LU (sent by BF).
0002	Reserved resources requested for sessions exceed allowable maximum: The resource reservation request in RNAA exceeds the maximum allowed by system definition. The address was not assigned and no change was made to the current reservation of resources for the LU.
0003	Name substitution cannot be performed because the name alias function is not available.
0004	A switched connection currently exists for the link being activated, and the SSCP or the subarea PU does not support the protocols necessary to allow the take over of such a link.
0005	A SETCV has been received for a resource that is still represented in the pool of available control blocks.
0006	The line is not associated with a line adapter.
0007	The line is associated with a line adapter that is not installed or not attached to the CCU.
0008	The line is associated with a line adapter that is inoperative.
0009	The LU is not available because it is not ready to accept sessions.
000A	The primary logical unit is not available because it is being taken down, and is, therefore, not accepting new sessions. The initiation request should not be retried.
000B	The primary logical unit is not available because it is unable to comply with the primary logical unit-secondary logical unit role specification.
000C	The secondary logical unit is not available because it is unable to comply with the primary logical unit-secondary logical unit role specification.

000D	The LU is not available because its SSCP is in the process of being taken down, and is, therefore, not allowing new sessions to be started. The initiation request should not be retried.
000E	The LU is not available because an intermediate gateway SSCP is in the process of being taken down, and is, therefore, not allowing new sessions to be started.
000F	The secondary logical unit is not available because it is being taken down, and is, therefore, not accepting new sessions. The initiation request should not be retried.
4001-4002	Set aside for implementation-specific use and will not be otherwise defined in SNA; see implementation documentation for details.

0805 Session Limit Exceeded: The requested session cannot be activated, because one of the NAUs is at its session limit, for example, the LU-LU session limit or the (LU, mode) session limit. This sense code applies to ACTCDRM, INIT, BIND, and CINIT requests.

Bytes 2 and 3 following the sense code contain sense code specific information. Settings allowed are:

0000	No specific code applies.
0001	If accepted, the BIND request would prevent either the receiving LU or the sending LU from activating the number of contention winner sessions to the partner LU that were agreed on during a change-number-of-sessions procedure.
0004	For an independent LU, the BIND request, if accepted, would cause the system defined maximum number of sessions allowed for any LU to be exceeded for this LU.
0005	The intermediate session router is unable to create a session connector control block. The pool of session connectors is saturated with active sessions and with pending active sessions for which the queue bit was set in the BIND; the BIND should not be retried.
0006	The intermediate session router is unable to create a session connector control block. The pool of session connectors is saturated with active sessions and with pending active sessions for which the queue bit was not set in the BIND; the BIND should be retried.
0008	For a dependent LU, if accepted, the BIND request would cause the session limit to be exceeded.
0009	If accepted, the request would cause the primary logical unit session limit to be exceeded.
000A	If accepted, the request would cause the secondary logical unit session limit to be exceeded.
000B	The request was rejected because a session already exists between the same LU pair, and at least one of the LUs does not support parallel sessions.

0806 Resource Unknown: For example, the request contained a name or address not identifying a PU, LU, SSCP, link, or link station known to the receiver or the sender.

Note: In an interconnected network environment, this sense code may be set by an SSCP in whose subnetwork and domain the LU was expected to reside; it is not set by an SSCP that is only an intermediary on the session-setup path. A gateway SSCP examines the Resource Identifier control vector in a session setup request (for example, CDINIT), to determine whether the LU is in the SSCP's subnetwork and domain.

Bytes 2 and 3 following the sense code contain sense code specific information. Settings allowed are:

0000 No specific code applies.

0001 The resources identified in an SNA Address List (X'04') MS common subvector are unknown to the PU receiving the request.

Note: When this sense data flows in a -RSP to an NMVT, the referenced X'04' subvector is the one that was present in the request NMVT to which the -RSP corresponds. When this sense data flows in a Sense Data (X'7D') MS common subvector, the referenced X'04' subvector is present with the X'7D' subvector in the same major vector.

0002 Set aside for implementation-specific use, and will not be otherwise defined in SNA; see implementation documentation for details.

0004 The indicated resources in the accompanying Name List (X'06') subvector are unknown to the control point to which the request containing the subvector was routed.

Note: Names in the hierarchy below the level of the first unknown resource are not examined by the control point.

0006 For a dynamic reconfiguration DELETE, MOVE, or REPLACE operation, the resource to be DRed could not be found.

0007 The LU address in bytes 8-9 of RNAA type X'4' is already in the free pool.

0008 For a dynamic reconfiguration DELETE, MOVE, or REPLACE operation, the NAU name in RNAA does not correspond to the resource identified by the element address in the RNAA.

0009 The SSCP(OLU) cannot identify the SSCP(DLU), and default SSCP rerouting is not enabled.

000A The configuration identifier specified in a management services command is not recognized by the DLC manager at the receiving node.

0011 An unknown OLU name was specified in the request.

0012	An unknown DLU name was specified in the request.
0013	An unknown secondary logical unit name was specified in the request.
0014	An unknown primary logical unit name was specified in the request.
0015	An unknown OLU address was specified in the request.
0016	An unknown DLU address was specified in the request.
0017	An unknown secondary logical unit address was specified in the request.
0018	An unknown primary logical unit address was specified in the request.
0021	The session-initiation request specified that the receiving SSCP is the SSCP having the DLU in its domain, but the DLU is unknown to the receiving SSCP.
0022	The sender of the request is unknown to the receiver.
0023	The destination of the request or response is unknown to the sender.
0024	An unknown LU1 name was specified in the request.
0025	An unknown LU2 name was specified in the request.
0026	The SSCP does not have a session with the boundary function PU of an independent LU.
0027	The PU associated with a switched secondary logical unit is unknown. Session setup processing for the switched secondary logical unit cannot proceed.
0028	NAU1 network address is unknown.
0029	NAU2 network address is unknown.
002A	The NAU name in the CONTACT or ACTLU does not correspond to
002B	Link could not be identified by the local system because resource was not found or there was no match for the transmission group.

0809 Mode Inconsistency: The requested function cannot be performed in the present state of the receiver.

Bytes 2 and 3 following the sense code contain sense code specific information. Settings allowed are:

0000	No specific code applies.
0038	There is an inconsistency of mode between the XID sender and receiver. The XID receiver is operating in short hold mode. Examples include inconsistent settings of the Short Hold Indicator (SHI), the Short Hold Status Indicator (SHSI) and the XID Exchange State Indicator.
0039	CP capabilities error - CD error during CP capabilities exchange.

080C Procedure Not Supported: A procedure (Test, Trace, IPL, REQMS type, MS major vector key) specified in an RU is not supported by the receiver.

Bytes 2 and 3 following the sense code contain sense code specific information. Settings allowed are:

0000	No specific code applies.
0001-0003	Set aside for implementation specific use, and will not be otherwise defined in SNA; see implementation documentation for details.
0005	The MS major vector key is not supported by the receiver.
0006	The MS major vector is identified as one that contains a command, but the receiver does not recognize or support the command subvector. (See the X'086C' sense code for the case in which the command subvector is identified, but an additional required subvector is missing.)
0007	A request for a function is supported by the receiver, but the resource identified in the request does not support that function (no function is specifically indicated).
0009	A request for session information retrieval for an independent LU was received in an REQMS; such requests are permitted only in an NMVT.
000A	A request was received containing a name list or an address list MS subvector with multiple entries, but the receiver supports only a single entry in such a subvector.
4001, 4003	Set aside for implementation-specific use, and will not be otherwise defined in SNA; see implementation documentation for details.

080D NAU Contention: A request to activate a session was received while the receiving half-session was awaiting a response to a previously sent activation request for the same session; for example, the SSCP receives an ACTCDRM from the other SSCP before it receives the response for an ACTCDRM that it sent to the other SSCP and the SSCP ID in the received ACTCDRM was less than or equal to the SSCP ID in the ACTCDRM previously sent.

080E NAU Not Authorized: The requesting NAU does not have access to the requested resource.

Bytes 2 and 3 following the sense code contain sense code specific information. Settings allowed are:

0002	Locate message received when we were not the NSS for the OLU.
0006	NN received a REGISTER from an unauthorized PN; receiver rejects the REGISTER with this code.
0007	NN received a REGISTER from another NN; receiver rejects the REGISTER with this code.

0008	NN received a DELETE from another NN; receiver rejects the DELETE with this code.
0009	NN received a DELETE from an unauthorized PN; receiver rejects the DELETE with this code.
000A	A REGISTER was received for an LU, but a conflicting directory entry exists for this LU.
000B	A locate was received at an NN from an EN, but the EN is not served by the NN.

0812 Insufficient Resource: Receiver cannot act on the request because of a temporary lack of resources.

Bytes 2 and 3 may contain the following sense code specific information:

0000	No specific code applies.
0006	Unsuccessful Allocation: The Intermediate Session Router is unable to create a session connector control block. The RU being rejected is a BIND.
0007	Insufficient resources are available for LU address allocation.
0008	No Buffer Space: The session was deactivated because of a buffer shortage when extending a non-extended positive RSP(BIND). Insufficient resources exist to extend a BIND response.
0009	No unreserved session connectors are available to add an LU.
000A	A network node does not have adequate resources to perform the REGISTER (the available directory capacity is exceeded).
000B	A BFSESSINFO was received for an unknown LU.
000C	Not enough buffer space exists to support a deadlock-free transmission group. The receiver does not have enough buffers to allocate a BIND receive buffer.
000D	Insufficient buffers exist to activate a session.
000E	A BIND or BFCINIT cannot be processed because of insufficient storage to keep the network-qualified name of the initiating control point.
000F	Insufficient buffer space exists to build a BFINIT.
0010	The CP does not have adequate resources to process a Locate GDS variable request. The contention loser's CP-CP session is deactivated.
0011	There is insufficient storage available to the SNA component to satisfy the request at this time.
0016	Unknown Network ID.
0018	All address space has been used.

0815 Function Active: A request to activate a network element or procedure was received, but the element or procedure was already active.

Bytes 2 and 3 following the sense code contain sense code specific information. Settings allowed are:

0000	No specific code applies.
0007	CP capabilities received on a CP-CP session that is already active.

0817 0004: Link activation but a different TG number was negotiated.

0818 Link Procedure in Process: CONTACT, DISCONTACT, IPL, or other link procedure in progress when a conflicting request was received.

Bytes 2 and 3 following the sense code contain sense code specific information. Settings allowed are:

0000	No specific code applies.
0001,0002	Set aside for implementation-specific use, and will not be otherwise defined in SNA; see implementation documentation for details.
0003	CONTACT Not Serialized, Retry: An initial CONTACT procedure is in progress and a nonactivation CONTACT was received by the PU. The nonactivation CONTACT is rejected until the initial CONTACT procedure is completed.
0004	Set aside for implementation-specific use, and will not be otherwise defined in SNA; see implementation documentation for details.
0005	Link problem determination test for a modem in progress.
0006	Online terminal test in progress.
0007	SDLC link test, level 2, in progress.
0009	Test initiated from the modem panel is in progress.

081A Request Sequence Error: Invalid sequence of requests.

Bytes 2 and 3 following the sense code contain sense code specific information. Settings allowed are:

0000	No specific code applies.
0001	An ACTLU was received and no SSCP-PU session exists.
0002	An IPL or DUMP RU sequence error has occurred.
0004	An NC_ER_TEST was to be sent as a result of receiving a ROUTE_TEST request. The ROUTE_TEST was sent in one subnetwork, the NC_ER_TEST was to be sent in another. The SSCP sending the ROUTE_TEST did not have a required alias address within the subnetwork where the NC_ER_TEST was to be sent. (Before sending ROUTE_TEST, the SSCP sends RNAA, or the installation predefines the alias address, so that an origin SSCP address is available within the subnetwork of the route being tested. This address is then specified in the NC_ER_TEST RU.)

0006 RNAA Rejected: If the PU to which the LU is to be added is RNAA added and a control vector has not been received, the RNAA is rejected. A SETCV for the PU has not been received and processed.

0007 A CONTACT, BIND, or ACTLU has been received from an SSCP that has not established ownership of a permanent system defined resource. The resource is not usable until RNAA(MOVE) has been received.

0008 A CONTACT, BIND, or ACTLU has been received from an SSCP that has not established ownership of a temporary (DR added) resource. The resource is not usable until RNAA(ADD) has been received.

081E Session Reference Error: The request contained reference to a half-session that either could not be found or was not in the expected state (generally applies to network services requests).

Bytes 2 and 3 following the sense code contain sense code specific information. Settings allowed are:

0003 No session was found during the processing of a session services request.

0004 The appropriate session was found during processing of a session services request, but the session is not in the expected state.

081F Link Activation Failure: A link could not be activated, which caused a session initiation request to fail.

0001 There was a link activation failure while an attempt was being made to activate a TG.

0821 Invalid Session Parameters: Session parameters were not valid or not supported by the half-session whose activation was requested.

Bytes 2 and 3 following the sense code contain sense code specific information. Settings allowed are:

0000 No specific code applies.

0001 Invalid Mode Name at LU: The specified mode name was not recognized by the LU.

0002 Invalid Mode Name at CP: The specified mode name was not recognized by the CP.

0003 The primary half-session requires cryptography, but the secondary half-session does not support cryptography.

0004 The secondary half-session requires cryptography, but the primary half-session does not support cryptography.

0005 Selective or required cryptography is specified, but no secondary logical unit cryptographic data key is provided.

082C Resource-Sharing Limit Reached: The request received from an SSCP was to activate a half-session, a link, or a procedure, when that resource was at its share limit.

Bytes 2 and 3 following the sense code contain sense code specific information. Settings allowed are:

0000	No specific code applies.
0001	Invalid Request: The specified link station has already received a CONTACT and is, therefore, under the control of another SSCP. This CONTACT would exceed the share limit (=1).

0840 Procedure Invalid for Resource: The named RU is not supported in the receiver for this type of resource (for example, (1) SETCV specifies boundary function support for a type 1 node but the capability is not supported by the receiving node, or (2) the NCP PU receiving an EXECTEST or TESTMODE is not the primary NCP PU for the target link.)

Bytes 2 and 3 following the sense code contain sense code specific information. Settings allowed are:

0000	No specific code applies.
0003	Invalid Link: The link to which the PU is to be added is not an SNA link. Only SNA links are supported.
0004	Invalid Link: A request that is allowed only for a nonswitched link was received for a link that is defined to the receiver as switched.
0005	Resource was not dynamically added: This request only works with resources that were added through dynamic reconfiguration.
0007	Resource not found.
0008	The directory entry cannot be deleted. The network node received a DELETE with a delete entry condition indicating that the entry can be deleted only if it is a leaf. The entry is not a leaf, therefore, the DELETE is rejected.
0009	RNAA(Move) received for a resource that was added through dynamic reconfiguration. Such a resource may not be moved through RNAA(Move).
000A	Procedure Invalid for Resource: A PN supporting independent LUs has dialed into a boundary function that does not support sessions with independent LUs. The SSCP cannot activate the independent LUs.
000B	The REGISTER request specifies that a unique directory entry is required (for example, the REGISTER is for an LU), but there is a duplicate in the directory database.
000C	The entry type in a DELETE request does not agree with the entry type in the directory entry.
0010	A SETCV with control vector X′43′ has been received for a nonswitched resource.
0011	A dynamically added or a switched resource has not yet been activated.

0842 Session Not Active.

Bytes 2 and 3 following the sense code contain sense code specific information. Settings allowed are:

0000 This value is used if there is not enough data to select one of the more specific codes listed below.

0001 The session between T2.1 CPs is not active.

0002 For a session-initiation request, an SSCP does not have an SSCP-SSCP session with an SSCP in the direction of the DLU.

0003 For a session-initiation request, an SSCP does not have an SSCP-SSCP session with an SSCP in the direction of the OLU.

084B Requested Resources Not Available: Resources named in the request, and required to honor it, are not currently available. It is not known when the resources will be made available.

Bytes 2 and 3 following the sense code contain sense code specific information. Settings allowed are:

0000 No specific code applies.

0001 BIND Queuing Not Supported, Retry: The secondary logical unit is not available and the sender of the UNBIND does not support BIND queuing as requested by the primary logical unit.

0002 Requested Resource Not Available: For dynamic reconfiguration MOVE, ADD, or ADDLIKE operation, the requested local address is already assigned to an active resource. For MOVE PU this is the DLC address; for MOVE LU, the LU local address.

0003 The application transaction program specified in the request is not available.

6002 The resource identified by the destination program name (DPN) is not supported.

6003 The resource identified by the primary resource name (PRN) is not supported.

6031 Transaction Program Not Available—Retry Allowed: The FMH-5 Attach command specifies a transaction program that the receiver is unable to start. Either the program is not authorized to run or the resources to run it are not available at this time. The condition is temporary. The sender is responsible for subsequent retry. This sense data is sent only in FMH-7.

084C Permanent Insufficient Resource: Receiver cannot act on the request because resources required to honor the request are permanently unavailable. The sender should not retry immediately because the situation is not transient.

Bytes 2 and 3 following the sense code contain sense code specific information. Settings allowed are:

0000 For LU 6.2, Transaction Program Not Available—No Retry: The FMH-5 Attach command specifies a transaction program that the receiver is unable to start. The condition is not temporary. The sender should not retry immediately. This sense data is sent only in FMH-7.

For non-LU 6.2, no additional information is specified.

0001 — Set aside for implementation-specific use, and will not be otherwise defined in SNA; see implementation documentation for details.

hnnn — where h is greater than or equal to 8, that is, the high-order bit in byte 2 is set to 1. The 15 low-order bits of bytes 2 and 3 contain a binary count that indexes (zero-origin) the first byte of the field found to be in error.

084F Resource Not Available: A requested resource is not available to service the given request.

Bytes 2 and 3 following the sense code contain sense code specific information. Settings allowed are:

0000 — No specific code applies.

0001 — The disk is full; therefore, the load module cannot be stored.

0852 Duplicative Session Activation Request: Two session activation requests have been received with related identifiers. The relationship of the identifiers and the resultant action varies by request.

Bytes 2 and 3 following the sense code contain sense code specific information. Settings allowed are:

0000 — If the RU is an ACTPU or ACTCDRM, it means that a session has already been activated for the subject destination-origin pair by a session activation request that carried a larger activation request identifier than the current request; the current request is refused.

If the RU is a BIND, it means that the BIND request was received with the same session instance identifier (in the structured subfield X'03' of the User Data field) as an active session's; the current request is refused.

0001 — Received a second BIND from a peripheral node primary logical unit while the session is still in the activation process.

0861 Invalid COS Name: The class of service (COS) name, either specified by the ILU or generated by the SSCP of the secondary logical unit from the mode table is not in the "COS name to VR identifier list" table used by the SSCP of the primary logical unit.

Bytes 2 and 3 following the sense code contain sense code specific information. Settings allowed are:

0000 — COS name was generated by the SSCP.

0001 — COS name was generated by the ILU.

0002 — The COS name generated by the T2.1 CP local to, or the T2.1 NNCP server for, the ILU is not in the COS name definition table.

0003 — The CDINIT request or response contains a Session Initiation control vector that has Class-of-Service (COS) name fields that have not been properly specified.

0864 Function Abort: The conversation was ended abnormally. Other endings to conversations may occur after repeated runs; the request sender is responsible to detect such a loop.

Bytes 2 and 3 following the sense code contain sense code specific information. Settings allowed are:

0000 For LU 6.2, Premature Conversation Ending: The conversation is ended abnormally; for example, the transaction program may have issued a DEALLOCATE_ABEND verb, or the program may have ended (normally or abnormally) without explicitly ending the conversation. This sense data is sent only in FMH-7.

For non-LU 6.2, no additional information is specified.

0001 System Logic Error—No Retry: A system logic error has been detected. No retry of the conversation should be attempted. This sense data is sent only in FMH-7.

0002 Excessive Elapsed Time—No Retry: Excessive time has elapsed while waiting for a required action or event. For example, a transaction program has failed to issue a conversation-related protocol boundary verb. No retry of the conversation should be attempted. This sense data is sent in UNBIND when there is no chain to respond to; otherwise, it is sent in FMH-7.

nnnn Retired

086F Length Error: A length field within an MS major vector is invalid, or two or more length fields are incompatible.

Bytes 2 and 3 following the sense code contain sense code specific information. Settings allowed are:

0000 No specific code applies.

0001 The MS major vector length is incompatible with the RU length.

0002 The sum of the MS subvector lengths is incompatible with the MS major vector length.

nn03 The sum of the subfield lengths in an MS subvector is incompatible with the subvector length. Byte 2 following the sense code contains the subvector key (nn).

nn05 MS subvector length invalid. Byte 2 following the sense code contains the relevant subvector key (nn). (This is specified only if the sum of the subvector lengths is compatible with the major vector length.)

nn06 Subfield length invalid. Byte 2 following the sense code contains the subvector key (nn) of the MS subvector containing the invalid subfield length. (This is specified only if the sum of the subfield lengths is compatible with the subvector length.)

0877 Resource Mismatch: The receiver of a request has detected a mismatch between two of the following: (1) its definition of an affected resource, (2) the actual configuration, and (3) the definition of the resource as implied in the request.

Bytes 2 and 3 following the sense code contain sense code specific information. Settings allowed are:

0000	No specific code applies.
0020	A peripheral node supporting independent LUs has attached (using a nonswitched link) to a T2.0 PU that cannot have independent LU sessions through it. The SSCP activation request received for one of these independent LUs has failed.
0025	The receiving node is unable to process a BIND for the LU type specified for the given LU name.

0888 Name Conflict: A name specified in an RU is unknown, or is known and does not have the required capabilities, or is a duplicate resource for the specified resource type. When a name conflict is detected, further name checking ceases; multiple name conflicts are not reported or detected.

Bytes 2 and 3 following the sense code contain sense code specific information. Settings allowed are:

0000	No specific code applies.
0001	The specified DLU real network name is known, but identifies a resource that is not LU-LU session capable.
0002	The specified DLU alias network name is known, but identifies a resource that is not LU-LU session capable.
0003	The specified OLU real network name is known, but identifies a resource that is not LU-LU session capable.
0004	The specified OLU alias network name is known, but identifies a resource that is not LU-LU session capable.
0005	Name translation was invalid; that is, a different LU name was returned with the same network ID as the original LU name.
0006	The specified DLU real network name is known, but is a duplicate resource.
0007	The specified DLU alias network name is known, but is a duplicate resource.
0008	The specified OLU real network name is known, but is a duplicate resource.
0009	The specified OLU alias network name is known, but is a duplicate resource.
000B	A cross-network DLU name is defined as a shadow resource, but shadow resources are not supported for cross-network sessions.
000C	Set aside for implementation-specific use, and will not be otherwise defined in SNA; see implementation documentation for details.
000D	When processing a session initiation RU, an SSCP has found two different resource definitions for the OLU, one with the real OLU name and one with the alias OLU name.

000E When processing a session initiation RU, an SSCP has found two different resource definitions for the DLU, one with the real DLU name and one with the alias DLU name.

0890 Search Failure

Bytes 2 and 3 following the sense code contain sense code specific information. Settings allowed are:

0000 No specific code applies.

0010 Routing Error during a Directed Search: A Locate GDS variable for a directed search was received by an intermediate NNCP and could not be successfully routed to the destination control point.

0020 Resource Not Found during a Directed Search: A Locate GDS variable for a directed search was received by the named destination CP and the search argument resource is not a local resource.

0022 Destination not served by this CP.

0024 A search request was received from an unauthorized end node. The search origin information will not be cached.

0028 Resource Not Found, Broadcast Required: The resource was not found on a directed LOCATE/CDINIT search, and a restricted broadcast was run at the destination and failed; a broadcast should be tried.

0030 Resource Deleted, No Broadcast Required: A Locate GDS variable for a directed search was received by the named destination CP and the search argument resource has been deleted.

0038 Too Many Directed Search Subprocedures: A LOCATE exceeded the maximum height of the search tree; too many directed search subprocedures were tried; no retry.

0040 Resource Not Found during a Broadcast Search: A Locate GDS variable for a broadcast search was received by a CP that does not provide network services for the search argument resource and neither do any of the CPs searched in its broadcast subtree. This condition is detected by crossing search requests (a CP sends and receives a search request with the same PCID and the same search argument resource) or by a local search failure and all CPs in the broadcast subtree returning this sense data.

0048 A neutral search reply was received from an end node.

0050 Quiesced CP: A CP in the broadcast search tree is in a quiescent state and, therefore, not receiving Locate GDS variables. This condition is detected when a CP in the search subtree is quiesced and no other CP in the subtree found the requested resource.

	0060	Storage Not Available: A CP in the broadcast search tree does not have sufficient storage to participate in the search and no other CP in the search subtree found the requested resource.
	0070	Session Outage: A CP in the search tree has lost its CP-CP session with a CP that had been sent a Locate GDS variable and no reply had been received.
	0080	Duplicate Fully-Qualified PCID: A CP in the search tree detected a duplicate fully-qualified PCID for a different session request from the session request that first used the fully-qualified PCID.

0891 Invalid Network ID (NETID)

Bytes 2 and 3 following the sense code contain sense code specific information. Settings allowed are:

0000	No specific code applies.
0001	Primary Logical Unit NETID Invalid: The NETID of the primary logical unit is not the same as that of the SSCP(PLU).
0002	Invalid NETID: The NETID field in CONNOUT does not match the NETID defined in the link station receiving the CONNOUT.
0003	Invalid NETID: The NETID field in the RNAA is not the same as the AS/400 system NETID. There is a mismatch between the system definitions of the SSCP and the type 4 node.
0004	A resource name consists only of a network ID.

0892 Automatic network shutdown (ANS) has occurred.

Bytes 2 and 3 following the sense code contain sense code specific information. Settings allowed are:

0000	No specific code applies.
0001	Session Reset When ANS=STOP: The SSCP controlling the LU has been lost. The session will be ended because ANS=STOP was specified for this LU.
0002	The session was in pending-active state when the SSCP failed. However, because ANS=CONT, LU-LU sessions would normally continue, but because the session was not completely set up, it was reset.
0003	XRF-backup Session Reset When ANS=STOP: The XRF-backup session was reset because ANS=STOP was specified.

0893 Takeover not complete.

Bytes 2 and 3 following the sense code contain sense code specific information. Settings allowed are:

0000	No specific code applies.

0001 Primary Logical Unit Lacking a Control Point, Retry: The primary logical unit is not currently receiving network services from a control point. The BIND is rejected because the session cannot be established. This sense data is returned by the boundary function of the primary logical unit.

0002 secondary logical unit Lacking a Control Point, Retry: The secondary logical unit is not currently receiving network services from a control point. The BIND is rejected because the session cannot be established. This sense data is returned by the boundary function of the secondary logical unit.

0003 Sequence Error: The SSCP should not send an RNAA for an independent LU until the takeover sequence is complete for the link station, that is, until all BFSESSINFOs for that LU have been received and accepted.

0895 Control Vector Error: The RU contained a control vector that was in error.

xxyy The first byte (xx) of the sense code specific data contains the hex key of the control vector first detected in error. If more than one control vector is in error, only the first erroneous one is reported. The second byte (yy) of the sense code specific data contains the (zero-origin) byte offset of the error within the control vector.

0896 Control vector too long.

0000 No specific code applies.

0001 Network Name (X'0E') control vector is too long; the vector data portion is greater than 18 bytes long.

0897 System Definition Mismatch: The requested function is not supported by the receiver, or there is a mismatch between the sending and receiving system definitions.

Bytes 2 and 3 following the sense code contain sense code specific information. Settings allowed are:

0000 No specific code applies.

0001 The BFCLEANUP specifies that it is for an independent LU, but the LU specified is not an independent LU. This also could be caused by a resource mismatch.

0002 The target LU is not in the same subarea as the type 4 node.

0003 The function is not supported by the target resource.

0004 Invalid secondary logical unit Name: The network id (if present) for the NS secondary logical unit name field, is not equal to the network ID of the type 4 node, or the secondary logical unit name is not equal to the LU name field in the LUB.

0005 The LU address specified in the FNA is not associated with the PU target address specified in the FNA.

0006	The SSCP has no predefinition for an LU and does not support dynamic resource definition.
0007	The receiving SSCP has a different system-defined name for the SSCP(DLU) than the SSCP(DLU) name in the session initiation request.
0008	In a gateway with three gateway SSCPs, a gateway SSCP on the OLU side of the gateway was specified as having predesignated control in the CDINIT. In this configuration, only the middle gateway SSCP may have predesignated control.
0009	In a gateway with three gateway SSCPs, none of which is predesignated, the gateway node believes that one is predesignated. As a result, the gateway node receives gateway control RUs such as RNAA from a different SSCP than the one it expects.
000A	The PU of an independent primary logical unit named in BFINIT does not have the same element address as the one in the ALS field of BFINIT.
000B	An SSCP has detected a specification of gateway responsibility in the CDINIT request that is not consistent with its own definition. For example, two gateway SSCPs in the same gateway are both predefined to be predesignated.
000C	The receiver is unable to interpret the DLU name.
000D	A resource type was specified in a search request that is not understood by this node.
000F	A gateway node has received route data for a cross-network session in a form that it does not support.
0010	An adjacent SSCP has the same SSCP name as the SSCP that owns the DLU, but a different network identifier than the DLU.
0011	A end node supports control-point-to-control-point sessions, but does not support LOCATE.

089B Session Correlation Exception: The session correlation procedure detected an exceptional condition at the secondary logical unit.

Bytes 2 and 3 following the sense code contain sense code specific information. Settings allowed are:

0000	No specific code applies.
0001	RUs Out of Order: A BIND request with the correlating fully qualified PCID control vector (X′60′) arrived before UNBIND(Type X′02′) was received for the correlated session. This sense data is sent in an UNBIND that ends the correlated session.
0002	Correlator Not Found: A BIND request with the correlating fully qualified control vector (X′60′) cannot be correlated to any previous session.

08A0 Session Reset: An LU or PU is resetting an LU-LU session.

Bytes 2 and 3 following the sense code contain sense code specific information. Settings allowed are:

0000	No specific code applies.
0001	The LU is sending an UNBIND with a reason code of X'0A' (SSCP gone); the identified LU-LU session had to be deactivated because of a forced deactivation of the associated SSCP-PU or SSCP-LU session, for example, because of a DACTPU, DACTLU, or DISCONTACT.
0002	The LU or SCM is sending UNBIND with a reason code of X'0F' (cleanup).
0003	The gateway node is sending UNBIND with a reason code of X'11' (gateway node cleanup); a gateway node is cleaning up the session because a gateway SSCP has directed the gateway node (via NOTIFY) to deactivate the session, for example, a session setup error or session takedown failure had occurred.
0004	Reversed FRSN values: The CP is sending an UNBIND with a reason code of X'0F' (cleanup); the value in the *Last FRSN Sent* field is greater than the value in the *Current FRSN* field (no retry).
0005	TDU sent out of order: The CP is sending an UNBIND with a reason code of X'0F' (cleanup); the value in the *Last FRSN Sent* field of the current TDU GDS variable is not equal to the value of the *Current FRSN* field in the TDU GDS variable that immediately preceded it (no retry).

08A2 Resource Active: The requested function must be performed on an inactive resource, and the resource is active.

Bytes 2 and 3 following the sense code contain sense code specific information. Settings allowed are:

0000	No specific code applies.
0001	RNAA(MOVE) was received for an active resource.

08B4 CP-CP Sessions Not Required: This sense code is sent from one APPN control point to another to deactivate CP-CP sessions between them, because the sender does not currently need CP-CP sessions, and the TG carrying the sessions is a limited resource.

Note: This sense code is carried within the CV X'35' portion of the UNBIND request.

Bytes 2 and 3 following the sense code contain sense-code specific information. Settings allowed are:

0000	No specific code applies.

08B5 Network Node Server Not Required: This sense code is sent by an APPN end node control point to a network node control point to deactivate CP-CP sessions with the NNCP, or to reject a CP-CP session BIND from the NNCP. The end node no longer requires network node services from the receiver.

Note: This sense code is carried within the CV X'35' portion of the UNBIND request.

Bytes 2 and 3 following the sense code contain sense-code specific information. Settings allowed are:

0000 No specific code applies.

08B6 CP-CP Sessions Not Supported: This sense code is sent by a network node control point to reject a CP-CP session BIND from another APPN control point. Support for CP-CP sessions on that TG was removed since the time when the TG was first activated.

Note: This sense code is carried within the CV X'35' portion of the UNBIND request.

Bytes 2 and 3 following the sense code contain sense-code specific information. Settings allowed are:

0000 No specific code applies.

0891 Invalid Network ID (NETID)

Bytes 2 and 3 following the sense code contain sense code specific information. Settings allowed are:

0006 Invalid NETID: The sender has deactivated CP-CP sessions with the adjacent non-native CP because neither CP contains Border Node support (that is, neither CP sets byte 9, bit 7 in the CP Capabilities GDS variable that it sends to 1).

Request Error (Category Code = X'10')

This category indicates that the RU was delivered to the intended NAU component, but could not be interpreted or processed. This condition represents a mismatch of NAU capabilities.

Category and modifier (in hexadecimal):

1001 RU Data Error: Data in the request RU is not acceptable to the receiving component; for example, a character code is not in the set supported, a formatted data field is not acceptable to presentation services, a required name in the request has been omitted, or a value specified in the length field (LL) of a structured field is invalid.

Bytes 2 and 3 may contain the following sense-code specific information:

0003 Isolated pacing message (IPM) format error: An incorrectly formatted IPM was received.

1003 Function Not Supported: The function requested is not supported. The function may have been specified by a formatted request code, a field in an RU, or a control character.

Bytes 2 and 3 following the sense code contain sense code specific information. Settings allowed are:

0000 No specific code applies.

0001 The half-session receiving the request did not perform the function because it is not capable of doing so. The requesting half-session requested a function that the receiver does not support and the receiver did not specify that it was capable of supporting the function at session activation; consequently, there is an apparent mismatch of half-session capabilities.

Note: This is to cover a system error. For example, if the PU receiving a SETCV(Vector Key=X'15') is not a gateway PU, that is, the PU did not indicate in the ACTPU response that it is a gateway PU, the PU reports to the SSCP that sent the SETCV that there is an apparent mismatch of half-session capabilities.

0002 The half-session receiving the request did not perform the function, though it is capable of doing so. The requesting half-session did not specify at session activation that it was capable of supporting the function; consequently, there is an apparent mismatch of half-session capabilities.

Notes:

1. This is to cover a system error. For example, if the SSCP sending a SETCV(Vector Key=X'15') is not known to the receiving PU as a gateway SSCP, that is, the SSCP did not indicate in ACTPU that it is a gateway SSCP, the PU reports a mismatch of capabilities.
2. 0001 and 0002 are also assigned for implementation-specific use; see implementation documentation for details.

0003 The component received an unsupported normal-flow DFC command.

0004 The component received an unsupported expedited-flow DFC command.

0005 The component received a network control command during an LU-SSCP session.

0006 The component received an unsupported session control command during an LU-SSCP session.

0007 The component received an unsupported data flow control command with LU-SSCP session specified.

0008 Broadcast Search with Reservation: An NNCP received a broadcast search request with reservation.

0009 Initiate Type: The initiate type requested in the Cdinit GDS variable is not supported at the receiver.

000A Session Polarity: The session polarity requested in the Cdinit GDS variable is not supported at the receiver.

000B A BIND specifying delayed request mode was received from a non-6.2 type LU, but delayed request mode is not supported in the receiver.

000C A stand-alone BIND is received from a node that is served by an SSCP that does not support stand-alone BINDs.

000D The function identified in the request is not supported by the processing application transaction program.

0010 The RU is not known to session services.

0011 A session key is not supported.

0012 A control vector is not supported.

0014 Cryptography is not supported but a nonzero length was specified for the cryptography key.

0015 Queuing not supported for a controller session.

0020 A session initiation request specified an OLU and DLU that are the same LU. An LU cannot establish a session with itself.

0021 There is a mismatch between session initiation request type and LU type (independent or dependent). For example, a session initiation request other than BFINIT identifies an independent LU as a session partner.

6002 The resource identified by the destination program name (DPN) is not supported.

6003 The resource identified by the primary resource name (PRN) is not supported.

Note: This sense code can also be used instead of sense code X'0826'.

1005 Parameter Error: A parameter modifying a control function is invalid, or outside the range allowed by the receiver.

Bytes 2 and 3 following the sense code contain sense code specific information. Settings allowed are:

0000 No specific code applies.

0001 For NMVT, the address type field in an SNA Address List subvector does not match the address type required by the command subvector.

0002 Set aside for implementation-specific use, and will not be otherwise defined in SNA; see implementation documentation for details.

0004 Invalid display type was requested.

0005 Invalid storage length for display type requested.

0006 Invalid storage address; out of specified range.

0008 and 0121-0229
Set aside for implementation-specific use, and will not be otherwise defined in SNA; see implementation documentation for details.

1006 Required field or parameter is missing.

Bytes 2 and 3 following the sense code contain sense code specific information. Settings allowed are:

0000 No specific code applies.

0001 One or more required COS names were omitted.

0002 A required name was omitted.

0003 A required network identifier was omitted.

0004 A required session key was omitted.

0005 A required control vector was omitted.

0006 A required subfield of a control vector was omitted.

0007 The TG number field was omitted.

0008 The specific ID (IDNUM) was omitted.

1007 Category Not Supported: DFC, SC, NC, or FMD request was received by a half-session not supporting any requests in that category; or an NS request byte 0 was not set to a defined value, or byte 1 was not set to an NS category supported by the receiver.

Bytes 2 and 3 following the sense code contain sense code specific information. Settings allowed are:

0000 No specific code applies.

0001 Invalid NS header received. An NS request byte 0 was not set to a defined value.

1008 Invalid FM Header: The FM header was not understood or translatable by the receiver, or an FM header was expected but not present. For LU 6.2, this sense code is sent in FMH-7 or UNBIND.

Bytes 2 and 3 following the sense code contain sense code specific information. Settings allowed are:

0000 No specific code applies.

0801 The function code parameters are invalid.

0803 The forms functions cannot be performed.

0805 The copy function cannot be performed.

0806 Compaction table outside the supported set: The number of master characters is not within the valid range.

0807 The PDIR (peripheral data information record) identifier is invalid.

0808 The printer train function cannot be performed.

0809 The forms control block (FCB) load function cannot be performed.

080A The forms control block (FCB) load function is not supported.

080B The compaction table name is invalid.

080C The ACCESS is invalid.

080D The RECLEN is invalid.

080E The NUMRECS is invalid.

080F The data set is in use.

0810 The data set cannot be found.

0811 The password is invalid.

0812 The function is not allowed for the destination or for the data set.

0813 The record is too long.

0814	The data set is full.
0815	The RECID is invalid.
0816	Reserved.
0817	The VOLID format is invalid.
0818	The maximum number of logical records per chain is exceeded.
0819	The data set exists.
081A	No space is available.
081B	The VOLID is invalid.
081C	The DSACCESS is invalid.
081D	The RECTYPE is invalid *or* the data set cannot be found.
081E	The resolution space is insufficient.
081F	The key technique is invalid.
0820	The key displacement is invalid.
0821	The key is invalid.
0822	There is an invalid N (number of records.)
0823	The KEYIND is invalid.
0824	The SERID is invalid.
0825	Disk Error: An error was detected while reading from, or writing on, the disk.
0826	The RECID format is invalid.
0827	The password has not been supplied.
0828	The record ID has not been supplied.
0829	The volume ID has not been supplied.
082A	The PGMNAME is invalid.
1204	Set aside for implementation-specific use, and will not be otherwise defined in SNA; see implementation documentation for details.
2001	The destination (active) is invalid.
2002	The destination (inactive) is invalid.
2003	The destination (suspended) is invalid.
2004	The suspend-resume sequence is invalid.
2005	There has been an interruption level violation.
2006	The resume properties are invalid.
2007	The destination is not available.
2008	The end sequence is invalid.
2009	The FM header length is invalid.
200A	Invalid field setting: The reserved field is set to 1 or the setting is not defined.

200B	Invalid destination: The destination does not exist.
200C	The ERCL is invalid.
200D	The DST is invalid.
200E	Invalid Concatenation Indicator: The concatenation indicator is *on*, but concatenation is not allowed.
200F	FM data is not allowed for the header.
2010	The FM header set specified in the BIND has been violated.
2011-2013	Reserved.
2014	The FM header was not sent concatenated.
2015-2018	Reserved.
2019	The stack reference indicator (SRI) is invalid.
201A	The CMI modification could not be accepted.
201B	The CPI modification could not be accepted.
201C	The ECRL modification could not be accepted.
201D	FM Header and Associated Data Mismatch: The FM header indicated associated data would or would not follow (for example, FM header 7 followed by log data, or FM header 5 followed by program initialization parameters), but this indication was in error; or a previously received RU (for example, -RSP(X'0846')) implied that an FM header would follow, but none was received.
4001	Invalid FM Header Type for this LU: The type of the FM header is other than 5, 7, or 12.
4002	The FMH code is invalid.
4003	Compression is not supported.
4004	Compaction is not supported.
4005	Basic exchange is not supported.
4006	Only basic exchange is supported.
4007	The medium is not supported.
4008	There has been a code selection compression violation.
4009	FMHC is not supported.
400A	Demand select is not supported.
400B	DSNAME is not supported.
400C	The media subaddress field is invalid.
400D	There are insufficient resources to perform the requested function.
400E	DSP select is not supported.
6000	FM Header Length Not Correct: The value in the FM header length field differs from the sum of the lengths of the subfields of the FM header.
6001	The deblocking algorithm (DBA) is invalid.

6004 The queue name length is invalid.

6005 Access Security Information Length Field Not Correct: The value in the Access Security Information Length field differs from the sum of the lengths of the Access Security Information subfields.

6006 The data stream profile (DSP) is invalid.

6007 The FMH-7 is not preceded by a negative response carrying the X'0846' sense code.

6008 The Attach access code is invalid.

6009 Invalid Parameter Length: The field that specifies the length of fixed-length parameters has an invalid setting.

600A This is not the first FMH-5, the interchange unit type is not the same as the old, and the interchange unit end indicator is *off*.

600B Unrecognized FM Header Command Code: The partner LU received an FM header command code that it does not recognize. For LU 6.2 this sense data is sent only in FMH-7.

600C A null sequence field is required.

600D User-to-user program transition is not allowed.

600E User to non-SNA defined program transition is not allowed.

600F The FMH-5 reset attached program (RAP) was not sent properly.

6010 The FMH-5 reset attached program (RAP) was sent with an inactive Attach register.

6011 Invalid Logical Unit of Work (LUW): The LUW Length field (in a Compare States GDS variable or an FMH-5) is incorrect, or the length field is invalid, or a LUW ID is not present but is required by the setting of the synchronization level field.

6021 Transaction Program Name Not Recognized: The FMH-5 Attach command specifies a transaction program name that the receiver does not recognize. This sense data is sent only in FMH-7.

6031 PIP Not Allowed: The FMH-5 Attach command specifies program initialization parameter (PIP) data is present, but the receiver does not support PIP data for the specified transaction program. This sense data is sent only in FMH-7.

6032 PIP Not Specified Correctly: The FMH-5 Attach command specifies a transaction program name that requires program initialization parameter (PIP) data, and either the FMH-5 specifies PIP data is not present or the number of PIP subfields present does not agree with the number required for the program. This sense data is sent only in FMH-7.

	6034	Conversation Type Mismatch: The FMH-5 Attach command specifies a conversation type that the receiver does not support for the specified transaction program. This sense data is sent only in FMH-7.
	6040	Invalid Attach Parameter: A parameter in the FMH-5 Attach command conflicts with the statement of LU capability previously provided in the BIND negotiation.
	6041	Synchronization Level Not Supported: The FMH-5 Attach command specifies a synchronization level that the receiver does not support for the specified transaction program. This sense data is sent only in FMH-7.
	6042	Reconnection Not Supported: The FMH-5 Attach command specifies reconnection support but the receiver does not support reconnection for the specified transaction program. This sense data is sent only in FMH-7.
	6043	Unable to Reconnect Transaction Program — No Retry: The FMH-5 Reconnect command specifies the conversation correlator of a transaction program to which the receiver cannot reconnect. The condition is not temporary. This sense data is sent only in FMH-7.
	6044	Unable to Reconnect Transaction Program — Retry Allowed: The FMH-5 Reconnect command specifies the conversation correlator of a transaction program to which the receiver cannot reconnect. The condition is temporary. This sense data is sent only in FMH-7.
	C000	The header is not supported.
	C001	The header length is invalid.
	C002	There has been a logical message services block-level error.
	C003	There is a version ID mismatch.
1010	Control-point detected errors on GDS variable processing.	
	0000	Unrecoverable error.
	1000	CP capabilities length error.
	1002	CP capabilities identifier not correct.
	4004	Incomplete negative neutral reply.
	5000	CDINIT length error.
	5002	No CDINIT returned on a distributed search.
	5006	Session polarity or initiate type not supported.
	500A	CDINIT mode name length error.
	A002	Find not present on locate request.
	B080	No CV80 on found.
	X0YY	Error in GDS variable where: • X = Last half-byte of GDS variable key. • YY = Offset of the error in the GDS variable.

1014 Control-point detected errors on GDS variable processing or BIND processing.

00XX	Missing control vector.
0080	Invalid control vector.
023C	Invalid associated resources.
B280	Wildcard received.
502B	No RSCV received from NNS.
502C	No COS/TPF control vector received from NNS.
5046	No EN OLU TG vectors present in a CDINIT request.
52XX	CDINIT control vector error.
A080	Missing FIND CV80.
A082	Missing FIND CV82.
XYZZ	Error in imbedded control vector of GDS variable where:

- X=Last half-byte of GDS variable key.
- Y=Type of control vector error:
  - 0=Missing required vector.
  - 1=Syntax error in vector ZZ.
  - 2=Inconsistent values in vector ZZ.

State Error (Category Code = X'20')

This category indicates a sequence number error or an RH or RU that is not allowed for the receiver's current session control or data flow state. These errors prevent delivery of the request to the intended component.

Category and modifier (in hexadecimal):

2011 Pacing Protocol Error:

0000 A normal-flow request is received by a half-session after the pacing count has been reduced to 0 and before a pacing response has been sent.

0001 Received unexpected isolated pacing message (IPM): An IPM was received when the receiver was in a state that did not expect it.

0002 Received unexpected pacing request: A request with the pacing indicator set on was received when the receiver was in a state that did not expect it.

Path Error (Category Code = X'80')

This category indicates that the request could not be delivered to the intended receiver, because of a path outage, an invalid sequence of activation requests, or one of the listed path information unit (PIU) errors. Some PIU errors fall into other categories; for example, sequence number errors are sense code category X'20'. A path error received while the session is active generally indicates that the path to the session partner has been lost.

Category and modifier (in hexadecimal):

8003 NAU Inoperative: The NAU is unable to process requests or responses; for example, the NAU has been disrupted by an abnormal end.

Bytes 2 and 3 following the sense code contain sense code specific information. Settings allowed are:

0000 No specific code applies.

0001 Hierarchical Reset: The identified LU-LU session is being deactivated; an ACTLU/ACTPU(Cold) or DACTLU/DACTPU was received, or the PU has failed.

0003 Unrecoverable LU Failure: The identified LU-LU session had to be deactivated because of an abnormal end of the primary logical unit or secondary logical unit; recovery from the failure was not possible.

0004 Recoverable LU Failure: The identified LU-LU session had to be deactivated because of an abnormal end of one of the LUs of the session; recovery from the failure may be possible.

0005 Hierarchical Reset: Backup session reset resulted from a hierarchical reset.

8005 No Session: No half-session is active in the receiving end node for the indicated origination-destination pair, or no boundary function session connector is active for the origin-destination pair in a node providing the boundary function. A session activation request is needed.

Bytes 2 and 3 following the sense code contain sense code specific information. Settings allowed are:

0000 No specific code applies.

0001 The receiver received a request other than session control request when no LU-LU session was active.

0002 The receiver received a request other than session control request when no LU-SSCP session was active.

0003 The receiver received a session control request other than BIND/UNBIND when no LU-LU session was active.

0004 The receiver received an UNBIND when no LU-LU session was active.

0005 The receiver received a session control request other than ACTLU/DACTLU for the LU-SSCP session when no LU-SSCP session was active.

0006 The receiver received DACTLU when no LU-SSCP session was active.

0007 Session not activated: A BIND was received for a dependent LU that has not received an ACTLU to activate the SSCP-LU session.

8006 Invalid FID: Invalid FID for the receiving node. (See note 1.)

Bytes 2 and 3 following the sense code contain sense code specific information. Settings allowed are:

0000 No specific code applies.

8007 Segmenting Error: First BIU segment had less than 10 bytes; or mapping field sequencing error, such as first, last, middle; or segmenting not supported and MPF not set to 11. (See note 2.)

Bytes 2 and 3 following the sense code contain sense code specific information. Settings allowed are:

0000 No specific code applies.

0001 The node does not support receipt of segments, and a mapping field value other than OIS was received. Sent in UNBIND.

0002 Interleaved BIND Segments Not Allowed: A BIND receiver that is in the middle of receiving segments of one BIND receives a segment from a different BIND; the receiver rejects both BINDs and disconnects all the links in the transmission group.

8014 No Path Exists to the Destination Node: Route selection services in the CP has determined from the topology database that no path exists to the destination node.

Bytes 2 and 3 following the sense code contain sense code specific information. Settings allowed are:

0000 No specific code applies.

0001 No route to the destination node exists for the specified class of service.

0003 The topology database indicates that the destination node is not available at this time; the node either has inconsistent data or is quiescing.

0004 The topology database indicates that the endpoint resources are depleted; the node is out of either half-session control blocks or message buffers.

0005 RSCV truncated.

8015 Path not available.

Bytes 2 and 3 following the sense code contain sense code specific information. Settings allowed are:

0000 No specific code applies.

0001 The path in the Route Selection control vector is not available because the node is quiescing.

0002 The TG on which the BIND was received is in quiesce state; the BIND cannot be routed as specified.

0003 The TG on which the BIND is to be sent is in quiesce state; the BIND cannot be routed as specified.

8020 Session Reset: The LU-LU session identified in the UNBIND is being deactivated because of a reset condition.

Bytes 2 and 3 following the sense code contain sense code specific information. Settings allowed are:

0000 No specific code applies.

0001 Virtual Route Inoperative: The virtual route used by the LU-LU session has become inoperative, thus forcing the deactivation of the identified LU-LU session.

0002 Hierarchical Reset of Both XRF-Active and XRF-Backup Sessions: The XRF-backup session has failed; therefore, both the XRF-active and XRF-backup session are being reset.

0003 Virtual Route Deactivated: The identified LU-LU session had to be deactivated because of a forced deactivation of the virtual route being used by the LU-LU session.

0004 Route Extension Failure: The route extension used by the LU-LU session has become inoperative, thus forcing the deactivation of the identified LU-LU session.

0005 Route Extension Failure: The route extension used by the XRF-backup LU-LU session has become inoperative, thus forcing the deactivation of the identified XRF-backup LU-LU session.

0006 Virtual Route Inoperative: The virtual route used by the LU-LU session has become inoperative, thus forcing the deactivation via VR-INOP of the identified XRF-backup LU-LU session.

0007 Third Party Session Ending: The network operator caused the forced cleanup ending of the LU-LU session.

Internal Error (Category Code = X′FF′)

This category indicates that the requested function could not be performed because of an internal error condition.

FFFE Internal error conditions that are system specific. Bytes 2 and 3 following the sense code contain sense-code-specific information. Settings allowed are:

0001 A session has been requested with an LU that resides on the same control point. The AS/400 system does not support communications between LUs on the same control point when APPN is used.

0002 Session services has received a locate message (Reply) from directory services and the PCID does not correlate with any requests that session services is currently processing.

0003 The Address Space Manager has received an Assign_LFSID from the Session Connector Manager and the T2 (where the ASM resides) has shut off all intermediate sessions.

0004 A resolve request has been received and the local LU name specified was not found. For independent LUs, the local LU must be added to the local location list. For dependent LUs, the device description containing the local/remote LU pair must be varied on.

FFFF Internal error conditions that are not system specific. Bytes 2 and 3 following the sense code contain sense-code-specific information. Settings allowed are:

0001 No TG-vectors returned from an end node.

0002 Extra reply on search alert.

0003 No network node services are available for an end node.

0006 Cannot delete entry for node.

Appendix B. APPN Class of Service

Class of Service

Network nodes maintain information about all network nodes and links between network nodes. When a session is requested, a mode is specified. Each mode contains a class-of-service (COS) parameter that specifies the class-of-service description that will be used to calculate the route the session will take. The class of service also specifies the transmission priority that will govern the rate of data transfer after the session has been established.

A class of service consists of two parts: link characteristics and node characteristics.

- For links, the class-of-service description is compared to the same set of characteristics that are specified in the line descriptions (refer to "Line Descriptions" on page 4-9 for a description of configuring a line).
- For nodes, the class-of-service description is compared to the route addition resistance (RAR) specified in the network attributes (refer to "Change Network Attributes (CHGNETA) Command" on page 4-1 for a description of changing network attributes). The congestion characteristic is dynamically determined by a network node.

Network nodes get the characteristics of links to non-adjacent end nodes and low-entry networking nodes during directory services search processing. For a link to be acceptable for a given class of service, *each* characteristic for the link must be greater than or equal to the minimum value and less than or equal to the maximum value for the row. If a link is acceptable, it is assigned the weight associated with that row. Once every node and link between the origin and destination control points have been examined and assigned a weight, the set of links with the least weight (according to the class of service selected) will be used for the session path.

Notes:

1. If a link or node has characteristics that are not within the range for any of the eight rows in a class of service, that link or node cannot be used by the class of service. A link or node may be unacceptable because of either its configured values or because of dynamic characteristics.
2. If there is more than one route that supplies the lowest weight between the origin and destination control points, then a route will be selected at random. There is no consideration made as to the number of nodes and transmission groups traversed.
3. End nodes will calculate weights for links directly attached if a network node server is not calculating the route for the end node.

Route Selection Using Class of Service

The following describes how route selection is performed.

Starting with each link originating at the session origin, all possible paths will be examined by comparing the characteristics of every link and node as compared to the characteristics contained in each row of the class of service from row 1 to row 8 and proceeding until an acceptable row is found or all 8 rows are compared and none are acceptable. For a link to be considered acceptable, every characteristic for the link (line speed, cost/connect, cost/byte, propagation delay, security, and the 3 user-defined values) must be greater than or equal to the minimum value and less than or equal to the maximum value for every characteristic in a single row. If one characteristic does not meet this value, the next row will be examined until a row is found that does meet this value or all rows have been exhausted. If all rows have been exhausted, then the link and/or node is considered unacceptable for this class of service for this route calculation attempt.

The characteristics of the node at the destination end of the link will also be examined to see if it meets the node class of service value. The weight of the link added to the weight of the node at the destination end of the link will be used to obtain the weight of the hop. After all of the links between the origin and destination control points have been examined and either were assigned a weight or found to be unacceptable, then the set of links and nodes that supplies the least weight path will be used for the route. Even though all links and nodes may be operational and communicating, a route request may fail if there is not a set between the origin and destination control points that is acceptable for the class of service ((COS Char MIN < = Link or Node Char < = COS Char Max)).

Route Selection Considerations

- The lower the weight for a node or link the more desirable it is for the route calculation.
- Session control point origin and control point destination node weights are not added to the path weight.
- If a link or node has a disable pending, then it will be considered unacceptable for the route request and will not be compared against the class-of-service definition. This is also true if the link is not operational.
- The #CONNECT, #BATCH, and #INTER class-of-service definitions as supplied with the AS/400 system will be able to calculate a route for any line description whether the defaults are taken or the values are changed by the user. This may not be true if the class-of-service definitions are changed.
- When a link or node is being checked against the class of service the algorithm stops, for that link or node, as soon as the value has been satisfied. Subsequent rows that are not as desirable will not be examined for performance reasons.
- For the node class of service a value of *LOW means no it is not congested and a *HIGH means yes it is congested. Therefore, a minimum of *LOW and maximum of *LOW in all rows means that a congested node is never acceptable. If one of the supplied class of service definitions is changed to this or one is created with these values, a congested node is not chosen as part of the route.
- When a link becomes inoperative due to a failure, updates are sent around the network to inform all network nodes of the condition so that subsequent

session requests may be routed around the failed link or node. When and if the link becomes operative again, another update will be sent around the network to inform all network nodes of the new condition. Note that at least one active control point session is required for network nodes to receive and send this information.

Route Selection Example

Following is an example of how the route selection services algorithm examines every transmission group (TG) or route between the origin control point and the destination control points to obtain a route for the session request.

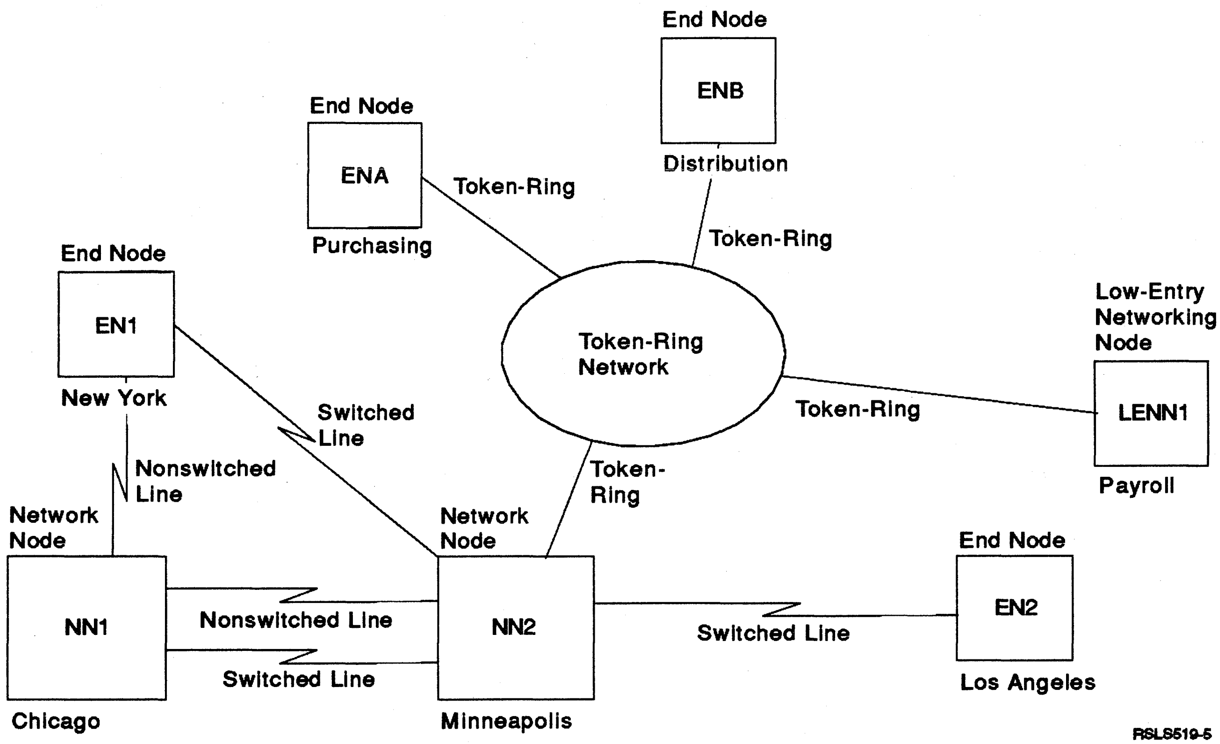


Figure B-1. Multiple-System APPN Network

Example 1: A description of the selection of a route between EN1 and NN2 as shown in Figure B-1. The class-of-service description #INTER will be used in this example. The characteristics of the three routes from EN1 to NN2 will be examined by APPN route selection services:

1. EN1 to NN1 nonswitched, NN1 to NN2 switched
2. EN1 to NN1 nonswitched, NN1 to NN2 nonswitched
3. EN1 to NN2 switched

Starting with each link originating at EN1, each one will be compared against the characteristics contained in each row for the class of service. If every characteristic for the link (line speed, cost per connect time, cost per byte, security, propagation delay, and user-defined values 1 through 3) is greater than or equal to the minimum value and less than or equal to the maximum value, then the link will be assigned the weight for that row for this route calculated using this class of service.

Because the configurations of the controllers on EN1 and NN1 default the control point session parameter (CPSSN) to *YES, and NN1 is the network server for

EN1, there will be a CP-CP session between EN1 and NN1. This session allows EN1 to send directory search requests to NN1 for remote locations not known by EN1. Included in the search request is information that describes all of the TGs attached to EN1. NN1 will use the information sent in the search request to calculate a route selection control vector. NN1 will then send the route description back to EN1 on the directory search reply. EN1 then uses this route selection control vector to determine where to forward the BIND.

The defaults have been taken on the line descriptions on EN1 for each of the lines, therefore, the characteristics of the links are as shown in Figure B-2. The default for the LINKSPEED parameter is *INTERFACE, which defaults to 9600 bps. The three routes and their associated intermediate nodes are compared to the characteristics in the class-of-service description named #INTER.

Figure B-2. Defaults for APPN Line Parameters

Line Type	COSTCNN Parameter	COSTBYTE Parameter	SECURITY Parameter	PRPDLY Parameter	LINKSPEED Parameter
Ethernet	0	0	*NONSECURE	*LAN	10M
IDLC Non-switched	0	0	*NONSECURE	*TELEPHONE	64000
IDLC Switched	128	128	*NONSECURE	*TELEPHONE	64000
SDLC Non-switched	0	0	*NONSECURE	*TELEPHONE	*INTERFACE
SDLC Switched	128	128	*NONSECURE	*TELEPHONE	*INTERFACE
Token-Ring	0	0	*NONSECURE	*LAN	4M
X.25	128	128	*PKTSWTNET	*PKTSWTNET	*INTERFACE

Taking the nonswitched line from EN1to NN1 as the first hop to examine, the characteristics described in row 6 of #INTER are the first set of values which satisfy the comparison. Every value in this line description fits in the range of values allowed by row 6 of the class-of-service description (COS min < = Link characteristics < = COS max).

Figure B-3. Example of User Values, Row 6

Class of Service #INTER (ROW 6)	Link Speed	Cost per Connect time	Cost per Byte	Security	Propagation Delay
Minimum	9600	00	00	*NONSECURE	*MIN
Maximum	*MAX	00	00	*MAX	*PKTSWTNET

Figure B-4. Example of User Values, Row 6

Line Characteristics	Link Speed	Cost per Connect time	Cost per Byte	Security	Propagation Delay
EN1→NN1 non-switched	9600	00	00	*NONSECURE	*TELEPHONE

There are also three user-defined values that can be defined, but these values are not shown in this example.

Refer to Figure 4-1 on page 4-12 for default line values and to Figure B-9 on page B-10 for the values in #INTER class-of-service description.

The weight of row 6 for links is 180

Next, the node at the end of this link (NN1) is examined and compared to the rows for node characteristics in #INTER. (Figure B-17 on page B-18 shows the node values for the IBM-supplied class-of-service descriptions.) The default value (128) was taken for route addition resistance (RAR) in CHGNETA on NN1. A RAR value of 128, assuming no congestion on NN1, compares to row 5 of the node characteristics in #INTER. This row has a weight of 60.

Adding the link weight (180) and the node weight (60), this hop (EN1 to NN1 nonswitched) is assigned a weight of 240.

The next hop on this route is NN1 to NN2 switched. The characteristics of the switched link between NN1 and NN2 compare to link values in row 7 in COSD #INTER, with a weight of 210. The node characteristics of NN2 are not considered because this is the destination node. The hop is assigned the weight calculated for the link, 210.

Figure B-5. Example of User Values, Row 7

Class of Service #INTER (ROW 7)	Link Speed	Cost per Connect time	Cost per Byte	Security	Propagation Delay
Minimum	9600	00	00	*NONSECURE	*MIN
Maximum	*MAX	196	196	*MAX	*MAX

Figure B-6. Example of User Values, Row 7

Line Characteristics	Link Speed	Cost per Connect time	Cost per Byte	Security	Propagation Delay
NN1→NN2 non-switched	9600	128	128	*NONSECURE	*TELEPHONE

Adding the weight of these two hops (240 + 210), gives a total weight of 450 for the route from EN1 to NN1 nonswitched, and NN1 to NN2 switched.

In the same manner, APPN route selection services compares the link and node characteristics of the nonswitched line from NN1 to NN2. The characteristics of the nonswitched link between NN1 and NN2 compare to link values in row 6 in class-of-service description #INTER, with a weight of 180. The node characteristics of NN2, as previously shown, are not considered in the weight of the hop. This hop is assigned the weight calculated for the link, 180.

Adding the weight of the hop from EN1 to NN1 nonswitched (240) to the weight of the hop from NN1 to NN2 nonswitched (180), this route is assigned a weight of 420.

The third route, EN1 to NN2 switched, will also be considered. This link compares to row 7 of #INTER and is assigned a weight of 210. The characteristics of

NN2 are not considered, because this is the destination node. This route, EN1 to NN2 switched, is assigned the weight calculated for the link, 210. This route is the most desirable (lowest weight) route and will be chosen.

Example 2: Using a unique class-of-service description, the nonswitched line between EN1 and NN1 will be used in the route to NN2 as shown in Figure C-5 on page C-33. The configurations shown in Chapter 4 are used with the addition of the user-defined value 1 added to the line description on EN1 (NEWYORK) for the link to NN2 (MPLS):

```
/*Create switched line description NEWYORK to MPLS*/
CRTLINSDLC LIND(MPLSS) RSRCNAME(LIN012) CNN(*SWTPP)
             AUTOANS(*NO) STNADR(01) COSTCNN(128)
             COSTBYTE(128) USRDFN1(130)
```

The nonswitched line from EN1 to NN1 is allowed to default to a user-defined value 1 of 128.

A new class-of-service description called COS#1 is defined on EN1 by copying #INTER class of service and changing the user-defined value 1 to a maximum of 128. The new class-of-service description, COS#1, appears as follows:

```
              Class-of-Service Description Line Information

       Link     Cost/     Cost/   Security      Propagation   User-defined
       Speed    Connect   Byte    for Line         Delay        1    2    3
Min    4M         0        0      *NONSECURE    *MIN          0    0    0
Max    *MAX       0        0      *MAX          *LAN          128  255  255
  Row 1 line weight = 30

Min    56000      0        0      *NONSECURE    *MIN          0    0    0
Max    *MAX       0        0      *MAX          *TELEPHONE    128  255  255
  Row 2 line weight = 60

Min    56000      0        0      *NONSECURE    *MIN          0    0    0
Max    *MAX       128      128    *MAX          *TELEPHONE    128  255  255
  Row 3 line weight = 90

Min    19200      0        0      *NONSECURE    *MIN          0    0    0
Max    *MAX       0        0      *MAX          *TELEPHONE    128  255  255
  Row 4 line weight = 120

Min    19200      0        0      *NONSECURE    *MIN          0    0    0
Max    *MAX       128      128    *MAX          *PKTSWTNET    128  255  255
  Row 5 line weight = 150

Min    9600       0        0      *NONSECURE    *MIN          0    0    0
Max    *MAX       0        0      *MAX          *PKTSWTNET    128  255  255
  Row 6 line weight = 180

Min    9600       0        0      *NONSECURE    *MIN          0    0    0
Max    *MAX       196      196    *MAX          *MAX          128  255  255
  Row 7 line weight = 210

Min    *MIN       0        0      *NONSECURE    *MIN          0    0    0
Max    *MAX       255      255    *MAX          *MAX          128  255  255
  Row 8 line weight = 240
```

This class-of-service description has a user-defined 1 value of minimum of 0 and maximum of 128. When the session uses a mode that points to class-of-service COS#1, the line chosen will have to meet all the values described in COS#1 including the user-defined values. Because all the rows in COS#1 have a user-defined 1 value of minimum of 0 and maximum of 128, the switched line, with a user-defined value 1 of 130, will not qualify. The nonswitched line between EN1 and NN1 will be chosen because the characteristics of this line are all greater than the minimum values in COSD#1 (row 6) and less than the maximum values (COS MIN < = LINK or node characteristics < = COS MAX).

The node characteristics of NN1 will be added to the weight of this hop, but because the switched line from EN1 to NN2 does not qualify for use with COS#1, this route must be taken regardless of the weight of NN1 in the calculations.

The second hop on the route to NN2 is the link between NN1 and NN2. The same class-of-service description (COS#1 defined on EN1) is used to examine these links. Each line from NN1 to NN2 has a default user-defined value 1 of 128. The comparison of the hop between NN1 and NN2 will progress as described in the previous example because COS#1 is identical to #INTER with the exception of user-defined value 1, which is set to a maximum of 128. Either line (non-switched or switched) from NN1 to NN2 will qualify when compared to the user-defined value 1 in COS#1.

As previously shown, the nonswitched line from NN1 to NN2 will be assigned a weight of 180 and the switched line will be assigned a weight of 210. The non-switched hop, with the lower weight, will be used. Therefore, the route with COS#1 from EN1 to NN2 will be EN1 to NN1 nonswitched, and NN1 to NN2 non-switched.

Route Randomization

When the route calculation algorithm encounters a situation where more than one link, node, or entire route supplies the same lowest weight for a given COS, then one will be chosen at random. Therefore, an attempt will be made to evenly distribute sessions over routes that are of equal weight.

IBM-Supplied Class-of-Service Descriptions

The following displays are viewed by using the Display Class-of-Service Description (DSPCOSD) command.

Defaults for Line Values

#CONNECT Class of Service

The following figures show the values in the #CONNECT class-of-service description as provided by IBM. Rows 1 through 4 are shown in Figure B-7, rows 5 through 8 are shown in Figure B-8 on page B-9. The transmission priority is medium.

```
                     Display Class-of-Service Description            RCH38360

Class-of-service description . . . :   #CONNECT
Transmission priority  . . . . . . :   *MED
Text . . . . . . . . . . . . . . . :   This COSD is IBM supplied

--------------------------Line Information----------------------------
                                                Security
 Line    Line              Link    Cost/   Cost/  for          Propagation
 Row     Weight            Speed   Connect  Byte  Line           Delay
 1         30    MINIMUM   4M         0       0   *NONSECURE   *MIN
                 MAXIMUM   *MAX       0       0   *MAX         *LAN
 2         60    MINIMUM   56000      0       0   *NONSECURE   *MIN
                 MAXIMUM   *MAX       0       0   *MAX         *TELEPHONE
 3         90    MINIMUM   19200      0       0   *NONSECURE   *MIN
                 MAXIMUM   *MAX       0       0   *MAX         *TELEPHONE
 4        120    MINIMUM   9600       0       0   *NONSECURE   *MIN
                 MAXIMUM   *MAX       0       0   *MAX         *TELEPHONE

                                                                      More...
 Press Enter to continue.

 F3=Exit   F11=Display user defined costs   F12=Cancel
```

```
                     Display Class-of-Service Description            RCH38360

Class-of-service description . . . :   #CONNECT
Transmission priority  . . . . . . :   *MED
Text . . . . . . . . . . . . . . . :   This COSD is IBM supplied

----------------------Line Information-------------------
                                  User     User     User
 Line    Line              Link   Defined  Defined  Defined
 Row     Weight            Speed     1        2        3
  1        30    MINIMUM   4M        0        0        0
                 MAXIMUM   *MAX     255      255      255
  2        60    MINIMUM   56000     0        0        0
                 MAXIMUM   *MAX     255      255      255
  3        90    MINIMUM   19200     0        0        0
                 MAXIMUM   *MAX     255      255      255
  4       120    MINIMUM   9600      0        0        0
                 MAXIMUM   *MAX     255      255      255

                                                                      More...
 Press Enter to continue.

 F3=Exit   F11=Display security/delays   F12=Cancel
```

Figure B-7. Class-of-Service Characteristics for #CONNECT, Rows 1 through 4

```
                  Display Class-of-Service Description              RCH38360

Class-of-service description . . . :   #CONNECT
Transmission priority  . . . . . . :   *MED
Text . . . . . . . . . . . . . . . :   This COSD is IBM supplied

--------------------------Line Information----------------------------
                                                Security
 Line   Line              Link   Cost/   Cost/  for            Propagation
 Row    Weight            Speed  Connect Byte   Line              Delay

 5      150      MINIMUM  19200      0       0  *NONSECURE     *MIN
                 MAXIMUM  *MAX       0       0  *MAX           *PKTSWTNET
 6      180      MINIMUM  9600       0       0  *NONSECURE     *MIN
                 MAXIMUM  *MAX       0       0  *MAX           *PKTSWTNET
 7      210      MINIMUM  4800       0       0  *NONSECURE     *MIN
                 MAXIMUM  *MAX       0       0  *MAX           *MAX
 8      240      MINIMUM  *MIN       0       0  *NONSECURE     *MIN
                 MAXIMUM  *MAX       0       0  *MAX           *MAX
                                                                      Bottom
 Press Enter to continue.

 F3=Exit   F11=Display user defined costs   F12=Cancel
```

```
                  Display Class-of-Service Description              RCH38360

Class-of-service description . . . :   #CONNECT
Transmission priority  . . . . . . :   *MED
Text . . . . . . . . . . . . . . . :   This COSD is IBM supplied

----------------------Line Information-------------------
                                   User     User     User
 Line   Line              Link   Defined  Defined  Defined
 Row    Weight            Speed     1        2        3
  5     150      MINIMUM  19200     0        0        0
                 MAXIMUM  *MAX     255      255      255
  6     180      MINIMUM  9600      0        0        0
                 MAXIMUM  *MAX     255      255      255
  7     210      MINIMUM  4800      0        0        0
                 MAXIMUM  *MAX     255      255      255
  8     240      MINIMUM  *MIN      0        0        0
                 MAXIMUM  *MAX     255      255      255

                                                                      Bottom
 Press Enter to continue.

 F3=Exit   F11=Display security/delays   F12=Cancel
```

Figure B-8. Class-of-Service Characteristics for #CONNECT, Rows 5 through 8

#INTER Class of Service

The following figures show the values in the #INTER class-of-service description as provided by IBM. Rows 1 through 4 are shown in Figure B-9, rows 5 through 8 are shown in Figure B-10 on page B-11. The transmission priority is high.

```
                     Display Class-of-Service Description            RCH38360

Class-of-service description . . . :   #INTER
Transmission priority  . . . . . . :   *HIGH
Text . . . . . . . . . . . . . . . :   This COSD is IBM supplied

--------------------------Line Information-----------------------------
                                                Security
 Line    Line             Link    Cost/   Cost/  for           Propagation
 Row     Weight           Speed   Connect Byte   Line              Delay

 1        30     MINIMUM  4M          0       0  *NONSECURE    *MIN
                 MAXIMUM  *MAX        0       0  *MAX          *LAN
 2        60     MINIMUM  56000       0       0  *NONSECURE    *MIN
                 MAXIMUM  *MAX        0       0  *MAX          *TELEPHONE
 3        90     MINIMUM  56000       0       0  *NONSECURE    *MIN
                 MAXIMUM  *MAX      128     128  *MAX          *TELEPHONE
 4       120     MINIMUM  19200       0       0  *NONSECURE    *MIN
                 MAXIMUM  *MAX        0       0  *MAX          *TELEPHONE
                                                                     More...
 Press Enter to continue.

 F3=Exit   F11=Display user defined costs   F12=Cancel
```

```
                     Display Class-of-Service Description            RCH38360

Class-of-service description . . . :   #INTER
Transmission priority  . . . . . . :   *HIGH
Text . . . . . . . . . . . . . . . :   This COSD is IBM supplied

----------------------Line Information------------------
                                  User     User     User
 Line    Line             Link    Defined  Defined  Defined
 Row     Weight           Speed     1        2        3
  1       30     MINIMUM  4M          0        0        0
                 MAXIMUM  *MAX      255      255      255
  2       60     MINIMUM  56000       0        0        0
                 MAXIMUM  *MAX      255      255      255
  3       90     MINIMUM  56000       0        0        0
                 MAXIMUM  *MAX      255      255      255
  4      120     MINIMUM  19200       0        0        0
                 MAXIMUM  *MAX      255      255      255

                                                                     More...
 Press Enter to continue.

 F3=Exit   F11=Display security/delays   F12=Cancel
```

Figure B-9. Class-of-Service Characteristics for #INTER, Rows 1 through 4

```
                    Display Class-of-Service Description               RCH38360

Class-of-service description . . . :   #INTER
Transmission priority  . . . . . . :   *HIGH
Text . . . . . . . . . . . . . . . :   This COSD is IBM supplied

--------------------------Line Information----------------------------
                                                Security
 Line    Line              Link   Cost/    Cost/ for             Propagation
 Row     Weight            Speed  Connect  Byte  Line               Delay

 5       150      MINIMUM  19200      0       0  *NONSECURE      *MIN
                  MAXIMUM  *MAX     128     128  *MAX            *PKTSWTNET
 6       180      MINIMUM  9600       0       0  *NONSECURE      *MIN
                  MAXIMUM  *MAX       0       0  *MAX            *PKTSWTNET
 7       210      MINIMUM  9600       0       0  *NONSECURE      *MIN
                  MAXIMUM  *MAX     196     196  *MAX            *MAX
 8       240      MINIMUM  *MIN       0       0  *NONSECURE      *MIN
                  MAXIMUM  *MAX     255     255  *MAX            *MAX
                                                                           Bottom
 Press Enter to continue.

 F3=Exit   F11=Display user defined costs   F12=Cancel
```

```
                    Display Class-of-Service Description               RCH38360

Class-of-service description . . . :   #INTER
Transmission priority  . . . . . . :   *HIGH
Text . . . . . . . . . . . . . . . :   This COSD is IBM supplied

---------------------Line Information-------------------
                                   User     User     User
 Line    Line              Link   Defined  Defined  Defined
 Row     Weight            Speed     1        2        3
  5      150      MINIMUM  19200      0        0        0
                  MAXIMUM  *MAX     255      255      255
  6      180      MINIMUM  9600       0        0        0
                  MAXIMUM  *MAX     255      255      255
  7      210      MINIMUM  9600       0        0        0
                  MAXIMUM  *MAX     255      255      255
  8      240      MINIMUM  *MIN       0        0        0
                  MAXIMUM  *MAX     255      255      255

                                                                           Bottom
 Press Enter to continue.

 F3=Exit   F11=Display security/delays   F12=Cancel
```

Figure B-10. Class-of-Service Characteristics for #INTER, Rows 5 through 8

#INTERSC Class of Service

The following figures show the values in the #INTERSC class-of-service description as provided by IBM. Rows 1 through 4 are shown in Figure B-11, rows 5 through 8 are shown in Figure B-12 on page B-13. The transmission priority is high.

```
                    Display Class-of-Service Description            RCH38360

 Class-of-service description . . . :   #INTERSC
 Transmission priority  . . . . . . :   *HIGH
 Text . . . . . . . . . . . . . . . :   This COSD is IBM supplied

 --------------------------Line Information----------------------------
                                                  Security
  Line    Line              Link    Cost/   Cost/ for           Propagation
  Row     Weight            Speed   Connect  Byte  Line             Delay

  1         30     MINIMUM  4M           0       0  *PKTSWTNET     *MIN
                   MAXIMUM  *MAX         0       0  *MAX           *LAN
  2         60     MINIMUM  56000        0       0  *PKTSWTNET     *MIN
                   MAXIMUM  *MAX         0       0  *MAX           *TELEPHONE
  3         90     MINIMUM  56000        0       0  *PKTSWTNET     *MIN
                   MAXIMUM  *MAX       128     128  *MAX           *TELEPHONE
  4        120     MINIMUM  19200        0       0  *PKTSWTNET     *MIN
                   MAXIMUM  *MAX         0       0  *MAX           *TELEPHONE
                                                                          More...
  Press Enter to continue.

  F3=Exit   F11=Display user defined costs   F12=Cancel
```

```
                    Display Class-of-Service Description            RCH38360

 Class-of-service description . . . :   #INTERSC
 Transmission priority  . . . . . . :   *HIGH
 Text . . . . . . . . . . . . . . . :   This COSD is IBM supplied

 ---------------------Line Information------------------
                                 User     User     User
  Line    Line           Link    Defined  Defined  Defined
  Row     Weight         Speed      1        2        3
   1        30   MINIMUM 4M         0        0        0
                 MAXIMUM *MAX     255      255      255
   2        60   MINIMUM 56000      0        0        0
                 MAXIMUM *MAX     255      255      255
   3        90   MINIMUM 56000      0        0        0
                 MAXIMUM *MAX     255      255      255
   4       120   MINIMUM 19200      0        0        0
                 MAXIMUM *MAX     255      255      255

                                                                          More...
  Press Enter to continue.

  F3=Exit   F11=Display security/delays   F12=Cancel
```

Figure B-11. Class-of-Service Characteristics for #INTERSC, Rows 1 through 4

```
                 Display Class-of-Service Description                RCH38360

Class-of-service description . . . :   #INTERSC
Transmission priority  . . . . . . :   *HIGH
Text . . . . . . . . . . . . . . . :   This COSD is IBM supplied

--------------------------Line Information-----------------------------
                                                    Security
 Line    Line            Link    Cost/    Cost/ for            Propagation
 Row     Weight          Speed   Connect  Byte  Line              Delay

 5        150    MINIMUM  19200      0       0  *PKTSWTNET      *MIN
                 MAXIMUM  *MAX     128     128  *MAX            *PKTSWTNET
 6        180    MINIMUM  9600       0       0  *PKTSWTNET      *MIN
                 MAXIMUM  *MAX       0       0  *MAX            *PKTSWTNET
 7        210    MINIMUM  9600       0       0  *PKTSWTNET      *MIN
                 MAXIMUM  *MAX     196     196  *MAX            *MAX
 8        240    MINIMUM  *MIN       0       0  *PKTSWTNET      *MIN
                 MAXIMUM  *MAX     255     255  *MAX            *MAX
                                                                           Bottom
 Press Enter to continue.

 F3=Exit   F11=Display user defined costs   F12=Cancel
```

```
                 Display Class-of-Service Description                RCH38360

Class-of-service description . . . :   #INTERSC
Transmission priority  . . . . . . :   *HIGH
Text . . . . . . . . . . . . . . . :   This COSD is IBM supplied

---------------------Line Information-------------------
                                 User     User     User
 Line    Line            Link    Defined  Defined  Defined
 Row     Weight          Speed     1        2        3
  5       150    MINIMUM  19200     0        0        0
                 MAXIMUM  *MAX     255      255      255
  6       180    MINIMUM  9600      0        0        0
                 MAXIMUM  *MAX     255      255      255
  7       210    MINIMUM  9600      0        0        0
                 MAXIMUM  *MAX     255      255      255
  8       240    MINIMUM  *MIN      0        0        0
                 MAXIMUM  *MAX     255      255      255

                                                                           Bottom
 Press Enter to continue.

 F3=Exit   F11=Display security/delays   F12=Cancel
```

Figure B-12. Class-of-Service Characteristics for #INTERSC, Rows 5 through 8

#BATCH Class of Service

The following figures show the values in the #BATCH class-of-service description as provided by IBM. Rows 1 through 4 are shown in Figure B-13, rows 5 through 8 are shown in Figure B-14 on page B-15. The transmission priority is low.

```
                       Display Class-of-Service Description              RCH38360

Class-of-service description . . . :   #BATCH
Transmission priority  . . . . . . :   *LOW
Text . . . . . . . . . . . . . . . :   This COSD is IBM supplied

--------------------------Line Information----------------------------
                                                 Security
 Line    Line            Link    Cost/   Cost/  for            Propagation
 Row     Weight          Speed   Connect  Byte  Line              Delay

 1        30   MINIMUM  56000      0        0  *NONSECURE     *MIN
               MAXIMUM  *MAX       0        0  *MAX           *MAX
 2        60   MINIMUM  19200      0        0  *NONSECURE     *MIN
               MAXIMUM  *MAX       0        0  *MAX           *MAX
 3        90   MINIMUM  19200      0        0  *NONSECURE     *MIN
               MAXIMUM  *MAX     128      128  *MAX           *MAX
 4       120   MINIMUM  9600       0        0  *NONSECURE     *MIN
               MAXIMUM  *MAX       0        0  *MAX           *MAX
                                                                          More...
 Press Enter to continue.

 F3=Exit   F11=Display user defined costs   F12=Cancel
```

```
                       Display Class-of-Service Description              RCH38360

Class-of-service description . . . :   #BATCH
Transmission priority  . . . . . . :   *LOW
Text . . . . . . . . . . . . . . . :   This COSD is IBM supplied

---------------------Line Information-------------------
                                 User     User     User
 Line    Line            Link    Defined  Defined  Defined
 Row     Weight          Speed     1        2        3
  1       30   MINIMUM  56000      0        0        0
               MAXIMUM  *MAX     255      255      255
  2       60   MINIMUM  19200      0        0        0
               MAXIMUM  *MAX     255      255      255
  3       90   MINIMUM  19200      0        0        0
               MAXIMUM  *MAX     255      255      255
  4      120   MINIMUM  9600       0        0        0
               MAXIMUM  *MAX     255      255      255

                                                                          More...
 Press Enter to continue.

 F3=Exit   F11=Display security/delays   F12=Cancel
```

Figure B-13. Class-of-Service Characteristics for #BATCH, Rows 1 through 4

```
                    Display Class-of-Service Description                RCH38360

Class-of-service description . . . :   #BATCH
Transmission priority  . . . . . . :   *LOW
Text . . . . . . . . . . . . . . . :   This COSD is IBM supplied

-------------------------Line Information---------------------------
                                             Security
 Line    Line            Link    Cost/   Cost/ for           Propagation
 Row    Weight           Speed  Connect  Byte  Line             Delay

 5       150    MINIMUM  9600       0       0  *NONSECURE    *MIN
                MAXIMUM  *MAX     128     128  *MAX          *MAX
 6       180    MINIMUM  9600       0       0  *NONSECURE    *MIN
                MAXIMUM  *MAX     196     196  *MAX          *MAX
 7       210    MINIMUM  9600       0       0  *NONSECURE    *MIN
                MAXIMUM  *MAX     196     196  *MAX          *MAX
 8       240    MINIMUM  *MIN       0       0  *NONSECURE    *MIN
                MAXIMUM  *MAX     255     255  *MAX          *MAX
                                                                     Bottom
 Press Enter to continue.

 F3=Exit   F11=Display user defined costs    F12=Cancel
```

```
                    Display Class-of-Service Description                RCH38360

Class-of-service description . . . :   #BATCH
Transmission priority  . . . . . . :   *LOW
Text . . . . . . . . . . . . . . . :   This COSD is IBM supplied

---------------------Line Information------------------
                                  User     User     User
 Line    Line            Link   Defined  Defined  Defined
 Row    Weight           Speed     1        2        3
  5      150    MINIMUM  9600      0        0        0
                MAXIMUM  *MAX     255      255      255
  6      180    MINIMUM  9600      0        0        0
                MAXIMUM  *MAX     255      255      255
  7      210    MINIMUM  4800      0        0        0
                MAXIMUM  *MAX     255      255      255
  8      240    MINIMUM  *MIN      0        0        0
                MAXIMUM  *MAX     255      255      255

                                                                     Bottom
 Press Enter to continue.

 F3=Exit   F11=Display security/delays    F12=Cancel
```

Figure B-14. Class-of-Service Characteristics for #BATCH, Rows 5 through 8

#BATCHSC Class of Service

The following figures show the values in the #BATCHSC class-of-service description as provided by IBM. Rows 1 through 4 are shown in Figure B-15, rows 5 through 8 are shown in Figure B-16 on page B-17. The transmission priority is low.

```
                      Display Class-of-Service Description              RCH38360

 Class-of-service description . . . :   #BATCHSC
 Transmission priority  . . . . . . :   *LOW
 Text . . . . . . . . . . . . . . . :   This COSD is IBM supplied

 --------------------------Line Information----------------------------

                                                Security
  Line    Line            Link    Cost/    Cost/ for            Propagation
  Row     Weight          Speed   Connect  Byte  Line             Delay
  1         30   MINIMUM  56000      0        0  *PKTSWTNET     *MIN
                 MAXIMUM  *MAX       0        0  *MAX           *MAX
  2         60   MINIMUM  19200      0        0  *PKTSWTNET     *MIN
                 MAXIMUM  *MAX       0        0  *MAX           *MAX
  3         90   MINIMUM  19200      0        0  *PKTSWTNET     *MIN
                 MAXIMUM  *MAX     128      128  *MAX           *MAX
  4        120   MINIMUM  9600       0        0  *PKTSWTNET     *MIN
                 MAXIMUM  *MAX       0        0  *MAX           *MAX
                                                                          More...
  Press Enter to continue.

  F3=Exit   F11=Display user defined costs   F12=Cancel
```

```
                      Display Class-of-Service Description              RCH38360

 Class-of-service description . . . :   #BATCHSC
 Transmission priority  . . . . . . :   *LOW
 Text . . . . . . . . . . . . . . . :   This COSD is IBM supplied

 ----------------------Line Information-------------------
                                  User     User     User
  Line    Line            Link   Defined  Defined  Defined
  Row     Weight          Speed     1        2        3
   1        30   MINIMUM  56000     0        0        0
                 MAXIMUM  *MAX     255      255      255
   2        60   MINIMUM  19200     0        0        0
                 MAXIMUM  *MAX     255      255      255
   3        90   MINIMUM  19200     0        0        0
                 MAXIMUM  *MAX     255      255      255
   4       120   MINIMUM  9600      0        0        0
                 MAXIMUM  *MAX     255      255      255

                                                                          More...
  Press Enter to continue.

  F3=Exit   F11=Display security/delays   F12=Cancel
```

Figure B-15. Class-of-Service Characteristics for #BATCHSC, Rows 1 through 4

```
                    Display Class-of-Service Description                  RCH38360

Class-of-service description . . . :   #BATCHSC
Transmission priority  . . . . . . :   *LOW
Text . . . . . . . . . . . . . . . :   This COSD is IBM supplied

--------------------------Line Information-----------------------------
                                                Security
 Line    Line             Link    Cost/   Cost/ for            Propagation
 Row     Weight           Speed   Connect Byte  Line              Delay

 5        150     MINIMUM  9600        0      0 *PKTSWTNET     *MIN
                  MAXIMUM  *MAX      128    128 *MAX           *MAX
 6        180     MINIMUM  9600        0      0 *PKTSWTNET     *MIN
                  MAXIMUM  *MAX      196    196 *MAX           *MAX
 7        210     MINIMUM  4800        0      0 *PKTSWTNET     *MIN
                  MAXIMUM  *MAX      196    196 *MAX           *MAX
 8        240     MINIMUM  *MIN        0      0 *PKTSWTNET     *MIN
                  MAXIMUM  *MAX      255    255 *MAX           *MAX
                                                                       Bottom
 Press Enter to continue.

 F3=Exit   F11=Display user defined costs   F12=Cancel
```

```
                    Display Class-of-Service Description                  RCH38360

Class-of-service description . . . :   #BATCHSC
Transmission priority  . . . . . . :   *LOW
Text . . . . . . . . . . . . . . . :   This COSD is IBM supplied

----------------------Line Information-------------------
                                   User     User     User
 Line    Line              Link   Defined  Defined  Defined
 Row     Weight            Speed     1        2        3
  5       150     MINIMUM  9600       0        0        0
                  MAXIMUM  *MAX     255      255      255
  6       180     MINIMUM  9600       0        0        0
                  MAXIMUM  *MAX     255      255      255
  7       210     MINIMUM  4800       0        0        0
                  MAXIMUM  *MAX     255      255      255
  8       240     MINIMUM  *MIN       0        0        0
                  MAXIMUM  *MAX     255      255      255

                                                                       Bottom
 Press Enter to continue.

 F3=Exit   F11=Display security/delays   F12=Cancel
```

Figure B-16. Class-of-Service Characteristics for #BATCHSC, Rows 5 through 8

Defaults for Node Values

The following figures show the node information for the #CONNECT class-of-service description, but the node values are the same in all of the IBM-supplied class-of-service descriptions.

```
                    Display Class-of-Service Description              RCH38360

Class-of-service description . . . :   #CONNECT
Transmission priority  . . . . . . :   *MED
Text . . . . . . . . . . . . . . . :   This COSD is IBM supplied

-------------------Node Information------------------------
                                       Route          Congestion
Node      Node                        Addition           for
Row       Weight                     Resistance         Node
1           5       MINIMUM               0             *LOW
                    MAXIMUM              31             *LOW
2          10       MINIMUM               0             *LOW
                    MAXIMUM              63             *LOW
3          20       MINIMUM               0             *LOW
                    MAXIMUM              95             *LOW
4          40       MINIMUM               0             *LOW
                    MAXIMUM             127             *LOW
                                                                    More...
 Press Enter to continue.


 F3=Exit   F12=Cancel
```

```
                    Display Class-of-Service Description              RCH38360

Class-of-service description . . . :   #CONNECT
Transmission priority  . . . . . . :   *MED
Text . . . . . . . . . . . . . . . :   This COSD is IBM supplied

-------------------Node Information------------------------
                                       Route          Congestion
Node      Node                        Addition           for
Row       Weight                     Resistance         Node
5          60       MINIMUM               0             *LOW
                    MAXIMUM             159             *LOW
6          80       MINIMUM               0             *LOW
                    MAXIMUM             191             *LOW
7         120       MINIMUM               0             *LOW
                    MAXIMUM             223             *HIGH
8         160       MINIMUM               0             *LOW
                    MAXIMUM             255             *HIGH

                                                                   Bottom
 Press Enter to continue.

 F3=Exit   F12=Cancel
```

Figure B-17. Node Defaults for All IBM-Supplied Class-of-Service Descriptions

Appendix C. APPN Configuration Examples

This appendix provides configuration examples for the following:

- Two AS/400 systems as end nodes using APPN.
- Two AS/400 systems as network nodes using APPN.
- Three AS/400 systems using APPN.
- Two APPN networks with different network IDs linked together
- Multiple AS/400 systems using APPN.
- AS/400 systems and System/36s using APPN.

Notes:

1. In all of the following examples, default values are used for all parameters not explicitly defined. Refer to the description of the commands in this chapter for a description of those parameters that are specifically for APPC/APPN; see the *CL Reference* for the complete syntax of the commands and the parameters. In addition, the *OS/400* Communications Configuration Reference* describes the configuration process and all the values for communications and should be referred to for a discussion of the configuration process including the configuration menus.
2. The name assigned to each description created is the same as the name of the destination being defined in that description. For example, the line description configured in New York for the connection to Los Angeles is named LOSANGEL.
3. Names (such as location names), telephone numbers, exchange identifiers, and other values shown in the examples are for illustration only. The values you assign to your configuration are dependent on your network requirements.

Two AS/400 Systems as End Nodes Using APPN

In Figure C-1 (and Figure 3-2 on page 3-2), systems A and B are both configured as end nodes in the network attributes. The only APPN-specific parameter that must be configured is the remote control point name in the controller description. A device description is not required for an APPN configuration.

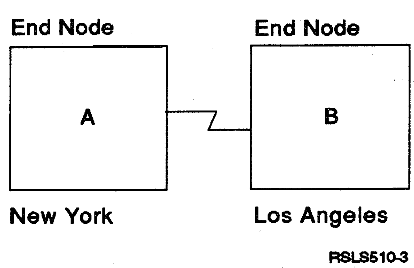


Figure C-1. Two-System APPN Network

Configuring System A (New York)

The following CL commands are used to define the configuration for the system identified as NEWYORK. The example shows the commands as used within a CL program; the configuration can also be performed using the configuration menus.

```
/*********************************************************************/
/*                                                                   */
/*  MODULE:  NYLAAPPN                  LIBRARY:  PUBSCFGS            */
/*                                                                   */
/*  LANGUAGE:  CL                                                    */
/*                                                                   */
/*  FUNCTION:  CONFIGURES APPN ENDNODES AS FOLLOWS:                  */
/*                                                                   */
/*                                                                   */
/*            NEWYORK  /______\  LOSANGEL                            */
/*                     \      /                                      */
/*                                                                   */
/*              (THIS IS NEWYORK TO LOSANGEL)                        */
/*                                                                   */
/*                                                                   */
/*                                                                   */
/*********************************************************************/
PGM
/*********************************************************************/
/*                        NEWYORK TO LOSANGEL                        */
/*********************************************************************/
             /* Change network attributes for NEWYORK  */
             CHGNETA    LCLNETID(APPN) LCLCPNAME(NEWYORK)
                          LCLLOCNAME(NEWYORK) NODETYPE(*ENDNODE)
             /* Create line description for NEWYORK to LOSANGEL */
             CRTLINSDLC LIND(LOSANGEL) RSRCNAME(LIN011)
             /* Create controller description for NEWYORK to
                                                    LOSANGEL */
             CRTCTLAPPC CTLD(LOSANGEL) LINKTYPE(*SDLC) LINE(LOSANGEL)
                          RMTNETID(APPN) RMTCPNAME(LOSANGEL)
                          STNADR(01) NODETYPE(*CALC)
ENDPGM
```

Changing the Network Attributes (New York): The Change Network Attributes (CHGNETA) command is used to set the attributes for the system within the network. The following attributes are defined for NEWYORK:

LCLNETID(APPN)
Specifies that the name of the local network is APPN. The remote location (LOSANGEL in the example, system B in Figure C-1 on page C-1) must specify this name as the remote network identifier (RMTNETID) on the CRTCTLAPPC command.

LCLCPNAME(NEWYORK)
Specifies that the name assigned to the local control point is NEWYORK. The remote system specifies this name as the remote control point name (RMTCPNAME) on the CRTCTLAPPC command.

LCLLOCNAME(NEWYORK)
The default local location name is NEWYORK. This name will be used for the device description that is created by the APPN support.

NODETYPE(*ENDNODE)
Specifies that the local system (NEWYORK) is an APPN end node.

Creating the Line Description (New York): The line used in this example is an SDLC nonswitched line. The command used to create the line is Create Line Description (SDLC) (CRTLINSDLC). The parameters specified are:

LIND(LOSANGEL)
The name assigned to the line description is LOSANGEL.

RSRCNAME(LIN011)
Specifies that the physical communications port named LIN011 is being defined.

Creating the Controller Description (New York): Because this is an APPN environment (AS/400 system to AS/400 system), the controller is an APPC controller and the CRTCTLAPPC command is used to define the attributes of the controller. The following attributes are defined by the example command:

CTLD(LOSANGEL)
The name assigned to the controller description is LOSANGEL.

LINKTYPE(*SDLC)
Because this controller is attached through an SDLC communications line, the value specified is *SDLC. This value must correspond to the type of line being used as defined by a create line description command.

LINE(LOSANGEL)
Specifies the name (LOSANGEL) of the line description to which this controller is attached. This value must match a name specified by the LIND parameter in a line description.

RMTNETID(APPN)
The name of the network in which the remote control point resides is APPN.

RMTCPNAME(LOSANGEL)
Specifies that the remote control-point name is LOSANGEL. The name specified here must match the name specified at the remote system for the local control-point name. In the example, the name is specified at the remote system (LOSANGEL) by the LCLCPNAME parameter of the CHGNETA command.

STNADR(01)
The address assigned to the remote controller is hex 01.

NODETYPE(*CALC)
Specifies that the local system must determine, during exchange identifier processing, the node type of the remote system.

Configuring System B (Los Angeles)

The following CL commands are used to define the configuration for the system identified as LOSANGEL (system B in Figure C-1 on page C-1). The example shows the commands as used within a CL program; the configuration can also be performed using the configuration menus.

```
/*********************************************************************/
/*                                                                   */
/*  MODULE:  LANYAPPN                    LIBRARY:  PUBSCFGS          */
/*                                                                   */
/*  LANGUAGE:  CL                                                    */
/*                                                                   */
/*  FUNCTION:  CONFIGURES APPN ENDNODES AS FOLLOWS:                  */
/*                                                                   */
/*                                                                   */
/*             NEWYORK /______\  LOSANGEL                            */
/*                     \      /                                      */
/*                                                                   */
/*              (THIS IS LOSANGEL TO NEWYORK)                        */
/*                                                                   */
/*                                                                   */
/*                                                                   */
/*********************************************************************/
PGM
/*********************************************************************/
/*                        LOSANGEL TO NEWYORK                        */
/*********************************************************************/
             /* Change network attributes for LOSANGEL  */
             CHGNETA    LCLNETID(APPN) LCLCPNAME(LOSANGEL)
                          LCLLOCNAME(LOSANGEL) NODETYPE(*ENDNODE)
             /* Create line description for LOSANGEL to NEWYORK */
             CRTLINSDLC LIND(NEWYORK) RSRCNAME(LIN012)
             /* Create controller description for LOSANGEL to
                                                        NEWYORK */
             CRTCTLAPPC CTLD(NEWYORK) LINKTYPE(*SDLC) LINE(NEWYORK)
                          RMTNETID(APPN) RMTCPNAME(NEWYORK)
                          STNADR(01) NODETYPE(*CALC)
ENDPGM
```

Changing the Network Attributes (Los Angeles): The Change Network Attributes (CHGNETA) command is used to set the attributes for the system within the network. The following attributes are defined for LOSANGEL:

LCLNETID(APPN)
Specifies that the name of the local network is APPN. The remote location (NEWYORK in the example) must specify this name as the remote network identifier (RMTNETID) on the CRTCTLAPPC command.

LCLCPNAME(LOSANGEL)
Specifies that the name assigned to the local control point is LOSANGEL. The remote system specifies this name as the remote control point name (RMTCPNAME) on the CRTCTLAPPC command.

LCLLOCNAME(LOSANGEL)
The default local location name name is LOSANGEL. This name will be used for the device description that is created by the APPN support.

NODETYPE(*ENDNODE)
Specifies that the local system (LOSANGEL) is an APPN end node.

Creating the Line Description (Los Angeles): The line used in this example is an SDLC nonswitched line. The command used to create the line is CRTLINSDLC. The parameters specified are:

LIND(NEWYORK)
The name assigned to the line description is NEWYORK.

RSRCNAME(LIN012)
Specifies that the physical communications port named LIN012 is being defined.

Creating the Controller Description (Los Angeles): Because this is an APPN environment (AS/400 system to AS/400 system), the controller is an APPC controller and the CRTCTLAPPC command is used to define the attributes of the controller. The following attributes are defined by the example command:

CTLD(NEWYORK)
The name assigned to the controller description is NEWYORK.

LINKTYPE(*SDLC)
Because this controller is attached through an SDLC communications line, the value specified is *SDLC. This value must correspond to the type of line being used as defined by a create line description command.

LINE(NEWYORK)
Specifies the name (NEWYORK) of the line description to which this controller is attached. This value must match a name specified by the LIND parameter in a line description.

RMTNETID(APPN)
The name of the network in which the remote control point resides is APPN.

RMTCPNAME(NEWYORK)
Specifies that the remote control-point name is NEWYORK. The name specified here must match the name specified at the remote system for the local control-point name. In the example, the name is specified at the remote system (NEWYORK) by the LCLCPNAME parameter of the CHGNETA command.

STNADR(01)
The address assigned to the remote controller is hex 01.

NODETYPE(*CALC)
Specifies that the local system must determine, during exchange identifier processing, the node type of the remote system.

Two AS/400 Systems as Network Nodes Using APPN

In Figure C-2, both systems are configured as network nodes in the network attributes. This example shows an APPN configuration using a switched line and a nonswitched line.

Configuring Network Node 1 (Chicago)

The following example program shows the CL commands used to define the configuration for the system identified as CHICAGO (NN1). The example shows the commands as used within a CL program; the configuration can also be performed using the configuration menus.

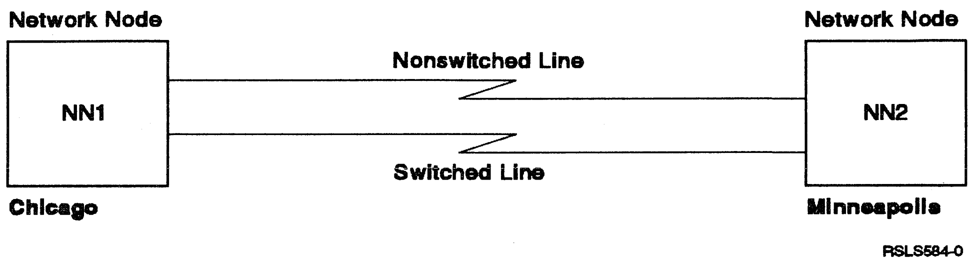


Figure C-2. APPN Two-System Network

```
/*********************************************************************/
/*                                                                   */
/*  MODULE:  CHICAGO                    LIBRARY:  PUBSCFGS           */
/*                                                                   */
/*  LANGUAGE:  CL                                                    */
/*                                                                   */
/*  FUNCTION:  CONFIGURES APPN NETWORK:                              */
/*                                                                   */
/*             THIS IS: CHICAGO TO MPLS    (nonswitched)             */
/*                      CHICAGO TO MPLS    (switched)                */
/*                                                                   */
/*                                                                   */
/*                                                                   */
/*                                                                   */
/*********************************************************************/
PGM
             /* Change network attributes for CHICAGO */
             CHGNETA    LCLNETID(APPN) LCLCPNAME(CHICAGO) +
                          LCLLOCNAME(CHICAGO) NODETYPE(*NETNODE)
/*********************************************************************/
/*                        CHICAGO TO MPLS (nonswitched)              */
/*********************************************************************/
             /* Create nonswitched line description for CHICAGO to MPLS  */
             CRTLINSDLC LIND(MPLSL) RSRCNAME(LIN021)
             /* Create controller description for CHICAGO to MPLS */
             CRTCTLAPPC CTLD(MPLSL) LINKTYPE(*SDLC) LINE(MPLSL) +
                          RMTNETID(APPN) RMTCPNAME(MPLS) +
                          STNADR(01) NODETYPE(*NETNODE)
/*********************************************************************/
/*                        CHICAGO TO MPLS (switched)                 */
/*********************************************************************/
             /* Create switched line description for CHICAGO to MPLS  */
             CRTLINSDLC LIND(MPLSS) RSRCNAME(LIN022) CNN(*SWTPP) +
                          AUTOANS(*NO) STNADR(01)
             /* Create controller description for CHICAGO to MPLS */
             CRTCTLAPPC CTLD(MPLSS) LINKTYPE(*SDLC) SWITCHED(*YES) +
                          SWTLINLST(MPLSS) RMTNETID(APPN) +
                          RMTCPNAME(MPLS) INLCNN(*DIAL) +
                          CNNNBR(6125551111) STNADR(01) +
                          TMSGRPNBR(3) NODETYPE(*NETNODE)
ENDPGM
```

Changing the Network Attributes (Chicago): The Change Network Attributes (CHGNETA) command is used to set the attributes for the system within the network. The following attributes are defined for the CHICAGO system, and these attributes apply to all connections in the network for this network node.

LCLNETID(APPN)
The name of the local network is APPN. The remote system (MPLS in the example program, NN2 in Figure C-2 on page C-6) must specify this name as the remote network identifier (RMTNETID) on the CRTCTLAPPC command.

LCLCPNAME(CHICAGO)
The name assigned to the local control point is CHICAGO. The remote systems specify this name as the remote control point name (RMTCPNAME) on the CRTCTLAPPC command.

LCLLOCNAME(CHICAGO)
The default local location name is CHICAGO. This name will be used for the device description that is created by the APPN support.

NODETYPE(*NETNODE)
The local system (CHICAGO) is an APPN network node.

Creating the Line Description (Chicago to Minneapolis, Nonswitched): The line used in this example is an SDLC nonswitched line. The command used to create the line is CRTLINSDLC. The parameters specified are:

LIND(MPLSL)
The name assigned to the line description is MPLSL.

RSRCNAME(LIN021)
The physical communications port named LIN021 is defined.

Creating the Controller Description (Chicago to Minneapolis, Nonswitched): Because this is an APPN environment (AS/400 system to AS/400 system), the controller is an APPC controller, and the CRTCTLAPPC command is used to define the attributes of the controller. The following attributes are defined by the example command:

CTLD(MPLSL)
The name assigned to the controller description is MPLSL.

LINKTYPE(*SDLC)
Because this controller is attached through an SDLC communications line, the value specified is *SDLC. This value must correspond to the type of line defined by a create line description command.

LINE(MPLSL)
The name of the line description to which this controller is attached is MPLSL. This value must match a name specified by the LIND parameter in a line description.

RMTNETID(APPN)
The name of the network in which the remote control point resides is APPN.

RMTCPNAME(MPLS)
The remote control-point name is MPLS. The name specified here must match the name specified at the remote system for the local control-point name. In the example, the name is specified at the remote system (NEWYORK) by the LCLCPNAME parameter on the Change Network Attributes (CHGNETA) command.

STNADR(01)
The address assigned to the remote controller is hex 01.

NODETYPE(*NETNODE)
The remote system (MPLS) is an APPN network node.

Creating the Line Description (Chicago to Minneapolis, Switched): The line used in this example is an SDLC switched line. The command used to create the line is CRTLINSDLC. The parameters specified are:

LIND(MPLSS)
The name assigned to the line description is MPLSS.

RSRCNAME(LIN022)
The physical communications port named LIN022 is defined.

CNN(*SWTPP)
This is a switched line connection.

AUTOANS(*NO)
This system will not automatically answer an incoming call.

STNADR(01)
The address assigned to the local system is hex 01.

Creating the Controller Description (Chicago to Minneapolis, Switched): Because this is an APPN environment (AS/400 system to AS/400 system), the controller is an APPC controller, and the CRTCTLAPPC command is used to define the attributes of the controller. The following attributes are defined by the example command:

CTLD(MPLSS)
The name assigned to the controller description is MPLSS.

LINKTYPE(*SDLC)
Because this controller is attached through an SDLC communications line, the value specified is *SDLC. This value must correspond to the type of line defined by a create line description command.

SWITCHED(*YES)
This controller is attached to a switched SDLC line.

SWTLINLST(MPLSS)
The name of the line description (for switched lines) to which this controller can be attached is MPLSS. In the example, there is only one line (MPLSS). This value must match a name specified by the LIND parameter in a line description.

RMTNETID(APPN)
The name of the network in which the remote control point resides is APPN.

RMTCPNAME(MPLS)
The remote control-point name is MPLS. The name specified here must match the name specified at the remote system for the local control-point name. In the example, the name is specified at the remote system by the LCLCPNAME parameter on the CHGNETA (Change Network Attributes) command.

INLCNN(*DIAL)
The initial connection is made by the AS/400 system either answering an incoming call or placing a call.

CNNNBR(6125551111)
The connection (telephone) number for the remote controller is 6125551111.

STNADR(01)
The address assigned to the remote controller is hex 01.

TMSGRPNBR(3)
The value (3) is to be used by the APPN support for transmission group negotiation with the remote system.

The remote system must specify the same value for the transmission group.

NODETYPE(*NETNODE)
The remote system (MPLS) is an APPN network node.

Configuring Network Node 2 (Minneapolis)

The following example program shows the CL commands used to define the configuration for the system identified as MPLS (NN2 in Figure C-2 on page C-6). The example shows these commands as used within a CL program; the configuration can also be performed using the configuration menus.

```
/*********************************************************************/
/*                                                                   */
/*  MODULE:  MPLS                           LIBRARY:  PUBSCFGS       */
/*                                                                   */
/*  LANGUAGE:  CL                                                    */
/*                                                                   */
/*  FUNCTION:  CONFIGURES APPN NETWORK:                              */
/*                                                                   */
/*             THIS IS: MPLS TO CHICAGO     (nonswitched)            */
/*                      MPLS TO CHICAGO     (switched)               */
/*                                                                   */
/*                                                                   */
/*********************************************************************/
PGM
             /* Change network attributes for MPLS */
             CHGNETA    LCLNETID(APPN) LCLCPNAME(MPLS) +
                          LCLLOCNAME(MPLS) NODETYPE(*NETNODE)
/*********************************************************************/
/*                            MPLS TO CHICAGO (nonswitched)          */
/*********************************************************************/
             /* Create line description for MPLS to CHICAGO */
             CRTLINSDLC LIND(CHICAGOL) RSRCNAME(LIN022)
             /* Create controller description for MPLS to CHICAGO */
             CRTCTLAPPC CTLD(CHICAGOL) LINKTYPE(*SDLC) LINE(CHICAGOL) +
                          RMTNETID(APPN) RMTCPNAME(CHICAGO) +
                          STNADR(01) NODETYPE(*NETNODE)
/*********************************************************************/
/*                          MPLS TO CHICAGO (switched)               */
/*********************************************************************/
             /* Create switched line description for MPLS to CHICAGO  */
             CRTLINSDLC LIND(CHICAGOS) RSRCNAME(LIN031) CNN(*SWTPP) +
                          AUTOANS(*NO) STNADR(01)
             /* Create controller description for MPLS TO CHICAGO */
             CRTCTLAPPC CTLD(CHICAGOS) LINKTYPE(*SDLC) SWITCHED(*YES) +
                          SWTLINLST(CHICAGOS) RMTNETID(APPN) +
                          RMTCPNAME(CHICAGO) INLCNN(*ANS) +
                          CNNNBR(3125551111) STNADR(01) TMSGRPNBR(3) +
                          NODETYPE(*NETNODE)
ENDPGM
```

Changing the Network Attributes (Minneapolis): The Change Network Attributes (CHGNETA) command is used to set the attributes for the system within the network. The following attributes are defined for the MPLS system, and these attributes apply to all connections in the network for this network node:

LCLNETID(APPN)
The name of the local network is APPN. The remote systems (CHICAGO in the example program, NN1 in Figure C-2 on page C-6) must specify this name as the remote network identifier (RMTNETID) on the CRTCTLAPPC command.

LCLCPNAME(MPLS)
The name assigned to the local control point is MPLS. The remote system specifies this name as the remote control point name (RMTCPNAME) on the CRTCTLAPPC command.

LCLLOCNAME(MPLS)
The default local location name is MPLS. This name will be used for the device description that is created by the APPN support.

NODETYPE(*NETNODE)
The local system (MPLS) is an APPN network node.

Creating the Line Description (Minneapolis to Chicago, Nonswitched): The line used in this example is an SDLC nonswitched line. The command used to create the line is CRTLINSDLC. The parameters specified are:

LIND(CHICAGOL)
The name assigned to the line description is CHICAGOL.

RSRCNAME(LIN022)
The physical communications port named LIN022 is defined.

Creating the Controller Description (Minneapolis to Chicago, Nonswitched): Because this is an APPN environment (AS/400 system to AS/400 system), the controller is an APPC controller, and the CRTCTLAPPC command is used to define the attributes of the controller. The following attributes are defined by the example command:

CTLD(CHICAGOL)
The name assigned to the controller description is CHICAGOL.

LINKTYPE(*SDLC)
Because this controller is attached through an SDLC communications line, the value specified is *SDLC. This value must correspond to the type of line defined by a create line description command.

LINE(CHICAGOL)
The name of the line description to which this controller is attached is CHICAGOL. This value must match a name specified by the LIND parameter in a line description.

RMTNETID(APPN)
The name of the network in which the remote system resides is APPN.

RMTCPNAME(CHICAGO)
The remote control-point name is CHICAGO. The name specified here must match the name specified at the remote system for the local control-point name. In the example, the name is specified at the remote system

(CHICAGO) by the LCLCPNAME parameter on the Change Network Attributes (CHGNETA) command.

STNADR(01)
The address assigned to the remote controller is hex 01.

NODETYPE(*NETNODE)
The remote system (CHICAGO) is an APPN network node.

Creating the Line Description (Minneapolis to Chicago, Switched): The line used in this example is an SDLC switched line. The command used to create the line is CRTLINSDLC. The parameters specified are:

LIND(CHICAGOS)
The name assigned to the line description is CHICAGOS.

RSRCNAME(LIN031)
The physical communications port named LIN031 is defined.

CNN(*SWTPP)
This is a switched line connection.

AUTOANS(*NO)
This system will not automatically answer an incoming call.

STNADR(01)
The address assigned to the local system is hex 01.

Creating the Controller Description (Minneapolis to Chicago, Switched): Because this is an APPN environment (AS/400 system to AS/400 system), the controller is an APPC controller, and the CRTCTLAPPC command is used to define the attributes of the controller. The following attributes are defined by the example command:

CTLD(CHICAGOS)
The name assigned to the controller description is CHICAGOS.

LINKTYPE(*SDLC)
Because this controller is attached through an SDLC communications line, the value specified is *SDLC. This value must correspond to the type of line defined by a create line description command.

SWITCHED(*YES)
This controller is attached to a switched SDLC line.

SWTLINLST(CHICAGOS)
The name of the line description (for switched lines) to which this controller can be attached is CHICAGOS. In the example, there is only one line (CHICAGO). This value must match a name specified by the LIND parameter in a line description.

RMTNETID(APPN)
The name of the network in which the remote control point resides is APPN.

RMTCPNAME(CHICAGO)
The remote control-point name is CHICAGO. The name specified here must match the name specified at the remote system for the local control-point name. In the example, the name is specified at the remote system (CHICAGO) by the LCLCPNAME parameter on the Change Network Attributes (CHGNETA) command.

INLCNN(*ANS)
The initial connection is made by the AS/400 system answering an incoming call.

CNNNBR(3125551111)
The connection (telephone) number for the remote controller is 3125551111.

STNADR(01)
The address assigned to the remote controller is hex 01.

TMSGRPNBR(3)
The value (3) to be used by the APPN support for transmission group negotiation with the remote system.

The remote system must specify the same value for the transmission group.

NODETYPE(*NETNODE)
The remote system (CHICAGO) is an APPN network node.

Three AS/400 Systems Using APPN

In Figure C-3 (and Figure 3-3 on page 3-2), A and B are end nodes. The network node must configure its network attributes to reflect that it is a network node. Each system must configure the remote control-point name in the controller description representing the adjacent system. Also, A and B must indicate in the controller description for the network node that it can be a network node. A and B must add the network node to the server list in network attributes so that the network node could act as a network server for both end nodes.

Note: Neither end node needs to configure any information about the other end node.

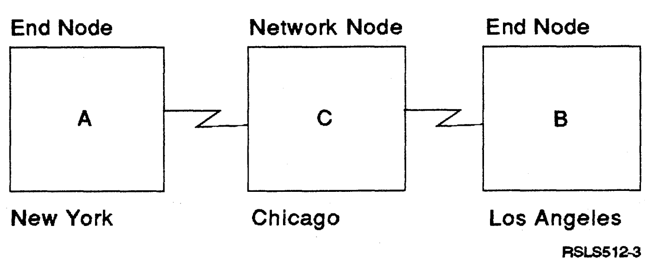


Figure C-3. Three-System APPN Network

Configuring System A (New York)

The following CL commands are used to define the configuration for the system identified as NEWYORK (system A in Figure C-3). The examples show these commands as used within a CL program; the configuration can also be performed using the configuration menus.

```
/*********************************************************************/
/*                                                                   */
/*  MODULE:  NYCHENNN                     LIBRARY:  PUBSCFGS         */
/*                                                                   */
/*  LANGUAGE:  CL                                                    */
/*                                                                   */
/*  FUNCTION:  CONFIGURES APPN EN-NN-EN AS FOLLOWS:                  */
/*                                                                   */
/*                                                                   */
/*             NEWYORK /______\ CHICAGO /______\ LOSANGEL            */
/*                     \      /         \      /                     */
/*                                                                   */
/*                 (THIS IS NEWYORK TO CHICAGO)                      */
/*                                                                   */
/*                                                                   */
/*                                                                   */
/*********************************************************************/
PGM
/*********************************************************************/
/*                          NEWYORK TO CHICAGO                       */
/*********************************************************************/
             /* Change network attributes for NEWYORK  */
             CHGNETA    LCLNETID(APPN) LCLCPNAME(NEWYORK)
                          LCLLOCNAME(NEWYORK) NODETYPE(*ENDNODE)
                          NETSERVER((APPN CHICAGO))
             /* Create remote configuration list for NEWYORK */
             CRTCFGL    TYPE(*APPNRMT) APPNRMTE((LOSANGEL APPN
                        NEWYORK LOSANGEL APPN 3BD29F *YES *NO *NO *NO
                        'RMT LOC of NEWYORK'))
             /* Create line description for NEWYORK to CHICAGO */
             CRTLINSDLC LIND(CHICAGO) RSRCNAME(LIN011)
             /* Create controller description for NEWYORK to
                                                        CHICAGO */
             CRTCTLAPPC CTLD(CHICAGO) LINKTYPE(*SDLC) LINE(CHICAGO)
                          RMTNETID(APPN) RMTCPNAME(CHICAGO)
                          STNADR(01) NODETYPE(*NETNODE)
ENDPGM
```

Changing the Network Attributes (New York): The Change Network Attributes (CHGNETA) command is used to set the attributes for the system within the network. The following attributes are defined for NEWYORK:

LCLNETID(APPN)
Specifies that the name of the local network is APPN. The remote location (CHICAGO in the example, system B in Figure C-3 on page C-13), must specify this name as the remote network identifier (RMTNETID) on the CRTCTLAPPC command.

LCLCPNAME(NEWYORK)
Specifies that the name assigned to the local control point is NEWYORK. The remote system specifies this name as the remote control point name (RMTCPNAME) on the CRTCTLAPPC command.

LCLLOCNAME(NEWYORK)
The default local location name of this location is NEWYORK. This name will be used for the device description that is created by the APPN support.

NODETYPE(*ENDNODE)
Specifies that the local system (NEWYORK) is an end node in the APPN network.

NETSERVER((APPN CHICAGO))
Specifies the name of the network node (CHICAGO) and the name of the network (APPN) that serves this end node. These names are defined at the remote system on the CHGNETA command.

Creating the Remote Location Configuration List (New York): The Create Configuration List (CRTCFGL) command is also used to define the remote locations with special characteristics to the APPN support. In this example, location security is being used and the following is defined at NEWYORK:

TYPE(*APPNRMT)
Specifies that the entries being defined are remote locations.

APPNRMTE((LOSANGEL APPN NEWYORK LOSANGEL APPN 3BD29F *YES *NO *NO *NO 'RMT LOC of NEWYORK'))
Specifies the remote location with which the local location can be paired. The remote location name is LOSANGEL; the remote network ID is APPN; the associated local location name is NEWYORK; the remote control-point name is LOSANGEL; the remote control point network ID is also APPN; the password is 3BD29F; it is a secure location; and it is not a single session location (the last two entries, locally controlled sessions and pre-established sessions, are *NO because this is not a single session location).

Creating the Line Description (New York): The line used in this example is an SDLC nonswitched line. The command used to create the line is CRTLINSDLC. The parameters specified are:

LIND(CHICAGO)
The name assigned to the line description is CHICAGO.

RSRCNAME(LIN011)
Specifies that the physical communications port named LIN011 is being defined.

Creating the Controller Description (New York): Because this is an APPN environment (AS/400 system to AS/400 system), the controller is an APPC controller and the CRTCTLAPPC command is used to define the attributes of the controller. The following attributes are defined by the example command:

CTLD(CHICAGO)
The name assigned to the controller description is CHICAGO.

LINKTYPE(*SDLC)
Because this controller is attached through an SDLC communications line, the value specified is *SDLC. This value must correspond to the type of line being used as defined by a create line description command.

LINE(CHICAGO)
Specifies the name (CHICAGO) of the line description to which this controller is attached. This value must match a name specified by the LIND parameter in a line description.

RMTNETID(APPN)
The name of the network in which the remote control point resides is APPN.

RMTCPNAME(CHICAGO)
Specifies that the remote control-point name is CHICAGO. The name specified here must match the name specified at the remote system for the local control-point name. In the example, the name is specified at the remote system (CHICAGO) by the LCLCPNAME parameter on the CHGNETA command.

STNADR(01)
The address assigned to the remote controller is hex 01.

NODETYPE(*NETNODE)
Specifies that the remote location (CHICAGO) is an APPN networking node.

Configuring System B (Los Angeles)

The following CL commands are used to define the configuration for the system identified as LOSANGEL (system B in Figure C-3 on page C-13). The examples show these commands as used within a CL program; the configuration can also be performed using the configuration menus.

```
/*********************************************************************/
/*                                                                   */
/*  MODULE:  LACHENNN                    LIBRARY:  PUBSCFGS          */
/*                                                                   */
/*  LANGUAGE:  CL                                                    */
/*                                                                   */
/*  FUNCTION:  CONFIGURES APPN EN-NN-EN AS FOLLOWS:                  */
/*                                                                   */
/*                                                                   */
/*             NEWYORK /______\ CHICAGO /______\ LOSANGEL            */
/*                     \      /         \      /                     */
/*                                                                   */
/*                    (THIS IS LOSANGEL TO CHICAGO)                  */
/*                                                                   */
/*                                                                   */
/*                                                                   */
/*********************************************************************/
PGM
/*********************************************************************/
/*                       LOSANGEL TO CHICAGO                         */
/*********************************************************************/
             /* Change network attributes for LOSANGEL */
             CHGNETA    LCLNETID(APPN) LCLCPNAME(LOSANGEL)
                          LCLLOCNAME(LOSANGEL) NODETYPE(*ENDNODE)
                          NETSERVER((APPN CHICAGO))
             /* Create remote configuration list for LOSANGEL to
                                                          New York  */
             CRTCFGL    TYPE(*APPNRMT) APPNRMTE((NEWYORK APPN
                          LOSANGEL NEWYORK APPN 3BD29F *YES *NO *NO *NO
                          'RMT LOC of LOSANGEL'))
             /* Create line description for LOSANGEL to CHICAGO  */
             CRTLINSDLC LIND(CHICAGO) RSRCNAME(LIN041)
             /* Create controller description for LOSANGEL to
                                                           CHICAGO  */
             CRTCTLAPPC CTLD(CHICAGO) LINKTYPE(*SDLC) LINE(CHICAGO)
                          RMTNETID(APPN) RMTCPNAME(CHICAGO)
                          STNADR(01) NODETYPE(*NETNODE)
ENDPGM
```

Changing the Network Attributes (Los Angeles): The Change Network Attributes (CHGNETA) command is used to set the attributes for the system within the network. The following attributes are defined for NEWYORK:

LCLNETID(APPN)
Specifies that the name of the local network is APPN. The remote location (CHICAGO in the example) must specify this name as the remote network identifier (RMTNETID) on the CRTCTLAPPC command.

LCLCPNAME(LOSANGEL)
Specifies that the name assigned to the local control point is LOSANGEL. The remote system specifies this name as the remote control point name (RMTCPNAME) on the CRTCTLAPPC command.

LCLLOCNAME(LOSANGEL)
The default local location name of this location is LOSANGEL. This name will be used for the device description that is created by the APPN support.

NODETYPE(*ENDNODE)
Specifies that the local system (LOSANGEL) is an end node in the APPN network.

NETSERVER((APPN CHICAGO))
Specifies the name of the network node (CHICAGO) and the name of the network (APPN) that serves this end node. These names are defined at the remote system on the CHGNETA command.

Creating the Remote Location Configuration List (Los Angeles): The Create Configuration List (CRTCFGL) command is also used to define the remote locations with special characteristics to the APPN support. In this example, location security is being used and the following is defined at LOSANGEL:

TYPE(*APPNRMT)
Specifies that the entries being defined are remote locations.

APPNRMTE((NEWYORK APPN LOSANGEL NEWYORK APPN 3BD29F *YES *NO *NO *NO 'RMT LOC of LOSANGEL'))
Specifies the remote location with which the local location can be paired. The remote location name is NEWYORK; the remote network ID is APPN; the associated local location name is LOSANGEL; the remote control-point name is NEWYORK; the remote control point network ID is also APPN; the password is 3BD29F; it is a secure location; and it is not a single session location (the last two entries, locally controlled sessions and pre-established sessions, are *NO because this is not a single session location).

Creating the Line Description (Los Angeles): The line used in this example is an SDLC nonswitched line. The command used to create the line is CRTLINSDLC. The parameters specified are:

LIND(CHICAGO)
The name assigned to the line description is CHICAGO.

RSRCNAME(LIN041)
Specifies that the physical communications port named LIN041 is being defined.

Creating the Controller Description (Los Angeles): Because this is an APPN environment (AS/400 system to AS/400 system), the controller is an APPC controller and the CRTCTLAPPC command is used to define the attributes of the controller. The following attributes are defined by the example command:

CTLD(CHICAGO)
The name assigned to the controller description is CHICAGO.

LINKTYPE(*SDLC)
Because this controller is attached through an SDLC communications line, the value specified is *SDLC. This value must correspond to the type of line being used as defined by a create line description command.

LINE(CHICAGO)
Specifies the name (CHICAGO) of the line description to which this controller is attached. This value must match a name specified by the LIND parameter in a line description.

RMTNETID(APPN)
The name of the network in which the remote control point resides is APPN.

RMTCPNAME(CHICAGO)
Specifies that the remote control-point name is CHICAGO. The name specified here must match the name specified at the remote system for the local control-point name. In the example, the name is specified at the remote system (CHICAGO) by the LCLCPNAME parameter on the CHGNETA command.

STNADR(01)
The address assigned to the remote controller is hex 01.

NODETYPE(*NETNODE)
Specifies that the remote system (CHICAGO) is an APPN networking node.

Configuring System C (Chicago)

The following CL commands are used to define the configuration for the system identified as CHICAGO (system C in Figure C-3 on page C-13). The example shows the commands as used within a CL program; the configuration can also be performed using the configuration menus.

```
/*********************************************************************/
/*                                                                   */
/*  MODULE:  CHNYCHLA                    LIBRARY:  PUBSCFGS          */
/*                                                                   */
/*  LANGUAGE:  CL                                                    */
/*                                                                   */
/*  FUNCTION:  CONFIGURES APPN NETWORK:                              */
/*                                                                   */
/*                                                                   */
/*            NEWYORK  /______\ CHICAGO  /______\ LOSANGEL           */
/*                     \      /          \      /                    */
/*                                                                   */
/*             (THIS IS CHICAGO TO NEWYORK AND LOSANGEL)             */
/*                                                                   */
/*                                                                   */
/*                                                                   */
/*********************************************************************/
PGM
            /* Change network attributes for CHICAGO  */
            CHGNETA    LCLNETID(APPN) LCLCPNAME(CHICAGO)
                         LCLLOCNAME(CHICAGO) NODETYPE(*NETNODE)
/*********************************************************************/
/*                           CHICAGO TO NEWYORK                      */
/*********************************************************************/
            /* Create line description for CHICAGO to NEWYORK */
            CRTLINSDLC LIND(NEWYORK) RSRCNAME(LIN012)
            /* Create controller description for CHICAGO to
                                                     NEWYORK */
            CRTCTLAPPC CTLD(NEWYORK) LINKTYPE(*SDLC) LINE(NEWYORK)
                         RMTNETID(APPN) RMTCPNAME(NEWYORK)
                         STNADR(01) NODETYPE(*ENDNODE)
/*********************************************************************/
/*                           CHICAGO TO LOSANGEL                     */
/*********************************************************************/
            /* Create line description for CHICAGO to LOSANGEL */
            CRTLINSDLC LIND(LOSANGEL) RSRCNAME(LIN031)
            /* Create controller description for CHICAGO to
                                                     LOSANGEL */
            CRTCTLAPPC CTLD(LOSANGEL) LINKTYPE(*SDLC) LINE(LOSANGEL)
                         RMTNETID(APPN) RMTCPNAME(LOSANGEL)
                         STNADR(01) NODETYPE(*ENDNODE)
ENDPGM
```

Changing the Network Attributes (Chicago): The Change Network Attributes (CHGNETA) command is used to set the attributes for the system within the network. The following attributes are defined for CHICAGO:

LCLNETID(APPN)
: Specifies that the name of the local network is APPN. The remote locations (NEWYORK and LOSANGEL in the example, systems A and B in Figure C-3 on page C-13) must specify this name as the remote network identifier (RMTNETID).

LCLCPNAME(CHICAGO)
Specifies that the name assigned to the local control point is CHICAGO. The remote system specifies this name as the remote control point name (RMTCPNAME) on the CRTCTLAPPC command.

LCLLOCNAME(CHICAGO)
The name of this location is CHICAGO. This name will be used for the device description that is created by the APPN support.

NODETYPE(*NETNODE)
Specifies that the local system (CHICAGO) is a networking node in the APPN network.

Creating the Line Description (Chicago to New York): The line used in this example is an SDLC nonswitched line. The command used to create the line description is CRTLINSDLC. The parameters specified are:

LIND(NEWYORK)
The name assigned to the line description is NEWYORK.

RSRCNAME(LIN012)
Specifies that the physical communications port named LIN012 is being defined.

Creating the Controller Description (Chicago to New York): Because this is an APPN environment (AS/400 system to AS/400 system), the controller is an APPC controller and the CRTCTLAPPC command is used to define the attributes of the controller. The following attributes are defined by the example command:

CTLD(NEWYORK)
The name assigned to the controller description is NEWYORK.

LINKTYPE(*SDLC)
Because this controller is attached through an SDLC communications line, the value specified is *SDLC. This value must correspond to the type of line being used as defined by a create line description command.

LINE(NEWYORK)
Specifies the name (NEWYORK) of the line description to which this controller is attached. This value must match a name specified by the LIND parameter in a line description.

RMTNETID(APPN)
The name of the network in which the remote control point resides is APPN.

RMTCPNAME(NEWYORK)
Specifies that the remote control-point name (at NEWYORK) is NEWYORK. The name specified here must match the name specified at the remote system for the local control-point name. In the example, the name is specified at the remote system (NEWYORK) by the LCLCPNAME parameter on the CHGNETA command.

STNADR(01)
The address assigned to the remote controller is hex 01.

NODETYPE(*ENDNODE)
Specifies that the remote system (NEWYORK) is an APPN end node.

Creating the Line Description (Chicago to Los Angeles): The line used in this example is an SDLC nonswitched line. The Create Line Description (SDLC) (CRTLINSDLC) is command used to create the line. The parameters specified are:

LIND(LOSANGEL)
The name assigned to the line description is LOSANGEL.

RSRCNAME(LIN031)
Specifies that the physical communications port named LIN031 is being defined.

Creating the Controller Description (Chicago to Los Angeles): Because this is an APPN environment (AS/400 system to AS/400 system), the controller is an APPC controller and the CRTCTLAPPC command is used to define the attributes of the controller. The following attributes are defined by the example command:

CTLD(LOSANGEL)
The name assigned to the controller description is LOSANGEL.

LINKTYPE(*SDLC)
Because this controller is attached through an SDLC communications line, the value specified is *SDLC. This value must correspond to the type of line being used as defined by a create line description command.

LINE(LOSANGEL)
Specifies the name (LOSANGEL) of the line description to which this controller is attached. This value must match a name specified by the LIND parameter in a line description.

RMTNETID(APPN)
The name of the network in which the remote control point resides is APPN.

RMTCPNAME(LOSANGEL)
Specifies that the remote control-point name (at LOSANGEL) is LOSANGEL. The name specified here must match the name specified at the remote system for the local control-point name. In the example, the name is specified at the remote system (LOSANGEL) by the LCLCPNAME parameter of the Change Network Attributes (CHGNETA) command.

STNADR(01)
The address assigned to the remote controller is hex 01.

NODETYPE(*ENDNODE)
Specifies that the remote system (LOSANGEL) is an APPN end node.

Two APPN Networks with Different Network IDs Linked Together

This example describes two APPN networks that are linked together by network nodes.

The network with the LCLNETID of NEWNET is a simple connection of one end node to one network node. Network node B could act as a network server providing routing services for node A. Although there are no other nodes in the NEWNET network, there is a need for nodes A and B to communicate with the nodes in network APPN. To accomplish this, network node B is connected to network node NN1 in the APPN network. Node B must have a line description and a controller description created to identify node A, and a line description and a controller description to identify node NN1.

The network with the LCLNETID of APPN is similar to NEWNET, with the exception that NN2 is a network node instead of an end node. In order for NN1 and NN2 to communicate with the nodes in network NEWNET, node NN1 must have two line descriptions and two controller descriptions created to identify both node B and node NN2.

After node B and node NN1 are identified to each other as adjacent nodes, all nodes in either network can communicate through nodes B and NN1.

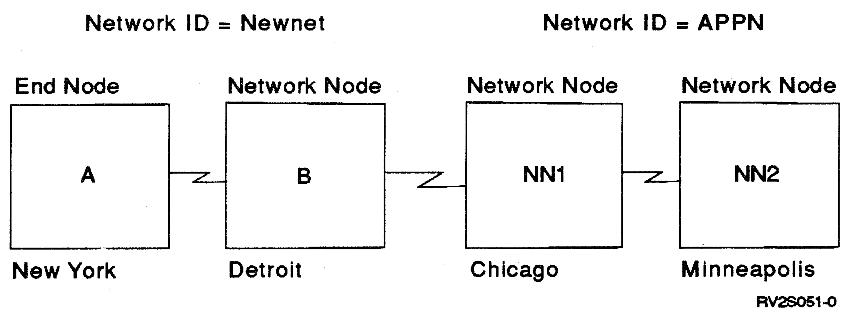


Figure C-4. Two APPN Networks Linked by Network Nodes

Configuring System A (New York)

The following CL commands are used to define the configuration for the system identified as NEWYORK (system A in Figure C-4). The examples show these commands as used within a CL program; the configuration can also be performed using the configuration menus.

```
/*********************************************************************/
/*                                                                   */
/*  MODULE:  NYCINT                     LIBRARY:  PUBSCFGS           */
/*                                                                   */
/*  LANGUAGE:  CL                                                    */
/*                                                                   */
/*  FUNCTION:  CONFIGURES APPN EN-NN AS FOLLOWS:                     */
/*                                                                   */
/*                                                                   */
/*                NEWYORK /______\ DETROIT                           */
/*                        \      /                                   */
/*                                                                   */
/*               (THIS IS NEWYORK TO DETROIT)                        */
/*                                                                   */
/*                                                                   */
/*                                                                   */
/*********************************************************************/
PGM
/*********************************************************************/
/*                         NEWYORK TO DETROIT                        */
/*********************************************************************/
             /* Change network attributes for NEWYORK  */
             CHGNETA    LCLNETID(NEWNET) LCLCPNAME(NEWYORK)
                          LCLLOCNAME(NEWYORK) NODETYPE(*ENDNODE)
                          NETSERVER((NEWNET DETROIT))
             /* Create line description for NEWYORK to DETROIT */
             CRTLINSDLC LIND(DETROIT) RSRCNAME(LIN011)
             /* Create controller description for NEWYORK to
                                                          DETROIT */
             CRTCTLAPPC CTLD(DETROIT) LINKTYPE(*SDLC) LINE(DETROIT)
                          RMTNETID(NEWNET) RMTCPNAME(DETROIT)
                          STNADR(01) NODETYPE(*NETNODE)
ENDPGM
```

Changing the Network Attributes (New York): The Change Network Attributes (CHGNETA) command is used to set the attributes for the system within the network. The following attributes are defined for NEWYORK:

LCLNETID(NEWNET)
Specifies that the name of the local network is NEWNET. The remote location (DETROIT in the example, system B in Figure C-4 on page C-22), must specify this name as the remote network identifier (RMTNETID) on the CRTCTLAPPC command.

LCLCPNAME(NEWYORK)
Specifies that the name assigned to the local control point is NEWYORK. The remote system specifies this name as the remote control-point name (RMTCPNAME) on the CRTCTLAPPC command.

LCLLOCNAME(NEWYORK)
The default local location name of this location is NEWYORK. This name is used for the device description that is created by the APPN support.

NODETYPE(*ENDNODE)
Specifies that the local system (NEWYORK) is an end node in the NEWNET network.

NETSERVER((NEWNET DETROIT))
Specifies the name of the network node (DETROIT) and the name of the network (NEWNET) that serves this end node. These names are defined at the remote system on the CHGNETA command.

Creating the Line Description (New York): The line used in this example is an SDLC nonswitched line. The command used to create the line is CRTLINSDLC. The parameters specified are:

LIND(DETROIT)
The name assigned to the line description is DETROIT.

RSRCNAME(LIN011)
Specifies that the physical communications port named LIN011 is being defined.

Creating the Controller Description (New York): Because this is an APPN environment (AS/400 system to AS/400 system), the controller is an APPC controller and the CRTCTLAPPC command is used to define the attributes of the controller. The following attributes are defined by the example command:

CTLD(DETROIT)
The name assigned to the controller description is DETROIT.

LINKTYPE(*SDLC)
Because this controller is attached through an SDLC communications line, the value specified is *SDLC. This value must correspond to the type of line being used as defined by a create line description command.

LINE(DETROIT)
Specifies the name (DETROIT) of the line description to which this controller is attached. This value must match a name specified by the LIND parameter in a line description.

RMTNETID(NEWNET)
The name of the network in which the remote control point resides is NEWNET.

RMTCPNAME(DETROIT)
Specifies that the remote control-point name is DETROIT. The name specified here must match the name specified at the remote system for the local control-point name. In the example, the name is specified at the remote system (DETROIT) by the LCLCPNAME parameter on the CHGNETA command.

STNADR(01)
The address assigned to the remote controller is hex 01.

NODETYPE(*NETNODE)
Specifies that the remote location (DETROIT) is an APPN networking node.

Configuring System B (DETROIT)

The following CL commands are used to define the configuration for the system identified as DETROIT (system B in Figure C-4 on page C-22). The example shows the commands as used within a CL program; the configuration can also be performed using the configuration menus.

```
/*********************************************************************/
/*                                                                   */
/*  MODULE:  DETRINT                      LIBRARY:  PUBSCFGS         */
/*                                                                   */
/*  LANGUAGE:  CL                                                    */
/*                                                                   */
/*  FUNCTION:  CONFIGURES APPN NETWORK:                              */
/*                                                                   */
/*                                                                   */
/*            NEWYORK  /______\ DETROIT  /______\ CHICAGO            */
/*                     \      /          \      /                    */
/*                                                                   */
/*             (THIS IS DETROIT TO NEWYORK AND CHICAGO)              */
/*                                                                   */
/*                                                                   */
/*                                                                   */
/*********************************************************************/
PGM
            /* Change network attributes for DETROIT */
            CHGNETA    LCLNETID(NEWNET) LCLCPNAME(DETROIT)
                         LCLLOCNAME(DETROIT) NODETYPE(*NETNODE)
/*********************************************************************/
/*                       DETROIT TO NEWYORK                          */
/*********************************************************************/
            /* Create line description for DETROIT to NEWYORK */
            CRTLINSDLC LIND(NEWYORK) RSRCNAME(LIN012)
            /* Create controller description for DETROIT to
                                                         NEWYORK */
            CRTCTLAPPC CTLD(NEWYORK) LINKTYPE(*SDLC) LINE(NEWYORK)
                         RMTNETID(NEWNET) RMTCPNAME(NEWYORK)
                         STNADR(01) NODETYPE(*ENDNODE)
/*********************************************************************/
/*                       DETROIT TO CHICAGO                          */
/*********************************************************************/
            /* Create line description for DETROIT to CHICAGO */
            CRTLINSDLC LIND(CHICAGO) RSRCNAME(LIN031)
            /* Create controller description for DETROIT to
                                                         CHICAGO */
            CRTCTLAPPC CTLD(CHICAGO) LINKTYPE(*SDLC) LINE(CHICAGO)
                         RMTNETID(APPN) RMTCPNAME(CHICAGO)
                         STNADR(01) NODETYPE(*NETNODE)
ENDPGM
```

Changing the Network Attributes (DETROIT): The Change Network Attributes (CHGNETA) command is used to set the attributes for the system within the network. The following attributes are defined for DETROIT:

LCLNETID(NEWNET)
Specifies that the name of the local network is NEWNET. The remote locations (NEWYORK and CHICAGO in the example program, systems A and NN1 in Figure C-4 on page C-22) must specify this name as the remote network identifier (RMTNETID).

LCLCPNAME(DETROIT)
Specifies that the name assigned to the local control point is DETROIT. The remote system specifies this name as the remote control-point name (RMTCPNAME) on the CRTCTLAPPC command.

LCLLOCNAME(DETROIT)
The name of this location is DETROIT. This name is used for the device description that is created by the APPN support.

NODETYPE(*NETNODE)
Specifies that the local system (DETROIT) is a networking node in the NEWNET network.

Creating the Line Description (DETROIT to New York): The line used in this example is an SDLC nonswitched line. The command used to create the line description is CRTLINSDLC. The parameters specified are:

LIND(NEWYORK)
The name assigned to the line description is NEWYORK.

RSRCNAME(LIN012)
Specifies that the physical communications port named LIN012 is being defined.

Creating the Controller Description (DETROIT to New York): Because this is an APPN environment (AS/400 system to AS/400 system), the controller is an APPC controller and the CRTCTLAPPC command is used to define the attributes of the controller. The following attributes are defined by the example command:

CTLD(NEWYORK)
The name assigned to the controller description is NEWYORK.

LINKTYPE(*SDLC)
Because this controller is attached through an SDLC communications line, the value specified is *SDLC. This value must correspond to the type of line being used as defined by a create line description command.

LINE(NEWYORK)
Specifies the name (NEWYORK) of the line description to which this controller is attached. This value must match a name specified by the LIND parameter in a line description.

RMTNETID(NEWNET)
The name of the network in which the remote control point resides is NEWNET.

RMTCPNAME(NEWYORK)
Specifies that the remote control-point name is NEWYORK. The name specified here must match the name specified at the remote system for the local control-point name. In the example, the name is specified at the remote system (NEWYORK) by the LCLCPNAME parameter on the CHGNETA command.

STNADR(01)
The address assigned to the remote controller is hex 01.

NODETYPE(*ENDNODE)
Specifies that the remote system (NEWYORK) is an APPN end node.

Creating the Line Description (DETROIT to CHICAGO): The line used in this example is an SDLC nonswitched line. The Create Line Description (SDLC) (CRTLINSDLC) command is used to create the line. The parameters specified are:

LIND(CHICAGO)
The name assigned to the line description is CHICAGO.

RSRCNAME(LIN031)
Specifies that the physical communications port named LIN031 is being defined.

Creating the Controller Description (DETROIT to CHICAGO): Because this is an APPN environment (AS/400 system to AS/400 system), the controller is an APPC controller and the CRTCTLAPPC command is used to define the attributes of the controller. The following attributes are defined by the example command:

CTLD(CHICAGO)
The name assigned to the controller description is CHICAGO.

LINKTYPE(*SDLC)
Because this controller is attached through an SDLC communications line, the value specified is *SDLC. This value must correspond to the type of line being used as defined by a create line description command.

LINE(CHICAGO)
Specifies the name (CHICAGO) of the line description to which this controller is attached. This value must match a name specified by the LIND parameter in a line description.

RMTNETID(APPN)
The name of the network in which the remote control point resides is APPN.

RMTCPNAME(CHICAGO)
Specifies that the remote control-point name is CHICAGO. The name specified here must match the name specified at the remote system for the local control-point name. In the example, the name is specified at the remote system (CHICAGO) by the LCLCPNAME parameter of the Change Network Attributes (CHGNETA) command.

STNADR(01)
The address assigned to the remote controller is hex 01.

NODETYPE(*NETNODE)
Specifies that the remote system (CHICAGO) is an APPN network node.

Configuring System NN1 (Chicago)

The following CL commands are used to define the configuration for the system identified as CHICAGO (system NN1 in Figure C-4 on page C-22). The examples show these commands as used within a CL program; the configuration can also be performed using the configuration menus.

```
/********************************************************************/
/*                                                                  */
/*  MODULE:  CHICINT                    LIBRARY:  PUBSCFGS          */
/*                                                                  */
/*  LANGUAGE:  CL                                                   */
/*                                                                  */
/*  FUNCTION:  CONFIGURES APPN NETWORK:                             */
/*                                                                  */
/*             THIS IS: CHICAGO TO MPLS                             */
/*                      CHICAGO TO DETROIT                          */
/*                                                                  */
/*                                                                  */
/*                                                                  */
/*                                                                  */
/********************************************************************/
PGM
             /* Change network attributes for CHICAGO */
             CHGNETA    LCLNETID(APPN) LCLCPNAME(CHICAGO) +
                          LCLLOCNAME(CHICAGO) NODETYPE(*NETNODE)
/********************************************************************/
/*                        CHICAGO TO MPLS                           */
/********************************************************************/
             /* Create nonswitched line description for CHICAGO to MPLS  */
             CRTLINSDLC LIND(MPLSL) RSRCNAME(LIN021)
             /* Create controller description for CHICAGO to MPLS */
             CRTCTLAPPC CTLD(MPLSL) LINKTYPE(*SDLC) LINE(MPLSL) +
                          RMTNETID(APPN) RMTCPNAME(MPLS) +
                          STNADR(01) NODETYPE(*NETNODE)
/********************************************************************/
/*                        CHICAGO TO DETROIT                        */
/********************************************************************/
             /* Create nonswitched line description for CHICAGO to       */
                                                          DETROIT */
             CRTLINSDLC LIND(DETROIT) RSRCNAME(LIN021)
             /* Create controller description for CHICAGO to
                                                          DETROIT */
             CRTCTLAPPC CTLD(DETROIT) LINKTYPE(*SDLC) LINE(DETROIT) +
                          RMTNETID(NEWNET) RMTCPNAME(DETROIT) +
                          STNADR(01) NODETYPE(*NETNODE)
ENDPGM
```

Changing the Network Attributes (Chicago): The Change Network Attributes (CHGNETA) command is used to set the attributes for the system within the network. The following attributes are defined for the CHICAGO system.

LCLNETID(APPN)
The name of the local network is APPN. The remote system (MPLS in the example program, NN2 in Figure C-4 on page C-22) must specify this name as the remote network identifier (RMTNETID) on the CRTCTLAPPC command.

LCLCPNAME(CHICAGO)
The name assigned to the local control point is CHICAGO. The remote systems specify this name as the remote control-point name (RMTCPNAME) on the CRTCTLAPPC command.

LCLLOCNAME(CHICAGO)
The default local location name is CHICAGO. This name is used for the device description that is created by the APPN support.

NODETYPE(*NETNODE)
The local system (CHICAGO) is an APPN network node.

Creating the Line Description (Chicago to Minneapolis): The line used in this example is an SDLC nonswitched line. The command used to create the line is CRTLINSDLC. The parameters specified are:

LIND(MPLSL)
The name assigned to the line description is MPLSL.

RSRCNAME(LIN021)
The physical communications port named LIN021 is defined.

Creating the Controller Description (Chicago to Minneapolis): Because this is an APPN environment (AS/400 system to AS/400 system), the controller is an APPC controller, and the CRTCTLAPPC command is used to define the attributes of the controller. The following attributes are defined by the example command:

CTLD(MPLSL)
The name assigned to the controller description is MPLSL.

LINKTYPE(*SDLC)
Because this controller is attached through an SDLC communications line, the value specified is *SDLC. This value must correspond to the type of line defined by a create line description command.

LINE(MPLSL)
The name of the line description to which this controller is attached is MPLSL. This value must match a name specified by the LIND parameter in a line description.

RMTNETID(APPN)
The name of the network in which the remote control point resides is APPN.

RMTCPNAME(MPLS)
The remote control-point name is MPLS. The name specified here must match the name specified at the remote system for the local control-point name. In the example, the name is specified at the remote system (MPLS) by the LCLCPNAME parameter on the Change Network Attributes (CHGNETA) command.

STNADR(01)
The address assigned to the remote controller is hex 01.

NODETYPE(*NETNODE)
The remote system (MPLS) is an APPN network node.

Creating the Line Description (Chicago to Detroit): The line used in this example is an SDLC nonswitched line. The command used to create the line is CRTLINSDLC. The parameters specified are:

LIND(DETROIT)
The name assigned to the line description is DETROIT.

RSRCNAME(LIN021)
The physical communications port named LIN021 is defined.

Creating the Controller Description (Chicago to DETROIT): Because this is an APPN environment (AS/400 system to AS/400 system), the controller is an APPC controller, and the CRTCTLAPPC command is used to define the attributes of the controller. The following attributes are defined by the example command:

CTLD(DETROIT)
The name assigned to the controller description is DETROIT.

LINKTYPE(*SDLC)
Because this controller is attached through an SDLC communications line, the value specified is *SDLC. This value must correspond to the type of line defined by a create line description command.

LINE(DETROIT)
The name of the line description to which this controller is attached is DETROIT. This value must match a name specified by the LIND parameter in a line description.

RMTNETID(NEWNET)
The name of the network in which the remote control point resides is NEWNET.

RMTCPNAME(DETROIT)
The remote control-point name is DETROIT. The name specified here must match the name specified at the remote system for the local control-point name. In the example, the name is specified at the remote system (DETROIT) by the LCLCPNAME parameter on the Change Network Attributes (CHGNETA) command.

STNADR(01)
The address assigned to the remote controller is hex 01.

NODETYPE(*NETNODE)
The remote system (DETROIT) is an APPN network node.

Configuring NN2 (Minneapolis)

The following example program shows the CL commands used to define the configuration for the system identified as MPLS (NN2 in Figure C-4 on page C-22). The example shows these commands used within a CL program; the configuration can also be performed using the configuration menus.

```
/********************************************************************/
/*                                                                  */
/*  MODULE:  MPLSINT                     LIBRARY:  PUBSCFGS         */
/*                                                                  */
/*  LANGUAGE:  CL                                                   */
/*                                                                  */
/*  FUNCTION:  CONFIGURES APPN NETWORK:                             */
/*                                                                  */
/*             THIS IS: MPLS TO CHICAGO    (nonswitched)            */
/*                                                                  */
/*                                                                  */
/********************************************************************/
PGM
            /* Change network attributes for MPLS */
            CHGNETA    LCLNETID(APPN) LCLCPNAME(MPLS) +
                         LCLLOCNAME(MPLS) NODETYPE(*NETNODE)
/********************************************************************/
/*                            MPLS TO CHICAGO                       */
/********************************************************************/
            /* Create line description for MPLS to CHICAGO */
            CRTLINSDLC LIND(CHICAGO) RSRCNAME(LIN022)
            /* Create controller description for MPLS to CHICAGO */
            CRTCTLAPPC CTLD(CHICAGO) LINKTYPE(*SDLC) LINE(CHICAGO) +
                         RMTNETID(APPN) RMTCPNAME(CHICAGO) +
                         STNADR(01) NODETYPE(*NETNODE)
ENDPGM
```

Changing the Network Attributes (Minneapolis): The Change Network Attributes (CHGNETA) command is used to set the attributes for the system within the network. The following attributes are defined for the MPLS system, and these attributes apply to all connections in the network for this network node:

LCLNETID(APPN)
The name of the local network is APPN. The remote systems (CHICAGO in the example program, NN1 in Figure C-4 on page C-22) must specify this name as the remote network identifier (RMTNETID) on the CRTCTLAPPC command.

LCLCPNAME(MPLS)
The name assigned to the local control point is MPLS. The remote system specifies this name as the remote control-point name (RMTCPNAME) on the CRTCTLAPPC command.

LCLLOCNAME(MPLS)
The default local location name is MPLS. This name is used for the device description that is created by the APPN support.

NODETYPE(*NETNODE)
The local system (MPLS) is an APPN network node.

Creating the Line Description (Minneapolis to Chicago): The line used in this example is an SDLC nonswitched line. The command used to create the line is CRTLINSDLC. The parameters specified are:

LIND(CHICAGO)
The name assigned to the line description is CHICAGO.

RSRCNAME(LIN022)
The physical communications port named LIN022 is defined.

Creating the Controller Description (Minneapolis to Chicago): Because this is an APPN environment (AS/400 system to AS/400 system), the controller is an APPC controller, and the CRTCTLAPPC command is used to define the attributes of the controller. The following attributes are defined by the example command:

CTLD(CHICAGO)
The name assigned to the controller description is CHICAGO.

LINKTYPE(*SDLC)
Because this controller is attached through an SDLC communications line, the value specified is *SDLC. This value must correspond to the type of line defined by a create line description command.

LINE(CHICAGO)
The name of the line description to which this controller is attached is CHICAGO. This value must match a name specified by the LIND parameter in a line description.

RMTNETID(APPN)
The name of the network in which the remote control point resides is APPN.

RMTCPNAME(CHICAGO)
The remote control-point name is CHICAGO. The name specified here must match the name specified at the remote system for the local control-point name. In the example, the name is specified at the remote system (CHICAGO) by the LCLCPNAME parameter on the Change Network Attributes (CHGNETA) command.

STNADR(01)
The address assigned to the remote controller is hex 01.

NODETYPE(*NETNODE)
The remote system (CHICAGO) is an APPN network node.

Multiple AS/400 Systems Using APPN

The following sections describe configuration for the network shown in Figure C-5 on page C-33. In this network, seven AS/400 systems are configured to communicate, using the APPN functions, as APPC devices.

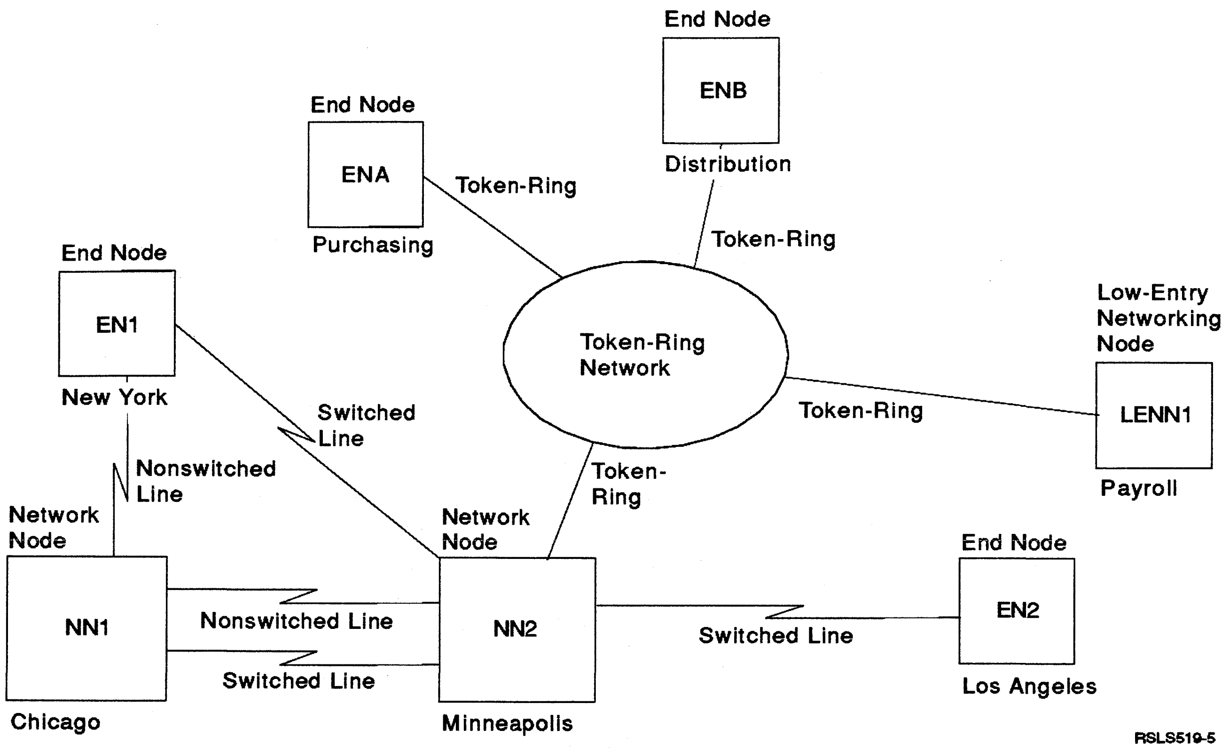


Figure C-5. Multiple-System APPN Network

Configuring End Node 1 (New York)

The following CL commands are used to define the configuration for the system identified as NEWYORK. The example shows the commands used within a CL program; the configuration can also be performed using the configuration menus.

```
/*******************************************************************/
/*                                                                 */
/*  MODULE:  NEWYORK                  LIBRARY:  PUBSCFGS           */
/*                                                                 */
/*  LANGUAGE:  CL                                                  */
/*                                                                 */
/*  FUNCTION:  CONFIGURES APPN NETWORK:                            */
/*                                                                 */
/*             THIS IS: NEWYORK TO CHICAGO (nonswitched)           */
/*                      NEWYORK TO MPLS    (switched)              */
/*                                                                 */
/*                                                                 */
/*                                                                 */
/*******************************************************************/
PGM
/*******************************************************************/
/*                          NEWYORK TO CHICAGO    (nonswitched)    */
/*******************************************************************/
             /* Change network attributes for NEWYORK */
             CHGNETA    LCLNETID(APPN) LCLCPNAME(NEWYORK)
                          LCLLOCNAME(NEWYORK) NODETYPE(*ENDNODE)
                          NETSERVER((APPN CHICAGO) (APPN MPLS))
             /* Create remote configuration list for NEWYORK to
                                                        Los Angeles */
             CRTCFGL    TYPE(*APPNRMT) APPNRMTE((LOSANGEL APPN
                        NEWYORK LOSANGEL APPN 3BD29F *YES *NO *NO *NO
                        'RMT LOC of NEWYORK'))
             /* Create nonswitched line description for NEWYORK to CHICAGO */
             CRTLINSDLC LIND(CHICAGOL) RSRCNAME(LIN011)
             /* Create controller description for NEWYORK to
                                                          CHICAGO */
             CRTCTLAPPC CTLD(CHICAGOL) LINKTYPE(*SDLC) LINE(CHICAGOL)
                          RMTNETID(APPN) RMTCPNAME(CHICAGO)
                          STNADR(01) NODETYPE(*NETNODE)
/*******************************************************************/
/*                          NEWYORK TO MPLS       (switched)       */
/*******************************************************************/
             /* Create switched line description NEWYORK to MPLS */
             CRTLINSDLC LIND(MPLSS) RSRCNAME(LIN012) CNN(*SWTPP)
                          AUTOANS(*NO) STNADR(01) COSTCNN(128)
                          COSTBYTE(128)
             /* Create controller description for NEWYORK to MPLS */
             CRTCTLAPPC CTLD(MPLSS) LINKTYPE(*SDLC) SWITCHED(*YES)
                          SWTLINLST(MPLSS) RMTNETID(APPN)
                          RMTCPNAME(MPLS) INLCNN(*ANS)
                          CNNNBR(6125551234) STNADR(01)
                          CPSSN(*NO)  NODETYPE(*NETNODE)
ENDPGM
```

Changing the Network Attributes (New York): The Change Network Attributes (CHGNETA) command is used to set the attributes for the system within the network. The following attributes are defined for NEWYORK and these attributes apply to all connections in the network for this end node:

LCLNETID(APPN)
Specifies that the name of the local network is APPN. The remote location (MINNEAPOLIS in the example, NN2 in the Figure C-5 on page C-33) must specify this name as the remote network identifier (RMTNETID) on the CRTCTLAPPC command.

LCLCPNAME(NEWYORK)
Specifies that the name assigned to the local control point is NEWYORK. The remote systems specify this name as the remote control point name (RMTCPNAME) on the CRTCTLAPPC command.

LCLLOCNAME(NEWYORK)
The default local location name is NEWYORK. This name will be used for the device description that is created by the APPN support.

NODETYPE(*ENDNODE)
Specifies that the local system (NEWYORK) is an APPN end node.

NETSERVER((APPN CHICAGO)
Specifies that network nodes CHICAGO (NN1) and MPLS (NN2) are both potential network node servers for this end point. Both network node servers are in the same (APPN) network.

Creating the Remote Location Configuration List (New York): The Create Configuration List (CRTCFGL) command is also used to define the remote locations with special characteristics to the APPN support. In this example, location security is being used and the following is defined at NEWYORK:

TYPE(*APPNRMT)
Specifies that the entries being defined are remote locations.

APPNRMTE((LOSANGEL APPN NEWYORK LOSANGEL APPN 3BD29F *YES *NO *NO *NO 'RMT LOC of NEWYORK'))
Specifies the remote location with which the local location can be paired. The remote location name is LOSANGEL; the remote network ID is APPN; the associated local location name is NEWYORK; the remote control-point name is LOSANGEL; the remote control point network ID is also APPN; the password is 3BD29F; it is a secure location; and it is not a single session location (the last two entries, locally controlled sessions and pre-established sessions, are *NO because this is not a single session location).

Creating the Line Description (New York to Chicago): The line used in this example is an SDLC nonswitched line. The command used to create the line is CRTLINSDLC. The parameters specified are:

LIND(CHICAGOL)
The name assigned to the line description is CHICAGOL.

RSRCNAME(LIN011)
Specifies that the physical communications port named LIN011 is being defined.

Creating the Controller Description (New York to Chicago): Because this is an APPN environment (AS/400 system to AS/400 system), the controller is an APPC controller and the CRTCTLAPPC command is used to define the attributes of the controller. The following attributes are defined by the example command:

CTLD(CHICAGOL)
The name assigned to the controller description is CHICAGOL.

LINKTYPE(*SDLC)
Because this controller is attached through an SDLC communications line, the value specified is *SDLC. This value must correspond to the type of line being used as defined by a create line description command.

LINE(CHICAGOL)
Specifies the name (CHICAGOL) of the line description to which this controller is attached. This value must match a name specified by the LIND parameter in a line description.

RMTNETID(APPN)
The name of the network in which the remote control point resides is APPN.

RMTCPNAME(CHICAGO)
Specifies that the remote control-point name is CHICAGO. The name specified here must match the name specified at the remote system for the local control-point name. In the example, the name is specified at the remote system (CHICAGO) by the LCLCPNAME parameter of the Change Network Attributes (CHGNETA) command.

STNADR(01)
The address assigned to the remote controller is hex 01.

NODETYPE(*NETNODE)
Specifies that the remote location (CHICAGO) is an APPN networking node.

Creating the Line Description (New York to Minneapolis): The line used in this example is an SDLC switched line. The command used to create the line is CRTLINSDLC. The parameters specified are:

LIND(MPLSS)
The name assigned to the line description is MPLSS.

RSRCNAME(LIN012)
Specifies that the physical communications port named LIN012 is being defined.

CNN(*SWTPP)
Specifies that this is a switched line connection.

AUTOANS(*NO)
Specifies that this system will not automatically answer an incoming call.

STNADR(01)
The address assigned to the remote controller is hex 01.

COSTCNN(128)
The relative cost of being connected to this line is 128, with 0 being the lowest cost and 255 the highest. This is used for route selection by the class of service.

COSTBYTE(128)
The relative cost of transferring a byte of data across this line is 128, with 0 being the lowest cost and 255 the highest. This is used for route selection by the class of service.

Creating the Controller Description (New York to Minneapolis): Because this is an APPN environment (AS/400 system to AS/400 system), the controller is an APPC controller and the CRTCTLAPPC command is used to define the attributes of the controller. The following attributes are defined by the example command:

CTLD(MPLSS)
The name assigned to the controller description is MPLSS.

LINKTYPE(*SDLC)
Because this controller is attached through an SDLC communications line, the value specified is *SDLC. This value must correspond to the type of line being used as defined by a create line description command.

SWITCHED(*YES)
Specifies that this controller is attached to a switched SDLC line.

SWTLINLST(MPLSS)
Specifies the name (MPLSS) of the line description (for switched lines) that this controller can be attached to. In the example, there is only one line (MPLSS). This value must match a name specified by the LIND parameter in a line description.

RMTNETID(APPN)
The name of the network in which the remote location resides is APPN.

RMTCPNAME(MPLS)
Specifies that the remote control-point name is MPLS. The name specified here must match the name specified at the remote system for the local control-point name. In the example, the name is specified at the remote system (MPLSS) by the LCLCPNAME parameter of the Change Network Attributes (CHGNETA) command.

INLCNN(*ANS)
Specifies that the initial connection is made by the AS/400 system answering an incoming call.

CNNNBR(6125551234)
The connection (telephone) number for the remote controller is 6125551234.

STNADR(01)
The address assigned to the remote controller is hex 01.

CPSSN(*NO)
Control point sessions are not supported with this node.

NODETYPE(*NETNODE)
Specifies that the remote location (MPLS) is an APPN networking node.

Configuring Network Node 1 (Chicago)

The following CL commands are used to define the configuration for the system named as CHICAGO (NN1). The example shows the commands as used within a CL program; the configuration can also be done using the configuration menus.

```
/********************************************************************/
/*                                                                  */
/*  MODULE:  CHICAGO                     LIBRARY:  PUBSCFGS         */
/*                                                                  */
/*  LANGUAGE:  CL                                                   */
/*                                                                  */
/*  FUNCTION:  CONFIGURES APPN NETWORK:                             */
/*                                                                  */
/*             THIS IS: CHICAGO TO NEWYORK (nonswitched)            */
/*                      CHICAGO TO MPLS    (nonswitched)            */
/*                      CHICAGO TO MPLS    (switched)               */
/*                                                                  */
/*                                                                  */
/*                                                                  */
/*                                                                  */
/********************************************************************/
PGM
            /* Change network attributes for CHICAGO */
            CHGNETA    LCLNETID(APPN) LCLCPNAME(CHICAGO)
                         LCLLOCNAME(CHICAGO) NODETYPE(*NETNODE)
/********************************************************************/
/*                           CHICAGO TO NEWYORK                     */
/********************************************************************/
            /* Create line description for CHICAGO to NEWYORK */
            CRTLINSDLC LIND(NEWYORK) RSRCNAME(LIN012)
            /* Create controller description for CHICAGO to
                                                         NEWYORK */
            CRTCTLAPPC CTLD(NEWYORK) LINKTYPE(*SDLC) LINE(NEWYORK)
                         RMTNETID(APPN) RMTCPNAME(NEWYORK)
                         STNADR(01) NODETYPE(*ENDNODE)
/********************************************************************/
/*                           CHICAGO TO MPLS (nonswitched)          */
/********************************************************************/
            /* Create nonswitched line description for CHICAGO to MPLS  */
            CRTLINSDLC LIND(MPLSL) RSRCNAME(LIN021)
            /* Create controller description for CHICAGO to MPLS */
            CRTCTLAPPC CTLD(MPLSL) LINKTYPE(*SDLC) LINE(MPLSL)
                         RMTNETID(APPN) RMTCPNAME(MPLS)
                         STNADR(01) NODETYPE(*NETNODE)
/********************************************************************/
/*                           CHICAGO TO MPLS (switched)             */
/********************************************************************/
            /* Create switched line description for CHICAGO to MPLS  */
            CRTLINSDLC LIND(MPLSS) RSRCNAME(LIN022) CNN(*SWTPP)
                         STNADR(01) AUTOANS(*NO) COSTCNN(128)
                         COSTBYTE(128)
            /* Create controller description for CHICAGO to MPLS */
            CRTCTLAPPC CTLD(MPLSS) LINKTYPE(*SDLC) SWITCHED(*YES)
                         SWTLINLST(MPLSS) RMTNETID(APPN)
                         RMTCPNAME(MPLS) INLCNN(*DIAL)
                         CNNNBR(6125551111) STNADR(01)
                         TMSGRPNBR(3) NODETYPE(*NETNODE)
ENDPGM
```

Changing the Network Attributes (Chicago): The Change Network Attributes (CHGNETA) command is used to set the attributes for the system within the network. The following attributes are defined for CHICAGO and these attributes apply to all connections in the network for this network node.

LCLNETID(APPN)
Specifies that the name of the local network is APPN. The remote location (MPLS in the example, NN2 in the figure, and NEWYORK, EN1 in the figure) must specify this name as the remote network identifier (RMTNETID) on the CRTCTLAPPC command.

LCLCPNAME(CHICAGO)
Specifies that the name assigned to the local control point is CHICAGO. The remote systems specify this name as the remote control point name (RMTCPNAME) on the CRTCTLAPPC command.

LCLLOCNAME(CHICAGO)
The default local location name is CHICAGO. This name will be used for the device description that is created by the APPN support.

NODETYPE(*NETNODE)
Specifies that the local system (CHICAGO) is an APPN network node.

Creating the Line Description (Chicago to New York): The line used in this example is an SDLC nonswitched line. The command used to create the line is CRTLINSDLC. The parameters specified are:

LIND(NEWYORK)
The name assigned to the line description is NEWYORK.

RSRCNAME(LIN012)
Specifies that the physical communications port named LIN012 is being defined.

Creating the Controller Description (Chicago to New York): Because this is an APPN environment (AS/400 system to AS/400 system), the controller is an APPC controller and the CRTCTLAPPC command is used to define the attributes of the controller. The following attributes are defined by the example command:

CTLD(NEWYORK)
The name assigned to the controller description is NEWYORK.

LINKTYPE(*SDLC)
Because this controller is attached through an SDLC communications line, the value specified is *SDLC. This value must correspond to the type of line being used as defined by a create line description command.

LINE(NEWYORK)
Specifies the name (NEWYORK) of the line description to which this controller is attached. This value must match a name specified by the LIND parameter in a line description.

RMTNETID(APPN)
The name of the network in which the remote control point resides is APPN.

RMTCPNAME(NEWYORK)
Specifies that the remote control-point name is NEWYORK. The name specified here must match the name specified at the remote system for the local control-point name. In the example, the name is specified at the remote

system (NEWYORK) by the LCLCPNAME parameter of the Change Network Attributes (CHGNETA) command.

STNADR(01)
The address assigned to the remote controller is hex 01.

NODETYPE(*ENDNODE)
Specifies that the remote location (NEWYORK) is an APPN end node.

Creating the Line Description (Chicago to Minneapolis, Nonswitched): The line used in this example is an SDLC nonswitched line. The command used to create the line is CRTLINSDLC. The parameters specified are:

LIND(MPLSL)
The name assigned to the line description is MPLSL.

RSRCNAME(LIN021)
Specifies that the physical communications port named LIN021 is being defined.

Creating the Controller Description (Chicago to Minneapolis, Nonswitched): Because this is an APPN environment (AS/400 system to AS/400 system), the controller is an APPC controller and the CRTCTLAPPC command is used to define the attributes of the controller. The following attributes are defined by the example command:

CTLD(MPLSL)
The name assigned to the controller description is MPLSL.

LINKTYPE(*SDLC)
Because this controller is attached through an SDLC communications line, the value specified is *SDLC. This value must correspond to the type of line being used as defined by a create line description command.

LINE(MPLSL)
Specifies the name (MPLSL) of the line description to which this controller is attached. This value must match a name specified by the LIND parameter in a line description.

RMTNETID(APPN)
The name of the network in which the remote control point resides is APPN.

RMTCPNAME(MPLS)
Specifies that the remote control-point name is MPLS. The name specified here must match the name specified at the remote system for the local control-point name. In the example, the name is specified at the remote system (NEWYORK) by the LCLCPNAME parameter on the Change Network Attributes (CHGNETA) command.

STNADR(01)
The address assigned to the remote controller is hex 01.

NODETYPE(*NETNODE)
Specifies that the remote location (MPLS) is an APPN networking node.

Creating the Line Description (Chicago to Minneapolis, Switched): The line used in this example is an SDLC switched line. The command used to create the line is CRTLINSDLC. The parameters specified are:

LIND(MPLSS)
The name assigned to the line description is MPLSS.

RSRCNAME(LIN022)
Specifies that the physical communications port named LIN022 is being defined.

CNN(*SWTPP)
Specifies that this is a switched line connection.

STNADR(01)
The address assigned to the local system is hex 01.

AUTOANS(*NO)
Specifies that this system will not automatically answer an incoming call.

COSTCNN(128)
The relative cost of being connected to this line is 128, with 0 being the lowest cost and 255 the highest. This is used for route selection by the class of service.

COSTBYTE(128)
The relative cost of transferring a byte of data across this line is 128, with 0 being the lowest cost and 255 the highest. This is used for route selection by the class of service.

Creating the Controller Description (Chicago to Minneapolis, Switched): Because this is an APPN environment (AS/400 system to AS/400 system), the controller is an APPC controller and the CRTCTLAPPC command is used to define the attributes of the controller. The following attributes are defined by the example command:

CTLD(MPLSS)
The name assigned to the controller description is MPLSS.

LINKTYPE(*SDLC)
Because this controller is attached through an SDLC communications line, the value specified is *SDLC. This value must correspond to the type of line being used as defined by a create line description command.

SWITCHED(*YES)
Specifies that this controller is attached to a switched SDLC line.

SWTLINLST(MPLSS)
Specifies the name (MPLSS) of the line description (for switched lines) that this controller can be attached to. In the example, there is only one line (MPLSS). This value must match a name specified by the LIND parameter in a line description.

RMTNETID(APPN)
The name of the network in which the remote control point resides is APPN.

RMTCPNAME(MPLS)
Specifies that the remote control-point name is MPLS. The name specified here must match the name specified at the remote system for the local control-point name. In the example, the name is specified at the remote system by the LCLCPNAME parameter on the CHGNETA (Change Network Attributes) command.

INLCNN(*DIAL)
Specifies that the initial connection is made by the AS/400 system either answering an incoming call or placing a call.

CNNNBR(6125551111)
The connection (telephone) number for the remote controller is 6125551111.

STNADR(01)
The address assigned to the remote controller is hex 01.

TMSGRPNBR(3)
Specifies the value (3) is to be used by the APPN support for transmission group negotiation with the remote system.

The remote system must specify the same value for the transmission group.

NODETYPE(*NETNODE)
Specifies that the remote location (MPLS) is an APPN networking node.

Configuring Network Node 2 (Minneapolis)

The following CL commands are used to define the configuration for the system identified as MPLS (NN2 in Figure C-5 on page C-33). The example shows these commands as used within a CL program; the configuration can also be performed using the configuration menus.

```
/*********************************************************************/
/*                                                                   */
/*  MODULE:  MPLS                       LIBRARY:  PUBSCFGS           */
/*                                                                   */
/*  LANGUAGE:  CL                                                    */
/*                                                                   */
/*  FUNCTION:  CONFIGURES APPN NETWORK:                              */
/*                                                                   */
/*             THIS IS: MPLS TO NEWYORK    (switched)                */
/*                      MPLS TO CHICAGO    (nonswitched)             */
/*                      MPLS TO CHICAGO    (switched)                */
/*                      MPLS TO LOSANGEL   (switched)                */
/*                      MPLS TO PURCH      (LAN)                     */
/*                      MPLS TO DISTRIB    (LAN)                     */
/*                      MPLS TO PAYROLL    (LAN)                     */
/*                                                                   */
/*                                                                   */
/*********************************************************************/
PGM
             /* Change network attributes for MPLS */
             CHGNETA    LCLNETID(APPN) LCLCPNAME(MPLS)
                          LCLLOCNAME(MPLS) NODETYPE(*NETNODE)
/*********************************************************************/
/*                         MPLS TO NEWYORK (switched)                */
/*********************************************************************/
             /* Create switched line description for MPLS to NEWYORK */
             CRTLINSDLC LIND(NEWYORK) RSRCNAME(LIN021) CNN(*SWTPP)
                          AUTOANS(*NO) STNADR(01) COSTCNN(128)
                          COSTBYTE(128)
             /* Create controller description for MPLS to NEWYORK */
             CRTCTLAPPC CTLD(NEWYORK) LINKTYPE(*SDLC) SWITCHED(*YES)
                          SWTLINLST(NEWYORK) RMTNETID(APPN)
                          RMTCPNAME(NEWYORK) INLCNN(*DIAL)
                          CNNNBR(2125551234) STNADR(01)
                          NODETYPE(*ENDNODE) CPSSN(*NO)
/*********************************************************************/
/*                         MPLS TO CHICAGO (nonswitched)             */
/*********************************************************************/
             /* Create line description for MPLS to CHICAGO */
             CRTLINSDLC LIND(CHICAGOL) RSRCNAME(LIN022)
             /* Create controller description for MPLS to CHICAGO */
             CRTCTLAPPC CTLD(CHICAGOL) LINKTYPE(*SDLC) LINE(CHICAGOL)
                          RMTNETID(APPN) RMTCPNAME(CHICAGO)
                          STNADR(01) NODETYPE(*NETNODE)
/*********************************************************************/
/*                         MPLS TO CHICAGO (switched)                */
/*********************************************************************/
             /* Create switched line description for MPLS to CHICAGO  */
             CRTLINSDLC LIND(CHICAGOS) RSRCNAME(LIN031) CNN(*SWTPP)
                          AUTOANS(*NO) STNADR(01) COSTCNN(128)
                          COSTBYTE(128)
             /* Create controller description for MPLS TO CHICAGO */
             CRTCTLAPPC CTLD(CHICAGOS) LINKTYPE(*SDLC) SWITCHED(*YES)
                          SWTLINLST(CHICAGOS) RMTNETID(APPN)
                          RMTCPNAME(CHICAGO) INLCNN(*ANS)
                          CNNNBR(3125551111) STNADR(01) TMSGRPNBR(3)
                          NODETYPE(*NETNODE)
```

```
/*********************************************************************/
/*                      MPLS TO LOSANGEL (switched)                 */
/*********************************************************************/
             /* Create switched line description for MPLS TO LOSANGEL*/
             CRTLINSDLC LIND(LOSANGEL) RSRCNAME(LIN032) CNN(*SWTPP)
                          AUTOANS(*NO) STNADR(01) COSTCNN(128)
                          COSTBYTE(128)
             /* Create controller description for MPLS TO LOSANGEL */
             CRTCTLAPPC CTLD(LOSANGEL) LINKTYPE(*SDLC) SWITCHED(*YES)
                          SWTLINLST(LOSANGEL) RMTNETID(APPN)
                          RMTCPNAME(LOSANGEL) INLCNN(*DIAL)
                          CNNNBR(2135553333) STNADR(01)  CPSSN(*NO)
/*********************************************************************/
/*                      MPLS TO LAN  (LAN)                          */
/*********************************************************************/
             /* Create LAN line description for MPLS to LAN     */
             CRTLINTRN LIND(MPLSTRN) RSRCNAME(LIN011)
                          ADPTADR(400000000002)
             /* Create controller description for MPLS to PURCH */
             CRTCTLAPPC CTLD(PURCH) LINKTYPE(*LAN) SWITCHED(*YES)
                          SWTLINLST(MPLSTRN) RMTNETID(APPN)
                          RMTCPNAME(PURCH) ADPTADR(400000000003)
                          MINSWTSTS(*VRYON) SWTDSC(*NO)
             /* Create controller description for MPLS to DISTRIB */
             CRTCTLAPPC CTLD(DISTRIB) LINKTYPE(*LAN) SWITCHED(*YES)
                          SWTLINLST(MPLSTRN) RMTNETID(APPN)
                          RMTCPNAME(DISTRIB) ADPTADR(400000000004)
                          MINSWTSTS(*VRYON) SWTDSC(*NO)
             /* Create controller description for MPLS to DISTRIB */
             CRTCTLAPPC CTLD(PAYROLL) LINKTYPE(*LAN) SWITCHED(*YES)
                          SWTLINLST(MPLSTRN) ADPTADR(400000000005)
                          RMTNETID(*NONE) RMTCPNAME(PAYROLL)
                          NODETYPE(*LENNODE)
ENDPGM
```

Changing the Network Attributes (Minneapolis): The Change Network Attributes (CHGNETA) command is used to set the attributes for the system within the network. The following attributes are defined for MPLS and these attributes apply to all connections in the network for this network node:

LCLNETID(APPN)
Specifies that the name of the local network is APPN. The remote locations (CHICAGO in the example, NN1 in the figure, LOSANGEL in the example, EN1 in figure, NEWYORK, EN1 in the figure) and all systems (PURCH, DISTRIB, PAYROLL) on the token-ring local area network, must specify this name as the remote network identifier (RMTNETID) on the CRTCTLAPPC command.

LCLCPNAME(MPLS)
Specifies that the name assigned to the local control point is MPLS. The remote systems specify this name as the remote control point name (RMTCPNAME) on the CRTCTLAPPC command.

LCLLOCNAME(MPLS)
The default local location name is MPLS. This name will be used for the device description that is created by the APPN support.

NODETYPE(*NETNODE)
Specifies that the local system (MPLS) is an APPN network node.

Creating the Line Description (Minneapolis to New York, Switched): The line used in this example is an SDLC switched line. The command used to create the line is CRTLINSDLC. The parameters specified are:

LIND(NEWYORK)
The name assigned to the line description is NEWYORK.

RSRCNAME(LIN021)
Specifies that the physical communications port named LIN021 is being defined.

CNN(*SWTPP)
Specifies that this is a switched line connection.

AUTOANS(*NO)
Specifies that this system will not automatically answer an incoming call.

STNADR(01)
The address assigned to the local system is hex 01.

COSTCNN(128)
The relative cost of being connected to this line is 128; with 0 being the lowest cost and 255 the highest. This is used for route selection by the class of service.

COSTBYTE(128)
The relative cost of transferring a byte of data across this line is 128; with 0 being the lowest cost and 255 the highest. This is used for route selection by the class of service.

Creating the Controller Description (Minneapolis to New York, Switched): Because this is an APPN environment (AS/400 system to AS/400 system), the controller is an APPC controller and the CRTCTLAPPC command is used to define the attributes of the controller. The following attributes are defined by the example command:

CTLD(NEWYORK)
The name assigned to the controller description is NEWYORK.

LINKTYPE(*SDLC)
Because this controller is attached through an SDLC communications line, the value specified is *SDLC. This value must correspond to the type of line being used as defined by a create line description command.

SWITCHED(*YES)
Specifies that this controller is attached to a switched SDLC line.

SWTLINLST(NEWYORK)
Specifies the name (NEWYORK) of the line descriptions (for switched lines) that this controller can be attached to. In the example, there is only one line (NEWYORK). This value must match a name specified by the LIND parameter in a line description.

RMTNETID(APPN)
The name of the network in which the remote control point resides is APPN.

RMTCPNAME(NEWYORK)
Specifies that the remote control-point name is NEWYORK. The name specified here must match the name specified at the remote system for the local control-point name. In the example, the name is specified at the remote

system (NEWYORK) by the LCLCPNAME parameter on the Change Network Attributes (CHGNETA) command.

INLCNN(*DIAL)
Specifies that the initial connection is made by the AS/400 system either answering an incoming call or placing a call.

CNNNBR(2125551234)
The connection (telephone) number for the remote controller is 2125551234.

STNADR(01)
The address assigned to the remote controller is hex 01.

Creating the Line Description (Minneapolis to Chicago, Nonswitched): The line used in this example is an SDLC nonswitched line. The command used to create the line is CRTLINSDLC. The parameters specified are:

LIND(CHICAGOL)
The name assigned to the line description is CHICAGOL.

RSRCNAME(LIN022)
Specifies that the physical communications port named LIN022 is being defined.

Creating the Controller Description (Minneapolis to Chicago, Nonswitched): Because this is an APPN environment (AS/400 system to AS/400 system), the controller is an APPC controller and the CRTCTLAPPC command is used to define the attributes of the controller. The following attributes are defined by the example command:

CTLD(CHICAGOL)
The name assigned to the controller description is CHICAGOL.

LINKTYPE(*SDLC)
Because this controller is attached through an SDLC communications line, the value specified is *SDLC. This value must correspond to the type of line being used as defined by a create line description command.

LINE(CHICAGOL)
Specifies the name (CHICAGOL) of the line description to which this controller is attached. This value must match a name specified by the LIND parameter in a line description.

RMTNETID(APPN)
The name of the network in which the remote control point resides is APPN.

RMTCPNAME(CHICAGO)
Specifies that the remote control-point name is CHICAGO. The name specified here must match the name specified at the remote system for the local control-point name. In the example, the name is specified at the remote system (CHICAGO) by the LCLCPNAME parameter on the Change Network Attributes (CHGNETA) command.

STNADR(01)
The address assigned to the remote controller is hex 01.

NODETYPE(*NETNODE)
Specifies that the remote location (CHICAGO) is an APPN networking node.

Creating the Line Description (Minneapolis to Chicago, Switched): The line used in this example is an SDLC switched line. The command used to create the line is CRTLINSDLC. The parameters specified are:

LIND(CHICAGOS)
The name assigned to the line description is CHICAGOS.

RSRCNAME(LIN031)
Specifies that the physical communications port named LIN031 is being defined.

CNN(*SWTPP)
Specifies that this is a switched line connection.

AUTOANS(*NO)
Specifies that this system will not automatically answer an incoming call.

STNADR(01)
The address assigned to the local system is hex 01.

COSTCNN(128)
The relative cost of being connected to this line is 128; with 0 being the lowest cost and 255 the highest. This is used for route selection by the class of service.

COSTBYTE(128)
The relative cost of transferring a byte of data across this line is 128; with 0 being the lowest cost and 255 the highest. This is used for route selection by the class of service.

Creating the Controller Description (Minneapolis to Chicago, Switched): Because this is an APPN environment (AS/400 system to AS/400 system), the controller is an APPC controller and the CRTCTLAPPC command is used to define the attributes of the controller. The following attributes are defined by the example command:

CTLD(CHICAGOS)
The name assigned to the controller description is CHICAGOS.

LINKTYPE(*SDLC)
Because this controller is attached through an SDLC communications line, the value specified is *SDLC. This value must correspond to the type of line being used as defined by a create line description command.

SWITCHED(*YES)
Specifies that this controller is attached to a switched SDLC line.

SWTLINLST(CHICAGOS)
Specifies the name (CHICAGOS) of the line descriptions (for switched lines) that this controller can be attached to. In the example, there is only one line (CHICAGOS). This value must match a name specified by the LIND parameter in a line description.

RMTNETID(APPN)
The name of the network in which the remote control point resides is APPN.

RMTCPNAME(CHICAGO)
Specifies that the remote control-point name is CHICAGO. The name specified here must match the name specified at the remote system for the local control-point name. In the example, the name is specified at the remote

system (CHICAGO) by the LCLCPNAME parameter on the Change Network Attributes (CHGNETA) command.

INLCNN(*ANS)
Specifies that the initial connection is made by the AS/400 system answering an incoming call.

CNNNBR(3125551111)
The connection (telephone) number for the remote controller is 3125551111.

STNADR(01)
The address assigned to the remote controller is hex 01.

TMSGRPNBR(3)
Specify the value (3) to be used by the APPN support for transmission group negotiation with the remote system.

The remote system must specify the same value for the transmission group.

NODETYPE(*NETNODE)
Specifies that the remote location (CHICAGO) is an APPN networking node.

Creating the Line Description (Minneapolis to Los Angeles, Switched): The line used in this example is an SDLC switched line. The command used to create the line is CRTLINSDLC. The parameters specified are:

LIND(LOSANGEL)
The name assigned to the line description is LOSANGEL.

RSRCNAME(LIN032)
Specifies that the physical communications port named LIN032 is being defined.

CNN(*SWTPP)
Specifies that this is a switched line connection.

AUTOANS(*NO)
Specifies that this system will not automatically answer an incoming call.

STNADR(01)
The address assigned to the local system is hex 01.

COSTCNN(128)
The relative cost of being connected to this line is 128; with 0 being the lowest cost and 255 the highest. This is used for route selection by the class of service.

COSTBYTE(128)
The relative cost of transferring a byte of data across this line is 128; with 0 being the lowest cost and 255 the highest. This is used for route selection by the class of service.

Creating the Controller Description (Minneapolis to Los Angeles, Switched): Because this is an APPN environment (AS/400 system to AS/400 system), the controller is an APPC controller and the CRTCTLAPPC command is used to define the attributes of the controller. The following attributes are defined by the example command:

CTLD(LOSANGEL)
The name assigned to the controller description is LOSANGEL.

LINKTYPE(*SDLC)
Because this controller is attached through an SDLC communications line, the value specified is *SDLC. This value must correspond to the type of line being used as defined by a create line description command.

SWITCHED(*YES)
Specifies that this controller is attached to a switched SDLC line.

SWTLINLST(LOSANGEL)
Specifies the name (LOSANGEL) of the line descriptions (for switched lines) that this controller can be attached to. In the example, there is only one line (LOSANGEL). This value must match a name specified by the LIND parameter in a line description.

RMTNETID(APPN)
The name of the network in which the remote control point resides is APPN.

RMTCPNAME(LOSANGEL)
Specifies that the remote control-point name is LOSANGEL. The name specified here must match the name specified at the remote system for the local control-point name. In the example, the name is specified at the remote system (LOSANGEL) by the LCLCPNAME parameter of the Change Network Attributes (CHGNETA) command.

INLCNN(*DIAL)
Specifies that the initial connection is made by the AS/400 system either answering an incoming call or placing a call.

CNNNBR(2135553333)
The connection (telephone) number for the remote controller is 2135553333.

STNADR(01)
The address assigned to the remote controller is hex 01.

CPSSN(*NO)
Control point sessions are not supported with this node.

Creating the Line Description (Minneapolis to Token-Ring Network): The line used in this example is a token-ring network. The command used to create the line is CRTLINTRN and the parameters specified are:

LIND(MPLSTRN)
The name assigned to the line description is MPLSTRN.

RSRCNAME(LIN011)
Specifies that the physical communications port named LIN011 is being defined.

ADPTADR(400000000002)
Specifies the LAN adapter address for the local system.

Note: For similar examples, showing how to create a token-ring line description using the automatic configuration and connection network support, see "AS/400 System on a Token-Ring Network with Other Systems" on page 7-16 and "AS/400 Network Node with Other Systems" on page 7-17.

Using automatic configuration, it is not necessary to manually create controller descriptions, as described below.

Creating the Controller Description (Minneapolis to Purchasing, Token-Ring Network): Because this is an APPN environment (AS/400 system to AS/400 system), the controller is an APPC controller and the CRTCTLAPPC command is used to define the attributes of the controller. The following attributes are defined by the example command:

CTLD(PURCH)
The name assigned to the controller description is PURCH.

LINKTYPE(*LAN)
Because this controller is attached through a token-ring network communications line, the value specified is *LAN. This value must correspond to the type of line being used as defined by a create line description command.

SWITCHED(*YES)
Always specified as *YES for token-ring network connections.

SWTLINLST(MPLSTRN)
Specifies the name (MPLSTRN) of the line descriptions (in this case, a token-ring local area network line) that this controller can be attached to. In the example, there is only one line (MPLSTRN). This value must match a name specified by the LIND parameter in a line description.

RMTNETID(APPN)
The name of the network in which the remote control point resides is APPN.

RMTCPNAME(PURCH)
Specifies that the remote control-point name is PURCH. The name specified here must match the name specified at the remote system for the local control-point name. In the example, the name is specified at the remote system (PURCH) by the LCLCPNAME parameter of the Change Network Attributes (CHGNETA) command.

ADPTADR(400000000003)
Specifies the LAN adapter address of the remote controller. This must match the value specified at the remote controller (PURCH) in the associated line description.

MINSWTSTS(*VRYON)
Specifies that CP-CP sessions are established over this connection only when the status of the controller is varied on or active. This connection is to be treated as logically nonswitched for purposes of APPN routing.

SWTDSC(*NO)
Specifies that the switched connection is not disconnected when the last session is unbound. This must be specified because MINSWTSTS(*VRYON) is specified.

Creating the Controller Description (Minneapolis to Distribution, Token-Ring Network): Because this is an APPN environment (AS/400 system to AS/400 system), the controller is an APPC controller and the CRTCTLAPPC command is used to define the attributes of the controller. The following attributes are defined by the example command:

CTLD(DISTRIB)
The name assigned to the controller description is DISTRIB.

LINKTYPE(*LAN)
Because this controller is attached through a token-ring network communications line, the value specified is *LAN. This value must correspond to the type of line being used as defined by a create line description command.

SWITCHED(*YES)
Always specified as *YES for token-ring network connections.

SWTLINLST(MPLSTRN)
Specifies the name (MPLSTRN) of the line descriptions (in this case, a token-ring network line) that this controller can be attached to. In the example, there is only one line (MPLSTRN). This value must match a name specified by the LIND parameter in a line description.

RMTNETID(APPN)
The name of the network in which the remote control point resides is APPN.

RMTCPNAME(DISTRIB)
Specifies that the remote control-point name is DISTRIB. The name specified here must match the name specified at the remote system for the local control-point name. In the example, the name is specified at the remote system (DISTRIB) by the LCLCPNAME parameter on the Change Network Attributes (CHGNETA) command.

ADPTADR(400000000004)
Specifies the LAN adapter address of the remote controller. This must match the value specified at the remote controller (DISTRIB) in the associated line description.

MINSWTSTS(*VRYON)
Specifies that CP-CP sessions are established over this connection only when the status of the controller is varied on or active. This connection is to be treated as logically nonswitched for purposes of APPN routing.

SWTDSC(*NO)
Specifies that the switched connection is not disconnected when the last session is unbound. This must be specified because MINSWTSTS(*VRYON) is specified.

Creating the Controller Description (Minneapolis to Payroll, Token-Ring Network): Because this is an APPN environment (AS/400 system to AS/400 system), the controller is an APPC controller and the CRTCTLAPPC command is used to define the attributes of the controller. The following attributes are defined by the example command:

CTLD(PAYROLL)
The name assigned to the controller description is PAYROLL.

LINKTYPE(*LAN)
Because this controller is attached through a token-ring network communications line, the value specified is *LAN. This value must correspond to the type of line being used as defined by a create line description command.

SWITCHED(*YES)
Always specified as *YES for token-ring network connections.

SWTLINLST(MPLSTRN)
Specifies the name (MPLSTRN) of the line descriptions (in this case, a token-ring local area network line) that this controller can be attached to. In the

example, there is only one line (MPLSTRN). This value must match a name specified by the LIND parameter in a line description.

ADPTADR(400000000005)
Specifies the LAN adapter address of the remote controller. This must match the value specified at the remote controller (PAYROLL) in the associated line description.

RMTNETID(*NONE)
The PAYROLL controller is a low entry networking node and does not use a network ID.

RMTCPNAME(PAYROLL)
Specifies that the remote control-point name is PAYROLL. The name specified here must match the name specified at the remote system for the local control-point name. In the example, the name is specified at the remote system (PAYROLL) by the LCLCPNAME parameter on the Change Network Attributes (CHGNETA) command.

NODETYPE(*LENNODE)
Specifies that the remote location (PAYROLL) is a low-entry networking node in an APPN network.

Configuring End Node 2 (Los Angeles)

The following CL commands are used to define the configuration for the system identified as LOSANGEL (EN2 in the figure). The example shows these commands as used within a CL program; the configuration can also be performed using the configuration menus.

```
/*********************************************************************/
/*                                                                   */
/*  MODULE:  LOSANGEL                    LIBRARY:  PUBSCFGS          */
/*                                                                   */
/*  LANGUAGE:  CL                                                    */
/*                                                                   */
/*  FUNCTION:  CONFIGURES APPN NETWORK:                              */
/*                                                                   */
/*             THIS IS: LOSANGEL TO MPLS   (switched)                */
/*                                                                   */
/*                                                                   */
/*                                                                   */
/*                                                                   */
/*********************************************************************/
PGM
            /* Change network attributes for LOSANGEL */
            CHGNETA    LCLNETID(APPN) LCLCPNAME(LOSANGEL)
                         LCLLOCNAME(LOSANGEL) NODETYPE(*ENDNODE)
/*********************************************************************/
/*                         LOSANGEL TO MPLS (switched)               */
/*********************************************************************/
            /* Create switched line description for LOSANGEL TO MPLS */
            CRTLINSDLC LIND(MPLS) RSRCNAME(LIN041) CNN(*SWTPP)
                         AUTOANS(*NO) STNADR(01) COSTCNN(128)
                         COSTBYTE(128)
            /* Create controller description for LOSANGEL TO MPLS */
            CRTCTLAPPC CTLD(MPLS) LINKTYPE(*SDLC) SWITCHED(*YES)
                         SWTLINLST(MPLS) RMTNETID(APPN)
                         RMTCPNAME(MPLS) INLCNN(*DIAL)
                         CNNNBR(6125553333) STNADR(01) CPSSN(*NO)
                         NODETYPE(*NETNODE)
ENDPGM
```

Changing the Network Attributes (Los Angeles): The Change Network Attributes (CHGNETA) command is used to set the attributes for the system within the network. The following attributes are defined for LOSANGEL and these attributes apply to all connections in the network for this end node:

LCLNETID(APPN)
Specifies that the name of the local network is APPN. The remote locations (MPLS in the example, NN2 in the figure) must specify this name as the remote network identifier (RMTNETID) on the CRTCTLAPPC command.

LCLCPNAME(LOSANGEL)
Specifies that the name assigned to the local control point is LOSANGEL. The remote systems specify this name as the remote control point name (RMTCPNAME) on the CRTCTLAPPC command.

LCLLOCNAME(LOSANGEL)
The default local location name is LOSANGEL. This name will be used for the device description that is created by the APPN support.

NODETYPE(*ENDNODE)
Specifies that the local system (LOSANGEL) is an APPN end node.

Creating the Line Description (Los Angeles to Minneapolis): The line used in this example is an SDLC switched line. The command used to create the line is CRTLINSDLC. The parameters specified are:

LIND(MPLS)
The name assigned to the line description is MPLS.

RSRCNAME(LIN041)
Specifies that the physical communications port named LIN041 is being defined.

CNN(*SWTPP)
Specifies that this is a switched line connection.

AUTOANS(*NO)
Specifies that this system will not automatically answer an incoming call.

STNADR(01)
The address assigned to the local system is hex 01.

COSTCNN(128)
The relative cost of being connected to this line is 128, with 0 being the lowest cost and 255 the highest. This is used for route selection by the class of service.

COSTBYTE(128)
The relative cost of transferring a byte of data across this line is 128, with 0 being the lowest cost and 255 the highest. This is used for route selection by the class of service.

Creating the Controller Description (Los Angeles to Minneapolis): Because this is an APPN environment (AS/400 system to AS/400 system), the controller is an APPC controller and the CRTCTLAPPC command is used to define the attributes of the controller. The following attributes are defined by the example command:

CTLD(MPLS)
The name assigned to the controller description is MPLS.

LINKTYPE(*SDLC)
Because this controller is attached through an SDLC communications line, the value specified is *SDLC. This value must correspond to the type of line being used as defined by a create line description command.

SWITCHED(*YES)
Specifies that this controller is attached to a switched SDLC line.

SWTLINLST(MPLS)
Specifies the name (MPLS) of the line description (for switched lines) that this controller can be attached to. In the example, there is only one line (MPLS). This value must match a name specified by the LIND parameter in a line description.

RMTNETID(APPN)
The name of the network in which the remote control point resides is APPN.

RMTCPNAME(MPLS)
Specifies that the remote control-point name is MPLS. The name specified here must match the name specified at the remote system for the local control-point name. In the example, the name is specified at the remote system (MPLS) by the LCLCPNAME parameter of the Change Network Attributes (CHGNETA) command.

INLCNN(*DIAL)
Specifies that the initial connection is made by the AS/400 system either answering an incoming call or placing a call.

CNNNBR(6125553333)
The connection (telephone) number for the remote controller is 6125553333.

STNADR(01)
The address assigned to the remote controller is hex 01.

CPSSN(*NO)
Control point sessions are not supported with this node.

NODETYPE(*NETNODE)
Specifies that the remote location (MPLS) is an APPN networking node.

Configuring End Node A (Purchasing)

The following CL commands are used to define the configuration for the system identified as PURCH (ENA in the figure). The example shows these commands as used within a CL program; the configuration can also be performed using the configuration menus.

```
/*********************************************************************/
/*                                                                   */
/*  MODULE:  PURCH                      LIBRARY:  PUBSCFGS           */
/*                                                                   */
/*  LANGUAGE:  CL                                                    */
/*                                                                   */
/*  FUNCTION:  CONFIGURES APPN NETWORK:                              */
/*                                                                   */
/*             THIS IS: PURCH TO MPLS    (LAN)                       */
/*                      PURCH TO DISTRIB (LAN)                       */
/*                                                                   */
/*                                                                   */
/*********************************************************************/
PGM
/*********************************************************************/
             /* Change network attributes for PURCH */
             CHGNETA    LCLNETID(APPN) LCLCPNAME(PURCH)
                          LCLLOCNAME(PURCH) NODETYPE(*ENDNODE)
                          NETSERVER((APPN MPLS))
             /* Create remote configuration list for PURCH */
             CRTCFGL    TYPE(*APPNRMT) APPNRMTE((NEWYORK APPN
                        PURCH NEWYORK APPN 3BD29F *YES *NO *NO *NO
                        'RMT LOC OF PURCH')
                        (LOSANGEL APPN
                        PURCH LOSANGEL APPN 3BD29F *YES *NO *NO *NO
                        'RMT LOC OF PURCH'))
             /* Create LAN line description for PURCH to LAN    */
             CRTLINTRN LIND(MPLSTRN) RSRCNAME(LIN031)
                          ADPTADR(400000000003)
             /* Create controller description for PURCH to MPLS */
             CRTCTLAPPC CTLD(MPLS) LINKTYPE(*LAN) SWITCHED(*YES)
                          SWTLINLST(MPLSTRN) RMTNETID(APPN)
                          RMTCPNAME(MPLS) ADPTADR(400000000002)
                          MINSWTSTS(*VRYON) SWTDSC(*NO)
                          NODETYPE(*NETNODE)
             /* Create controller description for PURCH to DISTRIB */
             CRTCTLAPPC CTLD(DISTRIB) LINKTYPE(*LAN) SWITCHED(*YES)
                          SWTLINLST(MPLSTRN) RMTNETID(APPN)
                          RMTCPNAME(DISTRIB) ADPTADR(400000000004)
                          MINSWTSTS(*VRYON) SWTDSC(*NO)
ENDPGM
```

Changing the Network Attributes (Purchasing): The Change Network Attributes (CHGNETA) command is used to set the attributes for the system within the network. The following attributes are defined for PURCH and these attributes apply to all connections in the network for this end node:

LCLNETID(APPN)
: Specifies that the name of the local network is APPN. The remote locations (MPLS in the example, NN2 in the figure) must specify this name as the remote network identifier (RMTNETID) on the CRTCTLAPPC command.

LCLCPNAME(PURCH)
Specifies that the name assigned to the local control point is PURCH. The remote systems specify this name as the remote control point name (RMTCPNAME) on the CRTCTLAPPC command.

LCLLOCNAME(PURCH)
The default local location name is PURCH. This name will be used for the device description that is created by the APPN support.

NODETYPE(*ENDNODE)
Specifies that the local system (PURCH) is an APPN end node.

NETSERVER((APPN MPLS))
Specifies that network node MPLS (NN2 in the figure) is the network node server for this end point. The MPLS node is in the same (APPN) network.

Creating the Remote Location Configuration List (Purchasing): The Create Configuration List (CRTCFGL) command is used to define the remote locations with special characteristics to the APPN support. In this example, location security is being used and the following is defined at PURCH:

TYPE(*APPNRMT)
Specifies that the entries being defined are remote locations.

APPNRMTE((NEWYORK APPN PURCH NEWYORK APPN 3BD29F *YES *NO *NO *NO 'RMT LOC of PURCH') (LOSANGEL APPN PURCH LOSANGEL APPN 3BD29F *YES *NO *NO *NO 'RMT LOC of PURCH'))
Specifies the remote locations with which the local location can be paired. Two entries are defined:

- For the first entry, the remote location name is NEWYORK; the remote network ID is APPN; the associated local location name is PURCH (defined by the default local location name); the control-point name is NEWYORK and the remote control point network ID is also APPN; the password is 3BD29F; it is a secure location; and it is not a single session location (the last two entries locally controlled sessions and pre-established sessions, are *NO because this is not a single session location).
- For the second entry, the remote location name is LOSANGEL; the remote network ID is APPN; the associated local location name is PURCH (defined by the local location list); the control-point name is LOSANGEL the control point network ID is also APPN; the password is 3BD29F; it is a secure location; and it is not a single session location (the last two entries locally controlled sessions and preestablished sessions, are *NO because this is not a single session location).

Creating the Line Description (Purchasing to Token-Ring Network): The line used in this example is a token-ring network. The command used to create the line is CRTLINTRN and the parameters specified are:

LIND(MPLSTRN)
The name assigned to the line description is MPLSTRN.

RSRCNAME(LIN031)
Specifies that the physical communications port named LIN031 is being defined.

ADPTADR(400000000003)
Specifies the LAN adapter address of the local system.

Creating the Controller Description (Purchasing to Minneapolis, Token-Ring Network): Because this is an APPN environment (AS/400 system to AS/400 system), the controller is an APPC controller and the CRTCTLAPPC command is used to define the attributes of the controller. The following attributes are defined by the example command:

CTLD(MPLS)
The name assigned to the controller description is MPLS.

LINKTYPE(*LAN)
Because this controller is attached through a token-ring network communications line, the value specified is *LAN. This value must correspond to the type of line being used as defined by a create line description command.

SWITCHED(*YES)
Always specified as *YES for token-ring network connections.

SWTLINLST(MPLSTRN)
Specifies the name of the line descriptions (in this case, a token-ring network line) that this controller can be attached to. In the example, there is only one line (MPLSTRN). This value must match a name specified by the LIND parameter in a line description.

RMTNETID(APPN)
The name of the network in which the remote control point resides is APPN.

RMTCPNAME(MPLS)
Specifies that the remote control-point name is MPLS. The name specified here must match the name specified at the remote system for the local control-point name. In the example, the name is specified at the remote system (MPLS) by the LCLCPNAME parameter on the Change Network Attributes (CHGNETA) command.

ADPTADR(400000000002)
Specifies the LAN adapter address of the remote controller. This must match the value specified at the remote controller (MPLS) in the associated line description.

MINSWTSTS(*VRYON)
Specifies that CP-CP sessions are established over this connection only when the status of the controller is varied on or active. This connection is to be treated as logically nonswitched for purposes of APPN routing.

SWTDSC(*NO)
Specifies that the switched connection will not be disconnected when the last device is varied off. This must be specified since MINSWTSTS(*VRYON) is specified.

NODETYPE(*NETNODE)
Specifies that the remote location (MPLS) is an APPN networking node.

Creating the Controller Description (Purchasing to Distribution, Token-Ring Network): Because this is an APPN environment (AS/400 system to AS/400 system), the controller is an APPC controller and the CRTCTLAPPC command is used to define the attributes of the controller. The following attributes are defined by the example command:

CTLD(DISTRIB)
The name assigned to the controller description is DISTRIB.

LINKTYPE(*LAN)
Because this controller is attached through a token-ring network communications line, the value specified is *LAN. This value must correspond to the type of line being used as defined by a create line description command.

SWITCHED(*YES)
Always specified as *YES for token-ring network connections.

SWTLINLST(MPLSTRN)
Specifies the name (MPLSTRN) of the line descriptions (in this case, a token-ring network line) that this controller can be attached to. In the example, there is only one line (MPLSTRN). This value must match a name specified by the LIND parameter in a line description.

RMTNETID(APPN)
The name of the network in which the remote control point resides is APPN.

RMTCPNAME(DISTRIB)
Specifies that the remote control-point name is DISTRIB. The name specified here must match the name specified at the remote system for the local control-point name. In the example, the name is specified at the remote system (DISTRIB) by the LCLCPNAME parameter of the Change Network Attributes (CHGNETA) command.

ADPTADR(400000000004)
Specifies the LAN adapter address of the remote controller. This must match the value specified at the remote controller (DISTRIB) in the associated line description.

MINSWTSTS(*VRYON)
Specifies that CP-CP sessions are established over this connection only when the status of the controller is varied on or active. This connection is to be treated as logically nonswitched for purposes of APPN routing.

SWTDSC(*NO)
Specifies that the switched connection will not be disconnected when the last device is varied off. This must be specified since MINSWTSTS(*VRYON) is specified.

Configuring End Node B (Distribution)

The following CL commands are used to define the configuration for the system identified as DISTRIB (ENB in the figure). The example shows these commands as used within a CL program; the configuration can also be performed using the configuration menus.

```
/*******************************************************************/
/*                                                                 */
/*  MODULE:  DISTRIB                    LIBRARY:  PUBSCFGS         */
/*                                                                 */
/*  LANGUAGE:  CL                                                  */
/*                                                                 */
/*  FUNCTION:  CONFIGURES APPN NETWORK:                            */
/*                                                                 */
/*             THIS IS: DISTRIB TO MPLS   (LAN)                    */
/*                      DISTRIB TO PURCH  (LAN)                    */
/*                                                                 */
/*                                                                 */
/*******************************************************************/
PGM
/*******************************************************************/
             /* Change network attributes for DISTRIB */
             CHGNETA    LCLNETID(APPN) LCLCPNAME(DISTRIB)
                          LCLLOCNAME(DISTRIB) NODETYPE(*ENDNODE)
                          NETSERVER((APPN MPLS))
/*******************************************************************/
/*                      DISTRIB TO LAN   (LAN)                     */
/*******************************************************************/
             /* Create LAN line description for DISTRIB to LAN    */
             CRTLINTRN LIND(MPLSTRN) RSRCNAME(LIN031)
                          ADPTADR(400000000004)
             /* Create controller description for DISTRIB to MPLS */
             CRTCTLAPPC CTLD(MPLS) LINKTYPE(*LAN) SWITCHED(*YES)
                          SWTLINLST(MPLSTRN) RMTNETID(APPN)
                          RMTCPNAME(MPLS) ADPTADR(400000000002)
                          MINSWTSTS(*VRYON) SWTDSC(*NO)
                          NODETYPE(*NETNODE)
             /* Create controller description for DISTRIB to PURCH */
             CRTCTLAPPC CTLD(PURCH) LINKTYPE(*LAN) SWITCHED(*YES)
                          SWTLINLST(MPLSTRN) RMTNETID(APPN)
                          RMTCPNAME(PURCH) ADPTADR(400000000003)
                          MINSWTSTS(*VRYON) SWTDSC(*NO)
ENDPGM
```

Changing the Network Attributes (Distribution): The Change Network Attributes (CHGNETA) command is used to set the attributes for the system within the network. The following attributes are defined for DISTRIB and these attributes apply to all connections in the network for this end node.

LCLNETID(APPN)
Specifies that the name of the local network is APPN. The remote locations (MPLS in the example, NN2 in Figure C-5 on page C-33 must specify this name as the remote network identifier (RMTNETID) on the CRTCTLAPPC command.

LCLCPNAME(DISTRIB)
Specifies that the name assigned to the local control point is DISTRIB. The remote systems specify this name as the remote control point name (RMTCPNAME) on the CRTCTLAPPC command.

LCLLOCNAME(DISTRIB)
The default local location name is DISTRIB. This name will be used for the device description that is created by the APPN support.

NODETYPE(*ENDNODE)
Specifies that the local system (DISTRIB) is an APPN end node.

NETSERVER((APPN MPLS))
Specifies that network node MPLS (NN2 in Figure C-5 on page C-33) is the network node server for this end point. The MPLS node is in the same (APPN) network.

Creating the Line Description (Distribution to Token-Ring Network): The line used in this example is a token-ring local are network. The command used to create the line is CRTLINTRN and the parameters specified are:

LIND(MPLSTRN)
The name assigned to the line description is MPLSTRN.

RSRCNAME(LIN031)
Specifies that the physical communications port named LIN031 is being defined.

ADPTADR(400000000004)
Specifies the LAN adapter address of the local system.

Creating the Controller Description (Distribution to Minneapolis, Token-Ring Network): Because this is an APPN environment (AS/400 system to AS/400 system), the controller is an APPC controller and the CRTCTLAPPC command is used to define the attributes of the controller. The following attributes are defined by the example command:

CTLD(MPLS)
The name assigned to the controller description is MPLS.

LINKTYPE(*LAN)
Because this controller is attached through a token-ring network communications line, the value specified is *LAN. This value must correspond to the type of line being used as defined by a create line description command.

SWITCHED(*YES)
Always specified as *YES for token-ring network connections.

SWTLINLST(MPLSTRN)
Specifies the name (MPLSTRN) of the line descriptions (in this case, a token-ring network line) that this controller can be attached to. In the example, there is only one line (MPLSTRN). This value must match a name specified by the LIND parameter in a line description.

RMTNETID(APPN)
The name of the network in which the remote control point resides is APPN.

RMTCPNAME(MPLS)
Specifies that the remote control-point name is MPLS. The name specified here must match the name specified at the remote system for the local

control-point name. In the example, the name is specified at the remote system (MPLS) by the LCLCPNAME parameter of the Change Network Attributes (CHGNETA) command.

ADPTADR(400000000002)
Specifies the LAN adapter address of the remote controller. This must match the value specified at the remote controller (MPLS) in the associated line description.

MINSWTSTS(*VRYON)
Specifies that CP-CP sessions are established over this connection only when the status of the controller is varied on or active. This connection is to be treated as logically nonswitched for purposes of APPN routing.

SWTDSC(*NO)
Specifies that the switched connection will not be disconnected when the last device is varied off. This must be specified since MINSWTSTS(*VRYON) is specified.

NODETYPE(*NETNODE)
Specifies that the remote location (MPLS) is an APPN networking node.

Creating the Controller Description (Distribution to Purchasing, Token-Ring Network): Because this is an APPN environment (AS/400 system to AS/400 system), the controller is an APPC controller and the CRTCTLAPPC command is used to define the attributes of the controller. The following attributes are defined by the example command:

CTLD(PURCH)
The name assigned to the controller description is PURCH.

LINKTYPE(*LAN)
Because this controller is attached through a token-ring network communications line, the value specified is *LAN. This value must correspond to the type of line being used as defined by a create line description command.

SWITCHED(*YES)
Always specified as *YES for token-ring network connections.

SWTLINLST(MPLSTRN)
Specifies the name (MPLSTRN) of the line descriptions (in this case, a token-ring network line) that this controller can be attached to. In the example, there is only one line (MPLSTRN). This value must match a name specified by the LIND parameter in a line description.

RMTNETID(APPN)
The name of the network in which the remote control point resides is APPN.

RMTCPNAME(PURCH)
Specifies that the remote control-point name is PURCH. The name specified here must match the name specified at the remote system for the local control-point name. In the example, the name is specified at the remote system (PURCH) by the LCLCPNAME parameter of the Change Network Attributes (CHGNETA) command.

ADPTADR(400000000003)
Specifies the LAN adapter address of the remote controller. This must match the value specified at the remote controller (DISTRIB) in the associated line description.

MINSWTSTS(*VRYON)
Specifies that CP-CP sessions are established over this connection only when the status of the controller is varied on or active. This connection is to be treated as logically nonswitched for purposes of APPN routing.

SWTDSC(*NO)
Specifies that the switched connection will not be disconnected when the last device is varied off. This must be specified since MINSWTSTS(*VRYON) is specified.

Configuring Low Entry Networking End Node 1 (Payroll)

The following CL commands are used to define the configuration for the system identified as PAYROLL (LENN1 in Figure C-5 on page C-33). The example shows these commands as used within a CL program; the configuration can also be performed using the configuration menus.

```
/*********************************************************************/
/*                                                                   */
/*  MODULE:  PAYROLL                   LIBRARY:  PUBSCFGS            */
/*                                                                   */
/*  LANGUAGE:  CL                                                    */
/*                                                                   */
/*  FUNCTION:  CONFIGURES APPN NETWORK:                              */
/*                                                                   */
/*             THIS IS: PAYROLL TO MPLS     (LAN)                    */
/*                      PAYROLL TO NEWYORK  (LAN)                    */
/*                      PAYROLL TO LOSANGEL (LAN)                    */
/*                                                                   */
/*********************************************************************/
PGM
/*********************************************************************/
             /* Create LAN line description for PAYROLL to LAN    */
             CRTLINTRN LIND(MPLSTRN) RSRCNAME(LIN011)
                         ADPTADR(400000000005)
             /* Create controller description for PAYROLL to MPLS */
             CRTCTLAPPC CTLD(MPLS) LINKTYPE(*LAN) SWITCHED(*YES)
                         SWTLINLST(MPLSTRN) RMTNETID(APPN)
                         RMTCPNAME(MPLS) ADPTADR(400000000002)
                         APPN(*NO)
             /* Create device description for NEWYORK */
             CRTDEVAPPC DEVD(NEWYORK) LOCADR(00) RMTLOCNAME(NEWYORK)
                         LCLLOCNAME(PAYROLL) APPN(*NO)
                         CTL(MPLS) MODE(BLANK #BATCH)
             /* Create device description for LOSANGEL */
             CRTDEVAPPC DEVD(LOSANGEL) LOCADR(00) RMTLOCNAME(LOSANGEL)
                         LCLLOCNAME(PAYROLL) APPN(*NO)
                         CTL(MPLS) MODE(BLANK #BATCH)
             /* Create device description for MPLS */
             CRTDEVAPPC DEVD(MPLS) LOCADR(00) RMTLOCNAME(MPLS)
                         LCLLOCNAME(PAYROLL) APPN(*NO)
                         CTL(MPLS) MODE(BLANK #BATCH)
ENDPGM
```

Creating the Line Description (Payroll to Token-Ring Network): The line used in this example is a token-ring network. The command used to create the line is CRTLINTRN and the parameters specified are:

LIND(MPLSTRN)
The name assigned to the line description is MPLSTRN.

RSRCNAME(LIN011)
Specifies that the physical communications port named LIN011 is being defined.

ADPTADR(400000000005)
Specifies the LAN adapter address of the local system.

Creating the Controller Description (Payroll to Token-Ring Network): Because this is an APPN environment (AS/400 system to AS/400 system), the controller is an APPC controller and the CRTCTLAPPC command is used to define the attributes of the controller. The following attributes are defined by the example command:

CTLD(MPLS)
The name assigned to the controller description is MPLS.

LINKTYPE(*LAN)
Because this controller is attached through a token-ring network communications line, the value specified is *LAN. This value must correspond to the type of line being used as defined by a create line description command.

SWITCHED(*YES)
Always specified as *YES for token-ring network connections.

SWTLINLST(MPLSTRN)
Specifies the name (MPLSTRN) of the line descriptions (in this case, a token-ring network line) that this controller can be attached to. In the example, there is only one line (MPLSTRN). This value must match a name specified by the LIND parameter in a line description.

RMTNETID(APPN)
The name of the network in which the remote control point resides is APPN.

RMTCPNAME(MPLS)
Specifies that the remote control-point name is MPLS. The name specified here must match the name specified at the remote system for the local control-point name. In the example, the name is specified at the remote system (MPLS) by the LCLCPNAME parameter on the Change Network Attributes (CHGNETA) command.

ADPTADR(400000000002)
Specifies the LAN adapter address of the remote controller. This must match the value specified at the remote controller (MPLS) in the associated line description.

APPN(*NO)
Specifies that this link does not use APPN networking support. All the devices must be specifically defined to the local system using the CRTDEVAPPC command.

Creating the APPC Device (Payroll to New York): Because this is an APPC/APPN environment, the device is an APPC device and the CRTDEVAPPC command is used to define the attributes of the device. The following attributes are defined by the example command:

DEVD(NEWYORK)
Specifies that the name assigned to the device description is NEWYORK.

LOCADR(00)
The location address should always be specified as hex 00 when the device is associated with an APPC controller.

RMTLOCNAME(NEWYORK)
Specifies that the remote location name associated with this device description is NEWYORK.

This value matches the value specified for the LCLLOCNAME parameter at the other system (NEWYORK).

LCLLOCNAME(PAYROLL)
Specifies the name assigned to the local location, which is PAYROLL in the example.

This value matches the value specified for the RMTLOCNAME parameter at the other system (NEWYORK).

APPN(*NO)
Specifies that the networking support is not used.

CTL(MPLS)
Specifies that this device description is attached to a controller description named MPLS.

MODE(BLANK #BATCH)
Specifies that this device will use either of two modes: BLANK, which is a mode name of all blanks (hex 40), or #BATCH. Both these modes are supplied by IBM. Note that the other location must also use one of these modes when communicating with this location.

Creating the APPC Device (Payroll to Los Angeles): Because this is an APPC/APPN environment, the device is an APPC device and the CRTDEVAPPC command is used to define the attributes of the device. The following attributes are defined by the example command:

DEVD(LOSANGEL)
Specifies that the name assigned to the device description is LOSANGEL.

LOCADR(00)
The location address should always be specified as hex 00 when the device is associated with an APPC controller.

RMTLOCNAME(LOSANGEL)
Specifies that the remote location name associated with this device description is LOSANGEL.

This value matches the value specified for the LCLLOCNAME parameter at the other system (LOSANGEL).

LCLLOCNAME(PAYROLL)
Specifies the name assigned to the local location, which is PAYROLL in the example.

This value matches the value specified for the RMTLOCNAME parameter at the other system (LOSANGEL).

APPN(*NO)
Specifies that the networking support is not used.

CTL(MPLS)
Specifies that this device description is attached to a controller description named MPLS.

MODE(BLANK #BATCH)
Specifies that this device will use either of two modes: BLANK, which is a mode name of all blanks (hex 40), or #BATCH. Both these modes are supplied by IBM. Note that the other location must also use one of these modes when communicating with this location.

Creating the APPC Device (Payroll to Minneapolis): Because this is an APPC/APPN environment, the device is an APPC device and the CRTDEVAPPC command is used to define the attributes of the device. The following attributes are defined by the example command:

DEVD(MPLS)
Specifies that the name assigned to the device description is MPLS.

LOCADR(00)
The location address should always be specified as hex 00 when the device is associated with an APPC controller.

RMTLOCNAME(MPLS)
Specifies that the remote location name associated with this device description is MPLS.

This value matches the value specified for the LCLLOCNAME parameter at the other system (MPLS).

LCLLOCNAME(PAYROLL)
Specifies the name assigned to the local location, which is PAYROLL in the example.

This value matches the value specified for the RMTLOCNAME parameter at the other system (MPLS).

APPN(*NO)
Specifies that the networking support is not used.

CTL(MPLS)
Specifies that this device description is attached to a controller description named MPLS.

MODE(BLANK #BATCH)
Specifies that this device will use either of two modes: BLANK, which is a mode name of all blanks (hex 40), or #BATCH. Both these modes are supplied by IBM. Note that the other location must also use one of these modes when communicating with this location.

AS/400 Systems and System/36s Using APPN

Figure C-6 shows an environment in which Chicago (NN1), Atlanta (NN2), and New York (EN1) have chosen to join their systems together into an APPN network. To view the System/36 displays used for this configuration, follow "Display 1.0 SSP-ICF Configuration Member Definition" on page C-68 through "Display 44.0 APPC and APPN Session Group Additional Options" on page C-82.

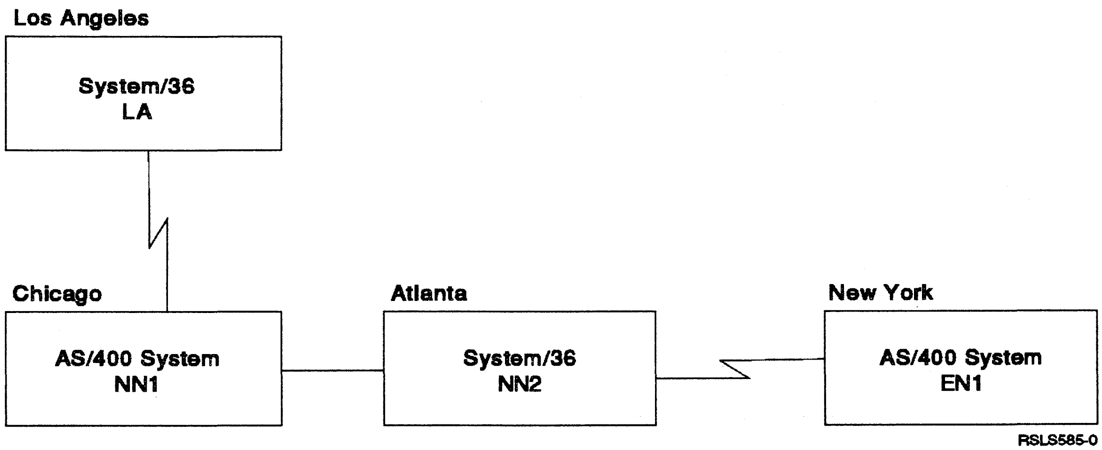


Figure C-6. AS/400 Network with a System/36

In this example, the connection between Los Angeles (LA) and Chicago (NN1) is not part of the APPN network. NN1 and LA have been configured so that they do not use APPN support, and they communicate entirely independent of the APPN network. If later on, LA needs to be included in the APPN network, this could be done simply by making configuration changes at NN1, and possibly some changes at LA (if LA has a need to communicate with multiple nodes in the network). NN1 is an AS/400 network node, NN2 is a System/36 network node, and EN1 is an AS/400 end node. Refer to the *APPC Programmer's Guide* for more details on APPC. Refer to the *Using System/36 Communications Guide* and the *System/36 Advanced Peer-to-Peer Networking Guide* for more about System/36.

Configuring System/36 for Los Angeles (LA)

The following configurations are created using the CNFIGICF procedure on the System/36. The first configuration, LACHLINE, defines the CNFIGICF line member needed to connect a switched synchronous data link control (SDLC) line from Los Angeles (LA) to Chicago (NN1). This connection uses the automatic disconnect feature, so the connection drops when there is no activity on the line.

Display 1.0 SSP-ICF Configuration Member Definition

The prompts for display 1.0 are described below:

```
 1.0              SSP-ICF CONFIGURATION MEMBER DEFINITION                  W1

1. Configuration member name  . . . . . . . . . . . . . . . . .  LACHLINE

2. Library name . . . . . . . . . . . . . . . . . . . . . . . .  CNFIGLIB

3. Select one of the following:
     1. Create new member
     2. Edit existing member
     3. Create new member from existing member
     4. Remove a member
     5. Review a member
   Option . . . . . . . . . . . . . . . . . . . . . . . . . 1-5  1

Cmd7-End     Cmd19-Cancel
```

1. Configuration member name
Enter the name that identifies this configuration member. This member name is used to store the configuration member in a library.

2. Library name
Enter the name of the library in which the configuration member is to be stored. The default is the current user library.

Note: The line member and subsystem member must be in the same library.

3. Select one of the following
Specify which of the five options you want. For this example, to create a new configuration member, select option 1 (Create new member).

Display 2.0 SSP-ICF Configuration Member Type

On display 2.0, specify the type of configuration member you want to define.

```
 2.0                  SSP-ICF CONFIGURATION MEMBER TYPE           LACHLINE   W1


Select one of the following options:
      1. INTRA
      2. BSC
      3. SNA
      4. Async
      5. PC Support/36

   Option: 3










Cmd3-Previous display        Cmd5-Restart CNFIGICF
Cmd7-End                     Cmd19-Cancel               COPR IBM Corp. 1986
```

Select one of the following options:

Select option 3 (SNA) to process an SNA member.

Display 4.0 SNA Configuration Member Type

On display 4.0, specify the type of member you want to define.

```
 4.0                    SNA CONFIGURATION MEMBER TYPE             LACHLINE   W1


1. SNA member type . . . . . . . . . . . . . . . . . . . . .  1-4    2
      1. SNA subsystem member
      2. SNA/SDLC line member
      3. SNA/X.25 line member
      4. SNA/IBM Token-Ring Network line member


2. Will APPC or APPN be used? . . . . . . . . . . . . . . .  Y,N    Y










Cmd3-Previous display        Cmd5-Restart CNFIGICF
Cmd7-End                     Cmd19-Cancel               COPR IBM Corp. 1986
```

1. SNA member type

Specify option 2 (SNA/SDLC line member).

2. Will APPC or APPN be used?

Specify a Y (Yes) to indicate that APPC or APPN is used on this line.

Display 12.0 SNA Line Member Attributes

The prompts for display 12.0 are described below.

```
12.0            SNA LINE MEMBER ATTRIBUTES                     LACHLINE    W1

1. Data link protocol . . . . . . . . . . . . . . . . . . . .  1
  1-Primary        2-Secondary

2. Line type  . . . . . . . . . . . . . . . . . . . . . . . .  2
  1-Nonswitched     2-Switched

3. Switch type at ENABLE  . . . . . . . . . . . . . . . . . .  2
  1-Inactive            3-Manual answer
  2-Autoanswer          4-Manual call




6. Local system's station XID in hexadecimal. . . . . . . . .  00001




Cmd5-Restart CNFIGICF            Cmd7-End
Cmd19-Cancel                                         COPR IBM Corp. 1986
```

1. Data link protocol

Specify whether this is a primary or secondary system in the network. By specifying primary, the remote system, NN1, must take the secondary or negotiable role.

Note: If the System/36 is configured as a primary system using APPC or APPN, all other remote systems with which the System/36 communicates in the network must be configured as secondary or negotiable.

2. Line type

Specify the type of communications line. Select option 2 (Switched).

3. Switch type at ENABLE

This prompt is only displayed if the line type is switched. Select option 2 (Autoanswer). This allows the System/36 to answer incoming calls without operator intervention. System/36 automatically answers a call from the remote system to establish the data link. This option is only valid if the modem used on the line has the automatic answer feature or if you are defining an X.25 line member.

6. Local system's station XID in hexadecimal

Specify the 5-hexadecimal character exchange identifier (XID) that is used to identify the System/36. The value can be from 00000 through FFFFF. Set the local system's station XID to 00001. Because the System/36 does not use APPN support, NN1 must have the EXCHID parameter defined in its controller description for the EXCHANGE ID to succeed. The AS/400 system needs to have its APPC controller description created with the EXCHID parameter set to 03E00001.

Display 12.5 Remote System Selection

On display 12.5, you select the remote systems that this subsystem communicates with. If the protocol is primary or the line type is switched, up to 32 remote systems can be defined.

If no remote systems have been defined, only option 1 (Create) is shown on this display.

```
 12.5                       REMOTE SYSTEM SELECTION              LACHLINE  W1

 1. Select from the following options:
      1-Create

    Option . . . . . . . . . . . . . . . . . . . . . . . . . .  1
 2. Remote system name . . . . . . . . . . . . . . . . . . . .  CHICAGO


--------------------------------------------------------------------------------
 OPTION  REMOTE SYSTEM    OPTION  REMOTE SYSTEM     OPTION  REMOTE SYSTEM









Cmd5-Restart CNFIGICF        Cmd7-End              Cmd8-Reset
Cmd19-Cancel                                       COPR IBM Corp. 1986
```

1. Select from the following options:
Specify option 1.

2. Remote system name
Specify the name (up to 8 characters) by which the remote system is to be known in the line member.

This name must match the LCLCPNAME parameter specified on the Change Network Attributes (CHGNETA) command on the AS/400 system. The AS/400 system identifies itself during the Exchange ID command using the name CHICAGO.

Display 13.0 Remote System Attributes

On display 13.0, define the characteristics for the remote system selected on display 12.5.

```
13.0                  REMOTE SYSTEM ATTRIBUTES                    LACHLINE    W1
           Remote system CHICAGO
1. Remote system type . . . . . . . . . . . . . . . . . . . . . . 2
                      2-Peer



3. Remote system's block ID in hexadecimal. . . . . . . . . . . 056

4. Remote system's station XID in hexadecimal . . . . . . . . . 00002

5. Switch type for session initiation . . . . . . . . . . . . . 1
  1-Call            2-Autoanswer          3-Manual answer

6. Phone list name  . . . . . . . . . . . . . . . . . . . . . .

7. Automatic disconnect? . . . . . . . . . . . . . . . . . . Y,N  Y



Cmd5-Restart CNFIGICF          Cmd7-End
Cmd19-Cancel                                      COPR IBM Corp. 1986
```

1. Remote system type
Specify peer for the remote system type.

3. Remote system's block ID in hexadecimal
Specifies the 3-hexadecimal character block identifier of the remote system. This value can be from 000 to FFF and must be the same as the value assigned to the remote system by SNA. Set the value to 056 to represent the AS/400 system.

4. Remote system's station XID in hexadecimal
Specify the exchange identifier (XID) used to identify the remote system. This identifier is 5 hexadecimal characters from 00000 through FFFFF. Set this value to 00002.

Note: Because NN1 is an AS/400 system, it identifies itself with its control-point name (CHICAGO). This block ID and remote XID do not need to match anything sent by the AS/400 system because the AS/400 system sends its control point name.

5. Switch type for session initiation
Specifies, for a switched line, how the data link is established when a session is started on a switched line using this line member. Selecting a 1 (Call) causes the System/36 to place an outgoing call when session activity is started.

6. Phone list name
A blank indicates an automatic call is not used and causes the type of call to be a manual call.

7. Automatic disconnect
Specify, for a switched line only, whether or not you want the line to be automatically disconnected when the last communications session ends. Type a Y (Yes) to disconnect the line automatically.

The second configuration, LACHSUB, defines the CNFIGICF subsystem member that allows application programs to communicate between LA and NN1 using APPC, as shown in Figure C-6 on page C-67.

Display 1.0 SSP-ICF Configuration Member Definition

The prompts on display 1.0 are described below.

```
 1.0           SSP-ICF CONFIGURATION MEMBER DEFINITION                 W1

1. Configuration member name  . . . . . . . . . . . . . . . . .  LACHSUB

2. Library name . . . . . . . . . . . . . . . . . . . . . . . .  CNFIGLIB

3. Select one of the following:
      1. Create new member
      2. Edit existing member
      3. Create new member from existing member
      4. Remove a member
      5. Review a member
   Option . . . . . . . . . . . . . . . . . . . . . . . . . 1-5  1




Cmd7-End     Cmd19-Cancel
```

1. Configuration member name
Enter the name that identifies this configuration member. This member name is used to store the subsystem configuration member in a library.

2. Library name
Enter the name of the library in which the configuration member is to be stored. The default is the current user library.

Note: The line member and subsystem member must be in the same library.

3. Select one of the following:
Specify which of the five options you want. For example, to create a new configuration member, select option 1 (Create a new member).

Display 2.0 SSP-ICF Configuration Member Type

On display 2.0, specify the type of configuration member you want to define.

```
 2.0                 SSP-ICF CONFIGURATION MEMBER TYPE              LACHSUB    W1


Select one of the following options:
      1. INTRA
      2. BSC
      3. SNA
      4. Async
      5. PC Support/36

   Option: 3









Cmd3-Previous display        Cmd5-Restart CNFIGICF
Cmd7-End                     Cmd19-Cancel               COPR IBM Corp. 1986
```

Select one of the following options:
Select option 3 (SNA) to process an SNA member.

Display 4.0 SNA Configuration Member Type

On display 4.0, specify the type of member (a subsystem member) you want to define.

```
 4.0                    SNA CONFIGURATION MEMBER TYPE                LACHSUB    W1


1. SNA member type . . . . . . . . . . . . . . . . . . . . .  1-4    1
      1. SNA subsystem member
      2. SNA/SDLC line member
      3. SNA/X.25 line member
      4. SNA/IBM Token-Ring Network line member














Cmd3-Previous display       Cmd5-Restart CNFIGICF
Cmd7-End                    Cmd19-Cancel                COPR IBM Corp. 1986
```

1. SNA member type
Specify option 1 (SNA subsystem member).

Display 21.0 SNA Subsystem Member Selection

On display 21.0, select the type of subsystem for which you want to create a subsystem member. Also, enter the name of the line member (previously defined) that you will use with this subsystem member.

```
21.0              SNA SUBSYSTEM MEMBER SELECTION                 LACHSUB    W1


1. Select subsystem type from the following options:
      1. Peer
      2. SNA Upline
      3. SNA 3270
      4. Finance
      5. SNA MSRJE
      6. APPC
      7. APPN
   Option . . . . . . . . . . . . . . . . . . . . . . . . . 1-7  6

2. Line member name . . . . . . . . . . . . . . . . . . . . .  LACHLINE




Cmd3-Previous display      Cmd5-Restart CNFIGICF
Cmd7-End                   Cmd19-Cancel              COPR IBM Corp. 1986
```

1. Select subsystem type from the following options:
Specify option 6 (APPC) to indicate that the subsystem used is APPC.

Note: APPN provides networking support, but APPC does not provide networking support.

2. Line member name
Specify the name of the *line member* with which this subsystem member is associated. The line member name is specified on display 1.0 during line member configuration (LACHLINE).

Display 22.0 Subsystem Member Definition

The prompt on display 22.0 is described below.

```
22.0                SUBSYSTEM MEMBER DEFINITION                LACHSUB    W1

1. Local location name . . . . . . . . . . . . . . . . . . . . . LOSANGEL










Cmd5-Restart CNFIGICF          Cmd7-End
Cmd19-Cancel                                          COPR IBM Corp. 1986
```

1. Local location name

Specify the local location name as LOSANGEL. This parameter must match the RMTLOCNAME parameter specified on the CRTDEVAPPC command on NN1.

Display 29.0 Remote Location Selection

Display 29.0 shows you which of the remote systems are configured in the line member used by this subsystem. You use this display to identify the remote systems available for communications with this subsystem. For each remote location that you specify, assign it to a remote system.

You can use the top half of the display to define a new remote location in this subsystem member using option 1 (Create).

If no remote locations have been defined for any of the remote systems in the line member, the only option shown on this display is the create option.

```
29.0                          REMOTE LOCATION SELECTION          LACHSUB      W1

1. Select from the following options:
     1-Create

   Option . . . . . . . . . . . . . . . . . . . . . . . . . .    1
2. Remote location name . . . . . . . . . . . . . . . . . . .    CHICAGO
3. Remote system name . . . . . . . . . . . . . . . . . . . .    CHICAGO

--------------------------------------------------------------------------------
OPTION   LOCATION     REMOTE SYSTEM                               Page 1    of 1
                        CHICAGO








                                                 Cmd5-Restart CNFIGICF
Cmd7-End     Cmd8-Reset     Cmd19-Cancel         Roll-Page     COPR IBM Corp. 1986
```

1. Select from the following options:
Enter the option you want to perform on each remote location. Specify option 1 (Create) to define a new remote location.

2. Remote location name
Enter the name of the remote location with which your subsystem will be communicating. Enter a name of no more than 8 characters. This name, which you define, is used to start and stop communications with this location. Specify the remote location name as CHICAGO. This parameter must match the LCLLOCNAME parameter specified on the CRTDEVAPPC command on NN1.

3. Remote system name
Enter the name of the remote system for which this remote location is being defined. This indicates that CHICAGO is the remote system that this remote location is defined for.

Display 30.0 Remote Location Definition

On display 30.0, enter whether or not you want to activate communications with the remote location at the time this subsystem is enabled and whether or not you want alerts sent to the remote location.

```
30.0                  REMOTE LOCATION DEFINITION                LACHSUB  W1

     Remote system CHICAGO                  Remote location CHICAGO

1. Activate location at ENABLE? . . . . . . . . . . . . . . . Y,N  Y

2. Send alerts to this location?  . . . . . . . . . . . . . . Y,N  N





Cmd3-Previous display      Cmd5-Restart CNFIGICF
Cmd7-End                   Cmd19-Cancel                COPR IBM Corp. 1986
```

1. Activate location at ENABLE?
Specifies whether or not you want the subsystem, as soon as it is enabled, to allow communications with this remote location. Specify a Y (Yes), which is the default, to indicate that communications can start without having to specify the name of the remote location on an ENABLE procedure command.

2. Send alerts to this location?
Specifies whether or not you want alerts sent. Specify an N (No) if you do not want alerts sent to this location.

Note: A separate location would need to be defined to send alerts to CHICAGO.

Display 41.0 APPC and APPN Location Definition

On display 41.0, specify whether the remote location has a single session or can have multiple sessions, and whether or not the subsystem stays enabled after the line is disconnected.

```
41.0             APPC AND APPN LOCATION DEFINITION              LACHSUB    W1

        Remote system CHICAGO              Remote location CHICAGO

1. Single-session location? . . . . . . . . . . . . . . . . Y,N  N

2. Stay operational? . . . . . . . . . . . . . . . . . . . Y,N  Y











Cmd3-Previous display     Cmd5-Restart CNFIGICF
Cmd7-End                  Cmd19-Cancel               COPR IBM Corp. 1986
```

1. Single session location?

Specify whether or not the remote location is limited to one session.

Specify an N (No) to allow more than a single session for the remote location.

2. Stay operational?

Specify whether or not you want the subsystem to remain active after the line is disconnected.

Specify a Y (Yes) to allow the subsystem to remain enabled following a normal line deactivation. This allows establishing communications again with the remote location at a later time.

Display 42.0 Session Group Selection

Display 42.0 lists the session groups that are defined for this remote location. You can create a new session group, edit an existing session group, remove a session group, create a new session group from an existing session group, or review a session group. In addition, you can specify the name of the session group that is to be used as the default.

System/36 has a default session group of *BLANK, and the AS/400 system has a default mode of BLANK. This default session group can be used by LA and NN1.

```
42.0                     SESSION GROUP SELECTION             LACHSUB    W1

      Remote system CHICAGO                Remote location CHICAGO

 1. Select from the following options:
     1-Create      3-Create from existing          5-Review
     2-Edit        4-Remove

    Option . . . . . . . . . . . . . . . . . . . . . . . . . .
 2. Session group name . . . . . . . . . . . . . . . . . . . .
 3. Existing session group name  . . . . . . . . . . . . . . .
 4. Default session group name . . . . . . . . . . . . . . . .  *BLANK
------------------------------------------------------------------------------
OPTION   SESSION GROUP
             *BLANK




 Cmd3-Previous display    Cmd5-Restart CNFIGICF     Cmd7-End
 Cmd8-Reset               Cmd19-Cancel              COPR IBM Corp. 1986
```

1. Select from the following options:
Option 5 (Review) displays an existing session group.

2. Session group name
Each session group name must be unique within the remote location.

4. Default session group name
Specify the default session group name that is used by the APPC subsystem whenever a local application program does not specifically provide a session group name at the session start. The default session group name must be a session group name already configured for this remote location.

Display 43.0 APPC and APPN Session Group Definition

Display 43.0 is the first of a set of displays that you use to define the session groups. The remote system name, remote location name, and session group name are shown for reference.

```
43.0          APPC and APPN SESSION GROUP DEFINITION           LACHSUB    W1

      Remote system CHICAGO                Remote location CHICAGO

                       Session group *BLANK

 1. Session group type . . . . . . . . . . . . . . . . . . . . .  1
      1-Interactive              2-Batch

 2. Maximum session limit  . . . . . . . . . . . . . . . .1 - 64  08

 3. Number of locally controlled sessions  . . . . . . . .0 - 08  04

 4. Number of pre-established sessions . . . . . . . . . .0 - 04  00




Cmd3-Previous display     Cmd5-Restart CNFIGICF
Cmd7-End                  Cmd19-Cancel                COPR IBM Corp. 1986
```

1. **Session group type**
   Specify whether or not the sessions are used for batch or interactive communications. This is used to select defaults at the local system for display 44.0. Type a 1 (Interactive) if the record exchange is in both directions, meaning that the systems alternate sending and receiving.

2. **Maximum session limit**
   Specify the maximum number of sessions that are allowed for this session group. The maximum number of sessions for all session groups in a single remote location is 64. The default is 8.

3. **Number of locally controlled sessions**
   Specify the number of locally controlled sessions that are requested for this session group. The range of available sessions is shown and the default is one-half of the maximum session limit. This value is actually negotiated with the remote system when the data link is established. Therefore, the number specified here is not a guaranteed value.

4. **Number of pre-established sessions**
   Specify the number of sessions established and kept active while communications with the remote location is active. The default is 1 if the line type is nonswitched or switched without automatic disconnect. The default is 0 if the line type is switched with automatic disconnect.

Note: All values specified in this session group are the default values.

Display 44.0 APPC and APPN Session Group Additional Options

On Display 44.0, you define additional options that can affect performance for this session group. The remote system name, remote location name, and session group name are shown for reference.

```
 44.0          APPC AND APPN SESSION GROUP ADDITIONAL OPTIONS       LACHSUB     W1

       Remote system CHICAGO                  Remote location CHICAGO

                       Session group *BLANK

 1. Receive pacing value . . . . . . . . . . . . . . . . . . .1-63  07

 2. Maximum receive RU size  . . . . . . . . . . . . . . . .8-4096  1024

 3. Acquire remotely controlled sessions? . . . . . . . . . . Y,N  N






Cmd3-Previous display     Cmd5-Restart CNFIGICF
Cmd7-End                  Cmd19-Cancel                 COPR IBM Corp. 1986
```

1. Receive pacing value
Specify that 7 request units (RUs) may be sent from the remote location without an intervening pacing response. The default is 7 if the type of session group is interactive.

2. Maximum receive RU size
Specify that the maximum RU size (in bytes) that can be received by the APPC subsystem is 1024. The default is 1024 if the type of session group is interactive.

3. Acquire remotely controlled sessions?
If there are no locally controlled sessions available, this prompt determines whether or not the subsystem attempts to acquire a session controlled by the remote system.

Specify an N (No) to indicate that LA cannot attempt to allocate a remotely controlled session to any local application program using this session group.

Note: All values specified in this session group are the default values.

Configuring AS/400 System for Chicago (NN1)

The following CL program creates the communication objects needed by Chicago to be able to communicate with Los Angeles on a switched point-to-point basis. It also contains the Change Network Attributes (CHGNETA) command and the communication objects needed by Chicago to be able to communicate in the APPN network as a network node. LA is directly attached to NN2 (Atlanta) by an SDLC nonswitched line, as shown in Figure C-6 on page C-67. The default value is used for any parameters not specified on the commands.

```
/*******************************************************************/
/*                                                                 */
/*   MODULE: CHICAGO                                               */
/*                                                                 */
/*   LANGUAGE:  CL                                                 */
/*                                                                 */
/*   FUNCTION:  PERFORM AS/400 CONFIGURATION FOR CHICAGO            */
/*                                                                 */
/*     THIS IS:   CHICAGO TO LOS ANGELES  (SWITCHED)               */
/*                CHICAGO TO ATLANTA     (NONSWITCHED)             */
/*                                                                 */
/*******************************************************************/
PGM
/*******************************************************************/
/*             CHICAGO TO LOS ANGELES (SWITCHED)                   */
/*******************************************************************/
/*   CHANGE NETWORK ATTRIBUTES FOR CHICAGO                         */
     CHGNETA    LCLNETID(APPN) LCLCPNAME(CHICAGO) +
                LCLLOCNAME(CHICAGO) NODETYPE(*NETNODE)
/*   CREATE SWITCHED LINE DESCRIPTION FOR CHICAGO TO LOS ANGELES   */
     CRTLINSDLC LIND(LOSANGEL) RSRCNAME(LIN021) CNN(*SWTPP) +
                STNADR(C1)
/*   CREATE CONTROLLER DESCRIPTION FOR CHICAGO TO LOS ANGELES      */
     CRTCTLAPPC CTLD(LOSANGEL) LINKTYPE(*SDLC) SWITCHED(*YES) +
                SWTLINLST(LOSANGEL) INLCNN(*DIAL) +
                EXCHID(03E00001) CNNNBR(7773333) +
                STNADR(C1)  APPN(*NO)
/*   CREATE DEVICE DESCRIPTION FOR CHICAGO TO LOS ANGELES          */
     CRTDEVAPPC DEVD(LOSANGEL)  LOCADR(00) RMTLOCNAME(LOSANGEL) +
                LCLLOCNAME(CHICAGO) MODE(BLANK) APPN(*NO) +
                CTL(LOSANGEL)
/*******************************************************************/
/*             CHICAGO TO ATLANTA  (NONSWITCHED)                   */
/*******************************************************************/
/*   CREATE NONSWITCHED LINE DESCRIPTION FOR CHICAGO TO ATLANTA    */
     CRTLINSDLC LIND(ATLANTA) RSRCNAME(LIN022)
/*   CREATE CONTROLLER DESCRIPTION FOR CHICAGO TO ATLANTA          */
     CRTCTLAPPC CTLD(ATLANTA) LINKTYPE(*SDLC) LINE(ATLANTA) +
                STNADR(C1) RMTNETID(APPN) RMTCPNAME(ATLANTA) +
                NODETYPE(*NETNODE)
ENDPGM
```

Changing the Network Attributes (CHICAGO)

The Change Network Attributes (CHGNETA) command is used to set the attributes for the system within the network. The following attributes are defined for CHICAGO.

LCLNETID(APPN)
The name of the local network is APPN.

LCLCPNAME(CHICAGO)
The name assigned to the local control point is CHICAGO. This name must match the remote system name parameter specified in the CNFIGICF line member for both LA and NN2.

LCLLOCNAME(CHICAGO)
The default local location name of this location is CHICAGO. This name is used for the device description that is dynamically created by the APPN support.

NODETYPE(*NETNODE)
The local system, CHICAGO, is a network node in the APPN network.

Creating the Line Description (LOSANGEL)

The line used in this example is an SDLC switched line. The command used to create the line is Create Line Description (SDLC) (CRTLINSDLC). The parameters specified are:

LIND(LOSANGEL)
The name assigned to the line description is LOSANGEL.

RSRCNAME(LIN021)
The physical communications port named LIN021 is being defined.

CNN(*SWTPP)
This is a switched line connection.

STNADR(C1)
The SDLC station address used over this line is C1. The controller description should specify the same value.

Because the default is taken for the data link role (ROLE), the role is negotiable. This is compatible with the System/36 specifying a primary SDLC role.

Creating the Controller Description (LOSANGEL)

An APPC controller needs to be created to represent LA. Because the controller being created is not part of the APPN network, APPN(*NO) needs to be specified. This allows the connection between LA and NN1 to operate completely independent of the APPN network. The command used to create the controller is Create Controller Description (APPC) (CRTCTLAPPC). The parameters specified are:

CTLD(LOSANGEL)
The name assigned to the controller description is LOSANGEL.

LINKTYPE(*SDLC)
Because this controller is attached to an SDLC communications line, the value specified is SDLC. This value must correspond to the type of line defined by the create line description command.

SWITCHED(*YES)
This controller is attached to a switched SDLC line.

SWTLINLST(LOSANGEL)
The name of the line description (for switched lines) that this controller is attached to is LOSANGEL. In this example, there is only one line (LOSANGEL). This value must match a name specified by the LIND parameter in a switched SDLC line description.

INLCNN(*DIAL)
The local system may place a call when session activity needs to be started by the local system.

EXCHID(03E00001)
The remote system's EXCHID is 03E00001. Because LA is using APPC (as opposed to APPN) on the System/36, it will not identify itself with a control point name at exchange ID time. Therefore, it is important that 03E00001 is specified for this parameter. The 03E represents the System/36 block

number, and the 00001 was specified in the local system's station XID parameter on the CNFIGICF line member.

CNNNBR(7773333)
The connection (telephone) number for the remote controller is 7773333.

STNADR(C1)
The address assigned to the local controller is C1.

APPN(*NO)
This controller is not part of the APPN network; therefore, APPN(*NO) is specified. All devices attached to this controller must also specify APPN(*NO).

Because the default is taken for the data link role (ROLE), the role is negotiable. This is compatible with the System/36 specifying a primary SDLC role.

Creating the Device Description (LOSANGEL)

Because this is an APPC environment (AS/400 system to System/36) and APPN support is not being used, an APPC device needs to be created using the Create Device Description (APPC) (CRTDEVAPPC) command. The parameters specified are:

DEVD(LOSANGEL)
The name assigned to the device description is LOSANGEL.

LOCADR(00)
The location address should always be specified as 00 when the device is associated with an APPC controller.

RMTLOCNAME(LOSANGEL)
The remote location name associated with this device description is LOSANGEL. This parameter must match the local location name specified in the System/36 subsystem member.

LCLLOCNAME(CHICAGO)
The name assigned to the local location is CHICAGO. This parameter must match the remote location name specified in the System/36 subsystem member.

MODE(BLANK)
This device uses mode BLANK, which is a mode name of all blanks (hex 40). This mode is supplied by IBM. This mode is compatible with the session group *BLANK on the System/36.

APPN(*NO)
The APPN networking support is not being used. This must be specified if the controller that this device is attached to specifies APPN(*NO).

CTL(LOSANGEL)
This device description is attached to controller description LOSANGEL.

Creating the Line Description (ATLANTA)

The line used in this example is an SDLC nonswitched line. The command used to create the line is Create Line Description (SDLC) (CRTLINSDLC). The parameters specified are:

LIND(ATLANTA)
The name assigned to the line description is ATLANTA.

RSRCNAME(LIN022)
The physical communications port named LIN022 is defined.

Creating the Controller Description (ATLANTA)

Because this controller is used in the APPN environment, this controller is an APPC controller that specifies APPN(*YES). The Create Controller Description (APPC) (CRTCTLAPPC) command is used to define the attributes of the controller. The following attributes are defined by the example command:

CTLD(ATLANTA)
The name assigned to the controller description is ATLANTA.

LINKTYPE(*SDLC)
Because this controller is attached to an SDLC communications line, the value specified is *SDLC. This value must correspond to the type of line defined by a create line description command.

LINE(ATLANTA)
The name of the line description to which this controller is attached is ATLANTA. This value must match a name specified by the LIND parameter in a line description.

STNADR(C1)
The address assigned to the local controller is C1.

RMTNETID(APPN)
The name of the network in which the remote control point resides is APPN. This name must match the network ID specified in the System/36 subsystem member.

RMTCPNAME(ATLANTA)
The remote control-point name is ATLANTA. The name specified here must match the local location name parameter specified on the System/36 subsystem member defined for Atlanta.

NODETYPE(*NETNODE)
The remote control point is an APPN network node.

Because the default value of CPSSN(*YES) is used and both the local and remote systems are network nodes, a control point-to-control point session is established between Chicago and Atlanta.

Configuring System/36 for Atlanta (NN2)

The following configurations were created using the CNFIGICF procedure on System/36. The first configuration, ATCHLINE, defines the CNFIGICF line member needed to connect a nonswitched SDLC line from Atlanta (NN2) to Chicago (NN1), as shown in Figure C-6 on page C-67. Because both systems are network nodes and NN1 indicates CPSSN(*YES) in the controller description, ATLANTA, a control point-to-control point session is established between NN2 and NN1.

Display 1.0 SSP-ICF Configuration Member Definition

The prompts for display 1.0 are described below.

```
 1.0            SSP-ICF CONFIGURATION MEMBER DEFINITION                    W1

1. Configuration member name . . . . . . . . . . . . . . . . .  ATCHLINE

2. Library name . . . . . . . . . . . . . . . . . . . . . . . .  CNFIGLIB

3. Select one of the following:
      1. Create new member
      2. Edit existing member
      3. Create new member from existing member
      4. Remove a member
      5. Review a member
   Option . . . . . . . . . . . . . . . . . . . . . . . . . 1-5  1




Cmd7-End      Cmd19-Cancel
```

1. Configuration member name
Enter the name that identifies this configuration member.

2. Library name
Enter the name of the library in which the configuration member is to be stored. The default is the current user library.

Note: The line member and subsystem member must be in the same library.

3. Select one of the following
Specify which of the five options you want. For this example, to create a new member, select option 1 (Create new member).

Display 2.0 SSP-ICF Configuration Member Type

On display 2.0, specify the type of configuration member you want to define.

```
 2.0              SSP-ICF CONFIGURATION MEMBER TYPE           ATCHLINE  W1


Select one of the following options:
      1. INTRA
      2. BSC
      3. SNA
      4. Async
      5. PC Support/36

   Option: 3










Cmd3-Previous display        Cmd5-Restart CNFIGICF
Cmd7-End                     Cmd19-Cancel              COPR IBM Corp. 1986
```

Select one of the following options:
Select option 3 (SNA) to process an SNA member.

Display 4.0 SNA Configuration Member Type

On display 4.0, specify the type of member you want to define.

```
 4.0                SNA CONFIGURATION MEMBER TYPE             ATCHLINE    W1


1. SNA member type . . . . . . . . . . . . . . . . . . . . 1-4    2
      1. SNA subsystem member
      2. SNA/SDLC line member
      3. SNA/X.25 line member
      4. SNA/IBM Token-Ring Network line member


2. Will APPC or APPN be used?  . . . . . . . . . . . . . . Y,N    Y










Cmd3-Previous display        Cmd5-Restart CNFIGICF
Cmd7-End                     Cmd19-Cancel              COPR IBM Corp. 1986
```

1. SNA member type
Specify option 2 (SNA/SDLC line member).

2. Will APPC or APPN be used?
Specify a Y (Yes) to indicate that APPC or APPN is used on this line.

Display 12.0 SNA Line Member Attributes

The prompts for display 12.0 are described below.

```
12.0             SNA LINE MEMBER ATTRIBUTES                    ATCHLINE    W1

1. Data link protocol . . . . . . . . . . . . . . . . . . . . . . 1
   1-Primary        2-Secondary

2. Line type  . . . . . . . . . . . . . . . . . . . . . . . . . . 1
   1-Nonswitched     2-Switched






6. Local system's station XID in hexadecimal. . . . . . . . . .   00003




Cmd5-Restart CNFIGICF              Cmd7-End
Cmd19-Cancel                                                COPR IBM Corp. 1986
```

1. Data link protocol

Specify whether this is a primary or secondary system in the network. By specifying primary, the remote system, NN1, must take the secondary or negotiable role.

Note: If the System/36 is configured as a primary system using APPC or APPN, all other remote systems with which the System/36 communicates in the network must be configured as secondary or negotiable.

2. Line type

Specify the type of communications line. Select option 1 (Nonswitched).

6. Local system's station XID in hexadecimal

Specify the 5-hexadecimal character exchange identifier (XID) that is used to identify the System/36. The value can be from 00000 through FFFFF. Set the local system's station XID to 00003. Because the System/36 is using APPN support, this parameter does not need to match any parameters on the AS/400 system (as long as the EXCHID parameter is not specified on the CRTCTLAPPC command). The System/36 identifies itself at exchange ID time with its control point name (specified as the local location name in the CNFIGICF subsystem member).

Display 12.5 Remote System Selection

On display 12.5, you select the remote systems that this subsystem communicates with. If the protocol is primary or the line type is switched, up to 32 remote systems can be defined.

If no remote systems have been defined, only option 1 (Create) is shown.

```
12.5                        REMOTE SYSTEM SELECTION                  ATCHLINE  W1

1. Select from the following options:
     1-Create

   Option . . . . . . . . . . . . . . . . . . . . . . . . . . .     1
2. Remote system name . . . . . . . . . . . . . . . . . . . . . .   CHICAGO


------------------------------------------------------------------------------
OPTION  REMOTE SYSTEM    OPTION  REMOTE SYSTEM     OPTION  REMOTE SYSTEM









Cmd5-Restart CNFIGICF          Cmd7-End                Cmd8-Reset
Cmd19-Cancel                                           COPR IBM Corp. 1986
```

1. Select from the following options:
Specify option 1.

2. Remote system name
Specify the name (up to 8 characters) by which the remote system is known in the line member.

This name must match the LCLCPNAME parameter specified on the Change Network Attributes (CHGNETA) command on the AS/400 system. The AS/400 system identifies itself during the Exchange ID command using the name CHICAGO.

Display 13.0 Remote System Attributes

On display 13.0 define the characteristics for the remote system selected on display 12.5.

```
13.0                 REMOTE SYSTEM ATTRIBUTES                    ATCHLINE     W1
           Remote system CHICAGO
1. Remote system type . . . . . . . . . . . . . . . . . . . . . . 2
                     2-Peer

2. Remote system's station address  . . . . . . . . . . . 01-FE  C1

3. Remote system's block ID in hexadecimal. . . . . . . . . . .   056

4. Remote system's station XID in hexadecimal . . . . . . . . .   00002








Cmd5-Restart CNFIGICF          Cmd7-End
Cmd19-Cancel                                           COPR IBM Corp. 1986
```

1. **Remote system type**
   Specify option 2 (Peer) for the remote system type.

2. **Remote system's station address**
   Set the remote system's station address to C1. This parameter must match the STNADR parameter specified in the CRTLINSDLC and the CRTCTLAPPC commands on the AS/400 system.

3. **Remote system's block ID in hexadecimal**
   Specifies the 3-hexadecimal character block identifier of the remote system. This value can be from 000 to FFF and must be the same as the value assigned to the remote system by SNA. Set this value to 056.

4. **Remote system's station XID in hexadecimal**
   Specify the exchange identifier (XID) used to identify the remote system. This identifier is 5 hexadecimal characters from 00000 through FFFFF. Set this value to 00002.

   Note: Because NN1 is an AS/400 system, it identifies itself with its control-point name (CHICAGO). This block ID and remote XID do not need to match anything sent by the AS/400 system because the AS/400 system sends its control-point name.

The second configuration, ATNYLINE, defines the CNFIGICF line member needed to connect a switched SDLC line from Atlanta (NN2) to New York (EN1), as shown in Figure C-6 on page C-67. This connection uses the automatic disconnect feature; the connection drops when there is no activity on the line. Because EN1 specifies CPSSN(*NO) in the controller description, ATLANTA, no control point-to-control point session is established between NN2 and EN1.

Display 1.0 SSP-ICF Configuration Member Definition

The prompts for display 1.0 are described below.

```
 1.0            SSP-ICF CONFIGURATION MEMBER DEFINITION                W1

1. Configuration member name . . . . . . . . . . . . . . . . . .  ATNYLINE

2. Library name . . . . . . . . . . . . . . . . . . . . . . . .  CNFIGLIB

3. Select one of the following:
      1. Create new member
      2. Edit existing member
      3. Create new member from existing member
      4. Remove a member
      5. Review a member
   Option . . . . . . . . . . . . . . . . . . . . . . . . . 1-5  1




Cmd7-End     Cmd19-Cancel
```

1. **Configuration member name**
   Enter the name that identifies this configuration member.

2. Library name
Enter the name of the library in which the configuration member is to be stored. The default is the current user library.

Note: The line member and subsystem member must be in the same library.

3. Select one of the following:
Specify which of the five options you want. For this example, to create a new configuration member, select option 1 (Create new member).

Display 2.0 SSP-ICF Configuration Member Type

On display 2.0, specify the type of configuration member you want to define.

```
 2.0              SSP-ICF CONFIGURATION MEMBER TYPE           ATNYLINE   W1


Select one of the following options:
      1. INTRA
      2. BSC
      3. SNA
      4. Async
      5. PC Support/36

   Option: 3









Cmd3-Previous display        Cmd5-Restart CNFIGICF
Cmd7-End                     Cmd19-Cancel             COPR IBM Corp. 1986
```

Select one of the following options:
Select option 3 (SNA) to process an SNA member.

Display 4.0 SNA Configuration Member Type

On display 4.0, specify the type of member you want to define.

```
4.0                     SNA CONFIGURATION MEMBER TYPE              ATNYLINE  W1

1. SNA member type . . . . . . . . . . . . . . . . . . . . .  1-4    2
      1. SNA subsystem member
      2. SNA/SDLC line member
      3. SNA/X.25 line member
      4. SNA/IBM Token-Ring Network line member

2. Will APPC or APPN be used? . . . . . . . . . . . . . . .  Y,N    Y







Cmd3-Previous display        Cmd5-Restart CNFIGICF
Cmd7-End                     Cmd19-Cancel                COPR IBM Corp. 1986
```

1. SNA member type
Specify a 2 (SNA/SDLC line member).

2. Will APPC or APPN be used?
Specify a Y (Yes) to indicate that APPC or APPN is used on this line.

Display 12.0 SNA Line Member Attributes

The prompts for display 12.0 are described below.

```
12.0              SNA LINE MEMBER ATTRIBUTES                    ATNYLINE    W1

1. Data link protocol . . . . . . . . . . . . . . . . . . . . . .  2
  1-Primary        2-Secondary

2. Line type  . . . . . . . . . . . . . . . . . . . . . . . . . .  2
  1-Nonswitched     2-Switched

3. Switch type at ENABLE  . . . . . . . . . . . . . . . . . . . .  2
  1-Inactive            3-Manual answer
  2-Autoanswer          4-Manual call


5. Local system's station address . . . . . . . . . . . . . 01-FE  C1

6. Local system's station XID in hexadecimal. . . . . . . . . . .  00003



Cmd5-Restart CNFIGICF              Cmd7-End
Cmd19-Cancel                                              COPR IBM Corp. 1986
```

1. Data link protocol
Specify whether this is a primary or secondary system in the network. Specify secondary link station role. Because the AS/400 system support is negotiable, the System/36 can specify either value here. The secondary role is specified for this example to show some additional prompts on the System/36 CNFIGICF line member.

2. Line type

Specify the type of communications line. Select option 2 (Switched).

3. Switch type at ENABLE

This prompt is only displayed if the line type is switched. Select option 2 (Autoanswer). This allows the System/36 to answer incoming calls without operator intervention. The System/36 automatically answers a call from the remote system to establish the data link. This option is only valid if the modem used on the line has the automatic answer feature or if you are defining an X.25 line member.

5. Local system's station address

The local system's station address is C1. This value must match the STNADR parameter on the CRTLINSDLC and CRTCTLAPPC commands on the AS/400 system.

6. Local system's station XID in hexadecimal

Specify the 5-hexadecimal character exchange identifier (XID) that is used to identify the System/36. The value can be from 00000 through FFFFF. Set the local system's station XID to 00003. Because the System/36 is using APPN support, this parameter does not need to match any parameters on the AS/400 system (as long as the EXCHID parameter is not specified on the CRTCTLAPPC command). The System/36 identifies itself at exchange ID time with its control-point name (specified as the local location name in the CNFIGICF subsystem member).

Display 12.5 Remote System Selection

On display 12.5, you select the remote systems that this subsystem communicates with. If the protocol is primary or the line type is switched, up to 32 remote systems can be defined.

If no remote systems have been defined, only option 1 (Create) is shown.

```
 12.5                          REMOTE SYSTEM SELECTION                   ATNYLINE

1. Select from the following options:
     1-Create

   Option . . . . . . . . . . . . . . . . . . . . . . . . . . . .      1
2. Remote system name . . . . . . . . . . . . . . . . . . . . . .      NEWYORK

----------------------------------------------------------------------------------
OPTION  REMOTE SYSTEM    OPTION  REMOTE SYSTEM     OPTION  REMOTE SYSTEM










Cmd5-RestartCNFIGICF          Cmd7-End             Cmd8-Reset
Cmd19-Cancel                                       COPR IBM Corp. 1986
```

1. Select from the following options:

Specify option 1.

2. Remote system name

Specify the name (up to 8 characters) by which the remote system is known in the line member.

This name must match the LCLCPNAME parameter specified on the Change Network Attributes (CHGNETA) command on the AS/400 system. The AS/400 system identifies itself during the Exchange ID command using the name NEWYORK.

Display 13.0 Remote System Attributes

On display 13.0 define the characteristics for the remote system selected on display 12.5.

```
13.0                 REMOTE SYSTEM ATTRIBUTES                     ATNYLINE    W1
           Remote system NEWYORK
1. Remote system type . . . . . . . . . . . . . . . . . . . . . . 2
                     2-Peer


3. Remote system's block ID in hexadecimal. . . . . . . . . . . . 056

4. Remote system's station XID in hexadecimal . . . . . . . . . . 00004

5. Switch type for session initiation . . . . . . . . . . . . . . 1
  1-Call            2-Autoanswer            3-Manual answer

6. Phone list name  . . . . . . . . . . . . . . . . . . . . . . .

7. Automatic disconnect?  . . . . . . . . . . . . . . . . . . Y,N Y


Cmd7-End   Cmd19-Cancel
```

1. Remote system type

Specify option 2 (Peer) for the remote system type.

3. Remote system's block ID in hexadecimal

Specifies the 3-hexadecimal character block identifier of the remote system. This value can be from 000 to FFF and must be the same as the value assigned to the remote system by SNA. Set the value to 056 to represent the AS/400 system.

4. Remote system's station XID in hexadecimal

Specify the exchange identifier (XID) used to identify the remote system. This identifier is 5 hexadecimal characters from 00000 through FFFFF. Set this value to 00004.

Note: Because EN1 is an AS/400 system, it identifies itself with its control-point name (NEWYORK). This block ID and remote XID do not need to match anything sent by the AS/400 system because the AS/400 system sends its control-point name.

5. Switch type for session initiation

Specifies, for a switched line, how the data link is established when a session is started on a switched line using this line member. Selecting a 1 (Call) causes the System/36 to place an outgoing call when session activity is started.

6. Phone list name
A blank indicates automatic call is not used and causes the type of call to be a manual call.

7. Automatic disconnect
Specify, for a switched line only, whether or not you want the line to be automatically disconnected when the last communications session ends. Type a Y (Yes) to disconnect the line automatically.

The third configuration, ATLANSUB, defines the CNFIGICF subsystem member that allows application programs to communicate between NN2, NN1, and EN1, as shown in Figure C-6 on page C-67. Because NN1 is a network node, there is no need to define any remote locations to represent Chicago (because this is done dynamically by the System/36 APPN support). A remote location needs to be defined to represent New York because EN1 is an end node.

Although no control point-to-control point session is established between NN2 and EN1, NN2 still provides network services for EN1. In this example, this is desirable because the connection support between the two systems is an SDLC switched line. Later, if this line is used on a constant basis, then the CPSSN parameter for EN1 can change to a value of *YES (which would allow EN1 to receive the benefits of having a control point-to-control point session active with its network server).

Display 1.0 SSP-ICF Configuration Member Definition

The prompts on display 1.0 are described below.

```
 1.0            SSP-ICF CONFIGURATION MEMBER DEFINITION                  W1

1. Configuration member name  . . . . . . . . . . . . . . . . .  ATLANSUB

2. Library name . . . . . . . . . . . . . . . . . . . . . . . .  CNFIGLIB

3. Select one of the following:
      1. Create new member
      2. Edit existing member
      3. Create new member from existing member
      4. Remove a member
      5. Review a member
   Option . . . . . . . . . . . . . . . . . . . . . . . . . 1-5  1




Cmd7-End      Cmd19-Cancel
```

1. Configuration member name
Enter the name that identifies this configuration member. This configuration member name is used to store the configuration member in a library.

2. Library name
Enter the name of the library in which the configuration member is to be stored. The default is the current user library.

Note: The line member and subsystem member must be in the same library.

3. **Select one of the following:**
   Specify which of the five options you want. For this example, to create a new configuration member, select option 1 (Create new member).

Display 2.0 SSP-ICF Configuration Member Type

On display 2.0, specify the type of configuration member you want to define.

```
 2.0                SSP-ICF CONFIGURATION MEMBER TYPE            ATLANSUB  W1


Select one of the following options:
      1. INTRA
      2. BSC
      3. SNA
      4. Async
      5. PC Support/36

   Option: 3









Cmd3-Previous display        Cmd5-Restart CNFIGICF
Cmd7-End                     Cmd19-Cancel                COPR IBM Corp. 1986
```

Select one of the following options:
   Select option 3 (SNA) to process an SNA member.

Display 4.0 SNA Configuration Member Type

On display 4.0, specify the type of member (a subsystem member) you want to define.

```
 4.0                  SNA CONFIGURATION MEMBER TYPE              ATLANSUB  W1


1. SNA member type . . . . . . . . . . . . . . . . . . . . .  1-4     1
      1. SNA subsystem member
      2. SNA/SDLC line member
      3. SNA/X.25 line member
      4. SNA/IBM Token-Ring Network line member











Cmd3-Previous display        Cmd5-Restart CNFIGICF
Cmd7-End                     Cmd19-Cancel                COPR IBM Corp. 1986
```

1. SNA member type
Specify option 1 (SNA subsystem member).

Display 21.0 SNA Subsystem Member Selection

On display 21.0, select the subsystem type for which you want to create a subsystem member.

```
21.0              SNA SUBSYSTEM MEMBER SELECTION              ATLANSUB  W1


1. Select subsystem type from the following options:
     1. Peer
     2. SNA Upline
     3. SNA 3270
     4. Finance
     5. SNA MSRJE
     6. APPC
     7. APPN
   Option . . . . . . . . . . . . . . . . . . . . . . . . . 1-7  7






Cmd3-Previous display       Cmd5-Restart CNFIGICF
Cmd7-End                    Cmd19-Cancel              COPR IBM Corp. 1986
```

1. Select subsystem type from the following options:
Specify option 7 (APPN) to indicate that the subsystem used is APPN.

Note: APPN provides networking support, but APPC does not provide networking functions.

Display 22.0 Subsystem Member Definition

The prompts for display 22.0 are described below.

```
22.0              SUBSYSTEM MEMBER DEFINITION                 ATLANSUB W1

1.Local location name . . . . . . . . . . . . . . . . . . . . ATLANTA






5.Network ID . . . . . . . . . . . . . . . . . . . . . . . . . APPN








Cmd5-Restart CNFIGICF           Cmd7-End
Cmd19-Cancel                                           COPR IBM Corp. 1986
```

1. Local location name

Set the local location name to ATLANTA. This name also represents the System/36 local control point name. This parameter must match the RMTCPNAME parameter specified on the CRTCTLAPPC command on both NN1 and EN1.

5. Network ID

Specify the APPN network ID. This parameter must match the LCLNETID parameter on the CHGNETA command and the RMTNETID parameter on the CRTCTLAPPC command on both NN1 and EN1.

Display 28.0 APPN Subsystem Member Definition

The prompt used for display 28.0 is described below.

```
28.0             APPN SUBSYSTEM MEMBER DEFINITION                  ATLANSUB W1


1. Select one of the following options:
      1. Define locations in non-networking nodes
      2. Define locations in networking nodes
      3. Define locations in nonadjacent single-session nodes
      4. Remove remote locations
      5. Define session groups for multiple-session locations
      6. Define session groups for single-session locations

   Option . . . . . . . . . . . . . . . . . . . . . . . . . . .  1








Cmd5-Restart CNFIGICF           Cmd7-End
Cmd19-Cancel                                             COPR IBM Corp. 1986
```

1. Select one of the following options:

Specify 1 (Define locations in non-networking nodes).

Display 28.0 APPN Subsystem Member Definition

The prompts used for display 28.0 are described below.

```
28.0              APPN SUBSYSTEM MEMBER DEFINITION                ATLANSUB W1

1. Select one of the following options:
      1. Define locations in non-networking nodes
      2. Define locations in networking nodes
      3. Define locations in nonadjacent single-session nodes
      4. Remove remote locations
      5. Define session groups for multiple-session locations
      6. Define session groups for single-session locations

   Option . . . . . . . . . . . . . . . . . . . . . . . . . .  1

2. Line member name . . . . . . . . . . . . . . . . . . . . . .  ATNYLINE





Cmd5-Restart CNFIGICF           Cmd7-End
Cmd19-Cancel                                           COPR IBM Corp. 1986
```

Line member name
Specify the line member name that needs to have a location definition. Because the only nonnetworking node is EN1, specify ATNYLINE.

Display 29.0 Remote Location Selection

Display 29.0 shows you which of the remote systems are configured in the line member used by this subsystem. You use this display to identify the remote systems available for communications with this subsystem. For each remote location that you specify, assign it to a remote system.

You can use the top half of the display to define a new remote location in this subsystem member using option 1 (Create).

If no remote locations have been defined for any of the remote systems in the line member, the only option shown on this display is the create option.

```
29.0                      REMOTE LOCATION SELECTION            ATLANSUB   W1

1. Select from the following options:
     1-Create

   Option . . . . . . . . . . . . . . . . . . . . . . . . . .  1
2. Remote location name . . . . . . . . . . . . . . . . . . .  NEWYORK
3. Remote system name . . . . . . . . . . . . . . . . . . . .  NEWYORK

-------------------------------------------------------------------------------
OPTION    LOCATION     REMOTE SYSTEM                             Page 1    of 1
                         NEWYORK






Cmd4-Display Remote Location List              Cmd5-Restart CNFIGICF
 Cmd7-End     Cmd8-Reset      Cmd19-Cancel       Roll-Page     COPR IBM Corp. 1986
```

1. **Select from the following options:**
   Enter the option you want to perform on each remote location. Specify a 1 (Create) to define a new remote location.

2. **Remote location name**
   Enter the name of the remote location with which your subsystem will be communicating. Enter a name of no more than 8 characters. This name, which you define, is used to start and stop communications with this location. Specify the remote location name as NEWYORK. This parameter must match the LCLLOCNAME parameter specified on the CHGNETA command on the AS/400 system.

3. **Remote system name**
   Enter the name of the remote system for which this remote location is being defined. This indicates that NEWYORK is the remote system that this remote location is defined for.

Display 30.0 Remote Location Definition

The prompt used for display 30.0 is described below.

```
30.0                    REMOTE LOCATION DEFINITION                  ATLANSUB W1

      Remote system NEWYORK                  Remote location NEWYORK


2. Send alerts to this location? . . . . . . . . . . . . . . Y,N  N











Cmd3-Previous display      Cmd5-Restart CNFIGICF
Cmd7-End                   Cmd19-Cancel                COPR IBM Corp. 1986
```

2. **Send alerts to this location?**
   Specifies whether or not you want alerts sent. Specify an N (No) if you do not want alerts sent to this location.

   Note: A separate location needs to be defined to send alerts to NEWYORK.

Display 41.0 APPC and APPN Location Definition

On display 41.0, you specify whether the remote location has a single session or can have multiple sessions, and whether or not the subsystem stays enabled after the line is disconnected.

```
41.0              APPC AND APPN LOCATION DEFINITION              ATLANSUB    W1

      Remote system NEWYORK                    Remote location NEWYORK

 1. Single-session location? . . . . . . . . . . . . . . . . . Y,N  N

 2. Stay operational?  . . . . . . . . . . . . . . . . . . . . Y,N  Y











Cmd3-Previous display     Cmd5-Restart CNFIGICF
Cmd7-End                  Cmd19-Cancel                 COPR IBM Corp. 1986
```

1. Single session location?
Specify whether or not the remote location is limited to one session.

Specify an N (No) to allow more than a single-session group for the remote location.

2. Stay operational?
Specify whether or not you want the subsystem to remain active after the line is disconnected.

Specify a Y (Yes) to allow the subsystem to remain enabled following a normal line deactivation. This allows establishing communications again with the remote location at a later time.

Display 28.0 APPN Subsystem Member Definition

The prompt used for display 28.0 is described below.

```
28.0            APPN SUBSYSTEM MEMBER DEFINITION                 ATLANSUB  W1


1. Select one of the following options:
      1. Define locations in non-networking nodes
      2. Define locations in networking nodes
      3. Define locations in nonadjacent single-session nodes
      4. Remove remote locations
      5. Define session groups for multiple-session locations
      6. Define session groups for single-session locations

   Option . . . . . . . . . . . . . . . . . . . . . . . . . .  5









Cmd5-Restart CNFIGICF          Cmd7-End
Cmd19-Cancel                                              COPR IBM Corp. 1986
```

1. Select one of the following options:

Specify option 5 (Define session groups for multiple-session locations) to indicate that session groups for multiple-session locations need to be edited.

Display 42.0 Session Group Selection

Display 42.0 lists the session groups that are defined for this remote location. You can create a new session group, edit an existing session group, remove a session group, create a new session group from an existing session group, or review a session group. In addition, you can specify the name of the session group that is to be used as the default.

System/36 has a default session group of *BLANK, and the AS/400 system has a default mode of BLANK. This default session group can be used by NN1, NN2, and EN1.

```
42.0                          SESSION GROUP SELECTION              ATLANSUB   W1


1. Select from the following options:
    1-Create      3-Create from existing            5-Review
    2-Edit        4-Remove
   Option . . . . . . . . . . . . . . . . . . . . . . . . . .  2

2. Session group name . . . . . . . . . . . . . . . . . . . .  *BLANK

4. Default session group name . . . . . . . . . . . . . . . .  *BLANK
--------------------------------------------------------------------------------
OPTION   SESSION GROUP
             #BATCH
             #BATCHSC
             #INTER
             #INTERSC
             *BLANK


 Cmd3-Previous display    Cmd5-Restart CNFIGICF     Cmd7-End
 Cmd8-Reset               Cmd19-Cancel              COPR IBM Corp. 1986
```

1. Select from the following options:

Option 2 (Edit) displays an existing session group indicating that *BLANK needs to be edited.

2. Session group name

Each session group name must be unique within the subsystem member.

4. Default session group name

Specify the default session group name that is used by the APPN subsystem whenever a local application program does not specifically provide a session group name at the start of the session. The default session group name must be a session group name already configured for this remote location.

Display 43.0 APPC and APPN Session Group Definition

Display 43.0 is the first of a set of displays that you use to define the session groups. The session group name is shown for reference.

```
43.0           APPC and APPN SESSION GROUP DEFINITION           ATLANSUB    W1

                           Session group *BLANK

1. Session group type . . . . . . . . . . . . . . . . . . . . . .  1
     1-Interactive             2-Batch

2. Maximum session limit  . . . . . . . . . . . . . . . . .1 - 64  08

3. Number of locally controlled sessions  . . . . . . . . .0 - 08  04

4. Number of pre-established sessions . . . . . . . . . . .0 - 04  00





Cmd3-Previous display      Cmd5-Restart CNFIGICF
Cmd7-End                   Cmd19-Cancel                  COPR IBM Corp. 1986
```

1. Session group type

Specify whether the sessions are used for batch or interactive communications. This is used to select defaults at the local system for display 44.0. Type a 1 (Interactive) if the record exchange is in both directions, meaning that the systems alternate sending and receiving.

2. Maximum session limit

Specify the maximum number of sessions that are allowed for this session group. The default is 8.

3. Number of locally controlled sessions

Specify the number of locally controlled sessions that are requested for this session group. The range of available sessions is shown and the default is one-half of the maximum session limit. This value is actually negotiated with the remote system when the data link is established. Therefore, the number specified here is not a guaranteed value.

4. Number of pre-established sessions

Specify the number of sessions established and kept active while communications with the remote location is active. The default is 1 when an APPN subsystem member is being defined.

Note: When defining an APPN session group, the number of pre-established sessions needs to be specifically changed to 0 so that the line automatically disconnects.

Display 44.0 APPC and APPN Session Group Additional Options

On display 44.0, you define additional options that can affect performance for this session group. The session group name is shown for reference.

```
44.0        APPC AND APPN SESSION GROUP ADDITIONAL OPTIONS       ATLANSUB    W1

                          Session group *BLANK

1. Receive pacing value . . . . . . . . . . . . . . . . . . .1-63  07

2. Maximum receive RU size  . . . . . . . . . . . . . . . .8-4096  1024

3. Acquire remotely controlled sessions? . . . . . . . . . . Y,N  N









Cmd3-Previous display     Cmd5-Restart CNFIGICF
Cmd7-End                  Cmd19-Cancel                  COPR IBM Corp. 1986
```

1. Receive pacing value
Specify that 7 request units (RUs) may be sent from the remote location without an intervening pacing response. The default is 7 if the type of session group is interactive.

2. Maximum receive RU size
Specify that the maximum RU size (in bytes) that can be received by the APPC subsystem is 1024. The default is 1024 if the type of session group is interactive.

3. Acquire remotely controlled sessions?
If there are no locally controlled sessions available, this prompt determines whether or not the subsystem attempts to acquire a session controlled by the remote system. If the remote location is a single-session location, this prompt is not displayed; the value for this prompt is automatically set to yes.

Specify an N (No) to indicate that NN2 cannot attempt to allocate a remotely controlled session to any local application program using this session group.

Configuring AS/400 System for New York (EN1)

The following CL program creates the communications objects needed by New York (EN1) to communicate with Atlanta (NN1) on a switched SDLC line, as shown in Figure C-6 on page C-67. The program also contains the Change Network Attributes (CHGNETA) command needed by New York to be part of the APPN network as an end node. In this example, EN1 uses the services of NN2, but EN1 does not have a control point-to-control point session active. This allows the switched line to automatically disconnect when all of the session activity over the line is completed.

```
/*********************************************************************/
/*                                                                   */
/*   MODULE: NEWYORK                                                 */
/*                                                                   */
/*   LANGUAGE:  CL                                                   */
/*                                                                   */
/*   FUNCTION:  PERFORM AS/400 CONFIGURATION FOR NEW YORK            */
/*                                                                   */
/*     THIS IS:   NEW YORK TO ATLANTA  (SWITCHED)                    */
/*                                                                   */
/*********************************************************************/
PGM
/*********************************************************************/
/*            NEW YORK TO ATLANTA  (SWITCHED)                        */
/*********************************************************************/
/*   CHANGE NETWORK ATTRIBUTES FOR NEW YORK                          */
     CHGNETA    LCLNETID(APPN) LCLCPNAME(NEWYORK) +
                LCLLOCNAME(NEWYORK) NODETYPE(*ENDNODE) +
                NETSERVER((APPN ATLANTA))
/*   CREATE SWITCHED LINE DESCRIPTION FOR NEW YORK TO ATLANTA        */
     CRTLINSDLC LIND(ATLANTA) RSRCNAME(LIN021) CNN(*SWTPP) +
                STNADR(C1)
/*   CREATE CONTROLLER DESCRIPTION FOR NEW YORK TO ATLANTA           */
     CRTCTLAPPC CTLD(ATLANTA) LINKTYPE(*SDLC) SWITCHED(*YES) +
                SWTLINLST(ATLANTA) INLCNN(*DIAL) +
                CNNNBR(8395555)  STNADR(C1) +
                RMTNETID(APPN)   RMTCPNAME(ATLANTA) +
                NODETYPE(*NETNODE) CPSSN(*NO)
ENDPGM
```

Changing the Network Attributes (New York)

The Change Network Attributes (CHGNETA) command is used to set the attributes for the system within the network. The following attributes are defined for New York.

LCLNETID(APPN)
The name of the local network is APPN.

LCLCPNAME(NEWYORK)
The name assigned to the local control point is NEWYORK. This name must match the remote system name parameter specified in the CNFIGICF line member for NN2.

LCLLOCNAME(NEWYORK)
The default local location name of this location is NEWYORK. This name is used for the device description that is dynamically created by the APPN support.

NODETYPE(*ENDNODE)
The local system, NEWYORK, is an end node in the APPN network.

NETSERVER((APPN ATLANTA))
The name of the network ID (APPN) and the control point name of the network node (ATLANTA) serving this end node. These names must match the network ID and the local location name specified on the System/36 subsystem member.

The line used in this example is an SDLC switched line. The command used to create the line is Create Line Description (SDLC) (CRTLINSDLC). The parameters specified are:

LIND(ATLANTA)
The name assigned to the line description is ATLANTA.

RSRCNAME(LIN021)
The physical communications port named LIN021 is defined.

CNN(*SWTPP)
This is a switched line connection.

STNADR(C1)
The SDLC station address that is to be used over this line is C1. The controller description should specify the same value. This value must match what the System/36 specified as its local system's station address.

Because the default is taken for the data link role (ROLE) parameter, the role is negotiable. This is compatible with the System/36 specifying a secondary SDLC data link protocol.

Creating the Controller Description (ATLANTA)

An APPC controller needs to be created to represent NN2. Because this controller is used in the APPN environment, this controller is an APPC controller that specifies APPN(*YES). This controller is defined specifying CPSSN(*NO) so that a control point session is not established. Then the SDLC switched connection can be automatically disconnected when all session activity is completed over the line. The Create Controller Description (APPC) CRTCTLAPPC command is used to define the attributes of the controller. The following attributes are defined by the example command:

CTLD(ATLANTA)
The name assigned to the controller description is ATLANTA.

LINKTYPE(*SDLC)
Because this controller is attached to an SDLC communications line, the value specified is SDLC. This value must correspond to the type of line defined by the create line description command.

SWITCHED(*YES)
This controller is attached to a switched SDLC line.

SWTLINLST(ATLANTA)
The name of the line description (for switched lines) that this controller can be attached to is (ATLANTA). In this example, there is only one line (ATLANTA). This value must match a name specified by the LIND parameter in a switched SDLC line description.

INLCNN(*DIAL)
The local system may place a call when session activity needs to be started by the local system.

CNNNBR(8395555)
The connection (telephone) number for the remote controller is 8395555.

STNADR(C1)
The address assigned to the remote controller is C1.

RMTNETID(APPN)
The name of the network in which the remote control point resides is APPN. This name must match the network ID specified in the System/36 subsystem member.

RMTCPNAME(ATLANTA)
The remote control-point name is ATLANTA. The name specified here must match the local location name parameter specified on the System/36 subsystem member defined for Atlanta.

NODETYPE(*NETNODE)
The remote control point is an APPN network node.

CPSSN(*NO)
A control point session is not supported with this controller. By specifying this, the automatic disconnect feature causes a switch line to be disconnected when all session activity is completed.

Appendix D. Record Formats for Output Files

This appendix explains the four DDS record formats defined for output file processing. The output is specified with the OUTPUT(*OUTFILE) parameter on the Display APPN Information (DSPAPPNINF) command. The formats correspond to the four types of APPN data that can be retrieved:

- Topology
- Directory
- Intermediate sessions
- Endpoint sessions

Although several members can be saved in an output database file, only one type of data can be saved per file.

The following notes relate to how the data is specified in the record formats.

Notes:

1. All dates are represented in YYMMDD format where:

   YY Year
   MM Month
   DD Day

   For example, 890515 represents May 15, 1989.

2. All times are for a 24-hour clock and are represented in HHMMSS format where:

   HH Hour
   MM Minutes
   SS Seconds

   For example, 144526 represents 26 seconds past 2:45 PM.

3. All reserved fields are set to blanks.

4. Non-reserved fields that are not set in a particular record are initialized as follows:

   - Character fields are initialized to blanks.
   - Hexadecimal and binary fields are initialized to hexadecimal zeros ('00'X).

5. Character data is represented by a **C**. Binary data is represented by a **B**.

Topology Data Record Format

The output file produced for topology data has one record for each link destination node. For a node that has no link destinations, a record is created containing information about that node, but the fields defined for link destination information are not set.

The record format is QLSTDB. The fields for the topology data record are shown in Figure D-1.

Figure D-1 (Page 1 of 2). Fields for Topology Data			
Field Name	**Type**	**Length**	**Description**
TCENT	C	1	Century the data was retrieved and placed in the output file: **0** 20th century **1** 21st century
TDATE	C	6	Date the data was retrieved and placed in the output file.
TTIME	C	6	Time the data was retrieved and placed in the output file.
TSYSNM	C	8	Name of the system where the DSPAPPNINF command was run to create this output file.
TLNET	C	8	Network ID of local node.
TLCPNM	C	8	Control-point name of local node.
TCPNET	C	8	Network ID of origin node.
TCPNM	C	8	Control-point name of origin node.
TNTYPE	C	3	Type of origin node: ***EN** End node ***NN** Network node ***VN** Virtual node
TVRT	C	1	Indicates whether routing information for this node is valid: **Y** Yes **N** No When the origin node is an end node, this field is not applicable and is not set.
TCNGST	C	1	Level of routing congestion: **L** Low **H** High When the origin node is an end node, this field is not applicable and is not set.
TRAR	B	3	Route addition resistance (0-255). When the origin node is an end node, this field is not applicable and is not set.
TNLDN	B	4	Number of link destination nodes attached by a link to the origin node.
TRSV1	C	18	Reserved.
TLDNET	C	8	Network ID of link destination node.
TLDCP	C	8	Control-point name of link destination node.
TLDTG	B	3	Transmission group (TG) number.
TTGACT	C	1	Indicates whether the link is active: **Y** Yes **N** No
TDISC	C	1	Indicates whether the link is in the process of being disconnected: **Y** Yes **N** No
TLDVRT	C	1	Indicates whether routing information for this link is valid: **Y** Yes **N** No
TCTL	C	10	Name of the controller description associated with this link.

Figure D-1 (Page 2 of 2). Fields for Topology Data			
Field Name	**Type**	**Length**	**Description**
TSPEED	C	10	Speed of link in bits per second: ***MIN** Minimum **1200** 1200 **2400** 2400 **4800** 4800 **7200** 7200 **9600** 9600 **14400** 14400 **19200** 19200 **48000** 48000 **56000** 56000 **64000** 64000 **4 MB** 4 megabits **10 MB** 10 megabits **16 MB** 16 megabits ***MAX** Maximum
TCOSTC	B	3	Cost per connect time (0-255).
TCOSTB	B	3	Cost per byte (0-255).
TSECUR	C	10	Security level of link: ***MAX** Maximum ***ENCRYPTED** Encrypted ***GUARDCND** Guarded conduit ***SECURECND** Secure conduit ***UNDGRDCBL** Underground cable ***PKTSWTNET** Packet switched ***NONSECURE** Nonsecure
TDELAY	C	10	Level of propagation delay: ***MIN** Minimum ***LAN** LAN (token-ring network or Ethernet) ***TELEPHONE** Telephone ***PKTSWTNET** Packet-switched network ***SATELLITE** Satellite ***MAX** Maximum
TUSER1	B	3	User-defined value 1 (0-255).
TUSER2	B	3	User-defined value 2 (0-255).
TUSER3	B	3	User-defined value 3 (0-255).
TSIG	C	16	Signaling information used to access a virtual node.
TRSV2	C	25	Reserved.

Directory Data Record Format

The output file produced for directory data has one record for each local location and one record for each remote location.

The record format is QLSDIR. The fields in the directory data record are shown in Figure D-2.

Figure D-2. Fields for Directory Data			
Field Name	**Type**	**Length**	**Description**
DCENT	C	1	Century the data was retrieved and placed in the output file: **0** 20th century **1** 21st century
DDATE	C	6	Date the data was retrieved and placed in the output file.
DTIME	C	6	Time the data was retrieved and placed in the output file.
DSYSNM	C	8	Name of the system where the DSPAPPNINF command was run to create this output file.
DLNET	C	8	Network ID of local node.
DLCPNM	C	8	Control-point name of local node.
DRNET	C	8	Network ID of local or remote control point.
DRCPNM	C	8	Name of local or remote control point.
DNTYPE	C	3	Type of node: ***EN** End node ***NN** Network node ***VN** Virtual node
DRSV1	C	16	Reserved.
DLCNET	C	8	Network ID associated with location name.
DLOCNM	C	8	Location name (local or remote).
DETYPE	C	1	Type of entry: **H** Home **R** Registered **C** Cached

Intermediate Session Data Record Format

The output file produced for intermediate session data has one record for each session.

The record format is QLSINM. The fields in the intermediate session data record are shown in Figure D-3.

Figure D-3 (Page 1 of 3). Fields for Intermediate Session Data			
Field Name	**Type**	**Length**	**Description**
ICENT	C	1	Century the data was retrieved and placed in the output file: **0** 20th century **1** 21st century
IDATE	C	6	Date the data was retrieved and placed in the output file.
ITIME	C	6	Time the data was retrieved and placed in the output file.
ISYSNM	C	8	Name of the system where the DSPAPPNINF command was run to create this output file.
ILNET	C	8	Network ID of local node.
ILCPNM	C	8	Control-point name of local node.
IPCID	C	8	Procedure correlator ID that identifies the session.

Figure D-3 (Page 2 of 3). Fields for Intermediate Session Data			
Field Name	**Type**	**Length**	**Description**
IPNET	C	8	Network ID of node that created the PCID.
IPCPN	C	8	Control-point name of node that created the PCID.
IMODE	C	8	Name of mode description.
ISTAT	C	1	Status of session: **S** Starting **A** Active **U** In use **Q** Ending
IRSV1	C	26	Reserved
ISDATE	C	13	Date and time that the session was started.
IONET	C	8	Network ID associated with the location that started the session.
IOLOCN	C	8	Name of the location that started the session.
IDNET	C	8	Network ID of the node that is the destination of the session.
IDCPN	C	8	Control-point name of the node that is the destination of the session.
IDNETL	C	8	Network ID associated with the location that is the destination of the session.
IDLOCN	C	8	Name of the location that is the destination of the session.
IRSV2	C	19	Reserved.
IPCTLN	C	10	Name of controller description associated with the primary session stage (that is, the controller representing the next closest node to the Primary Logical Unit).
IPPQUE	B	4	Size of the pacing queue associated with the primary session stage.
IPSPTP	C	9	Send pacing type for the primary session stage: ***NONE** None ***FIXED** Fixed ***ADAPTIVE** Adaptive
IPRPTP	C	9	Receive pacing type for the primary session stage: ***NONE** None ***FIXED** Fixed ***ADAPTIVE** Adaptive
IPSNWS	B	4	Next send window size for the primary session stage.
IPRNWS	B	4	Next receive window size for the primary session stage.
IPRSPC	B	4	Residual send window pacing count for the primary session stage.
IPRRPC	B	4	Residual receive window pacing count for the primary session stage.
IRSV3	C	26	Reserved.
IPPIUS	C	15	Last path information unit (PIU) sent on the primary session stage.
IRSV4	C	16	Reserved.
IPSRUL	B	9	Length of last request unit (RU) sent on the primary session stage.

Figure D-3 (Page 3 of 3). Fields for Intermediate Session Data			
Field Name	**Type**	**Length**	**Description**
IPPSDT	C	13	Date and time that last PIU on the primary session stage was sent.
IPPIUR	C	15	Last PIU received on the primary session stage.
IRSV5	C	16	Reserved.
IPRRUL	B	9	Length of last RU received on the primary session stage.
IPPRDT	C	13	Date and time that last PIU on the primary session stage was received.
ISCTLN	C	10	Name of controller description associated with the secondary session stage (that is, the controller representing the next closest node to the secondary logical unit).
ISPQUE	B	4	Size of the pacing queue associated with the secondary session stage.
ISSPTP	C	9	Send pacing type for the secondary session stage: ***NONE** None ***FIXED** Fixed ***ADAPTIVE** Adaptive
ISRPTP	C	9	Receive pacing type for the secondary session stage: ***NONE** None ***FIXED** Fixed ***ADAPTIVE** Adaptive
ISSNWS	B	4	Next send window size for the secondary session stage.
ISRNWS	B	4	Next receive window size for the secondary session stage.
ISRSPC	B	4	Residual send window pacing count for the secondary session stage.
ISRRPC	B	4	Residual receive window pacing count for the secondary session stage.
IRSV6	C	26	Reserved.
ISPIUS	C	15	Last PIU sent on the secondary session stage.
IRSV7	C	16	Reserved.
ISSRUL	B	9	Length of last RU sent on the secondary session stage.
ISPSDT	C	13	Date and time that last PIU on the secondary session stage was sent.
ISPIUR	C	15	Last PIU received on the secondary session stage.
IRSV8	C	16	Reserved.
ISRRUL	B	9	Length of last Request Unit (RU) received on the secondary session stage.
ISPRDT	C	13	Date and time that last PIU on the secondary session stage was received.

Endpoint Session Data Record Format

The output file produced for endpoint session data has one record for each session.

Note: The fields containing PIU and pacing data are set only if the session is active, or it if is one of the last five abnormally ended (failed) sessions.

The record format is QLSEND. The fields in the record endpoint session data record are shown in Figure D-4.

Figure D-4 (Page 1 of 4). Fields for Endpoint Session Data

Field Name	Type	Length	Description
ECENT	C	1	Century the data was retrieved and placed in the output file: **0** 20th century **1** 21st century
EDATE	C	6	Date the data was retrieved and placed in the output file.
ETIME	C	6	Time the data was retrieved and placed in the output file.
ESYSNM	C	8	Name of the system where the DSPAPPNINF command was run to create this output file.
ELNET	C	8	Network ID of local node.
ELCPNM	C	8	Control-point name of local node.
EJOB	C	10	Name portion of job name associated with this session.
EUSER	C	10	User portion of job name associated with this session.
ENBR	C	6	Number portion of job name associated with this session.
EPCID	C	8	Procedure correlator ID that identifies the session.
EPNET	C	8	Network ID of node that created the PCID.
EPCPNM	C	8	Control-point name of node that created the PCID.
EMODE	C	8	Name of mode description associated with this session.
ESTAT	C	1	Status of session: **A** Active **E** Ended **B** Failed (abnormally ended)
EBINDL	B	4	Length of BIND command that activated this session (maximum length of BIND is 512 bytes).
EBIND	C	512	BIND command that activated this session.
ERSVA	C	28	Reserved.
EPIUN	B	3	Number of PIUs in PIU list (0-10).
EWPIU1	C	15	PIU 1.
ERSV1	C	15	Reserved.
EWDIR1	C	1	Indicates whether PIU 1 was sent or received: **S** Sent **R** Received.
EWRUL1	B	9	Length of RU associated with PIU 1.
EWDT1	C	13	Date and time that PIU 1 was sent or received.
EWPIU2	C	15	PIU 2.
ERSV2	C	15	Reserved.

Figure D-4 (Page 2 of 4). Fields for Endpoint Session Data			
Field Name	**Type**	**Length**	**Description**
EWDIR2	C	1	Indicates whether PIU 2 was sent or received: **S** Sent **R** Received
EWRUL2	B	9	Length of RU associated with PIU 2.
EWDT2	C	13	Date and time that PIU 2 was sent or received.
EWPIU3	C	15	PIU 3.
ERSV3	C	15	Reserved.
EWDIR3	C	1	Indicates whether PIU 3 was sent or received: **S** Sent **R** Received
EWRUL3	B	9	Length of RU associated with PIU 3.
EWDT3	C	13	Date and time that PIU 3 was sent or received.
EWPIU4	C	15	PIU 4.
ERSV4	C	15	Reserved.
EWDIR4	C	1	Indicates whether PIU 4 was sent or received: **S** Sent **R** Received
EWRUL4	B	9	Length of RU associated with PIU 4.
EWDT4	C	13	Date and time that PIU 4 was sent or received.
EWPIU5	C	15	PIU 5.
ERSV5	C	15	Reserved.
EWDIR5	C	1	Indicates whether PIU 5 was sent or received: **S** Sent **R** Received
EWRUL5	B	9	Length of RU associated with PIU 5.
EWDT5	C	13	Date and time that PIU 5 was sent or received.
EWPIU6	C	15	PIU 6.
ERSV6	C	15	Reserved.
EWDIR6	C	1	Indicates whether PIU 6 was sent or received: **S** Sent **R** Received
EWRUL6	B	9	Length of RU associated with PIU 6.
EWDT6	C	13	Date and time that PIU 6 was sent or received.
EWPIU7	C	15	PIU 7.
ERSV7	C	15	Reserved.
EWDIR7	C	1	Indicates whether PIU 7 was sent or received: **S** Sent **R** Received
EWRUL7	B	9	Length of RU associated with PIU 7.
EWDT7	C	13	Date and time that PIU 7 was sent or received.
EWPIU8	C	15	PIU 8.
ERSV8	C	15	Reserved.

Figure D-4 (Page 3 of 4). Fields for Endpoint Session Data			
Field Name	**Type**	**Length**	**Description**
EWDIR8	C	1	Indicates whether PIU 8 was sent or received: **S** Sent **R** Received
EWRUL8	B	9	Length of RU associated with PIU 8.
EWDT8	C	13	Date and time that PIU 8 was sent or received.
EWPIU9	C	15	PIU 9.
ERSV9	C	15	Reserved.
EWDIR9	C	1	Indicates whether PIU 9 was sent or received: **S** Sent **R** Received
EWRUL9	B	9	Length of RU associated with PIU 9.
EWDT9	C	13	Date and time that PIU 9 was sent or received.
EWPIU0	C	15	PIU 10.
ERSV0	C	15	Reserved.
EWDIR0	C	1	Indicates whether PIU 10 was sent or received: **S** Sent **R** Received
EWRUL0	B	9	Length of RU associated with PIU 10.
EWDT0	C	13	Date and time that PIU 10 was sent or received.
ESPIU	C	15	Last expedited PIU sent on this session.
ERSVS	C	15	Reserved.
ESDIR	C	1	Specifies **S** to indicate that this PIU was sent.
ESRUL	B	9	Length of RU associated with the last expedited PIU sent.
ESDT	C	13	Date and time that the last expedited PIU was sent.
ERPIU	C	15	Last expedited PIU received on this session.
ERSVR	C	15	Reserved.
ERDIR	C	1	Specifies **R** to indicate that this PIU was received.
ERRUL	B	9	Length of RU associated with the last expedited PIU received.
ERDT	C	13	Date and time that the last expedited PIU was received.
ESENSE	C	4	Sense code associated with an UNBIND command or a negative response to a BIND command. This field is only set for failed sessions that abnormally ended because of an UNBIND command or a negative response to a BIND command.
EUBL	B	4	Length of UNBIND command. This field is only set for failed sessions that abnormally ended because of an UNBIND command.
EUBIND	C	90	UNBIND command. This field is only set for failed sessions that abnormally ended because of an UNBIND command.
ERSVB	C	16	Reserved.

Figure D-4 (Page 4 of 4). Fields for Endpoint Session Data			
Field Name	**Type**	**Length**	**Description**
EPACT	C	9	Pacing type: ***NONE** None ***FIXED** Fixed ***ADAPTIVE** Adaptive
EPACQ	B	4	Pacing queue size.
ESWIN	B	4	Next send window size.
ERWIN	B	4	Next receive window size.
ESRES	B	4	Residual send pacing count.
ERRES	B	4	Residual receive pacing count.
ESSDT	C	13	Date and time that the session was started.
ESEDT	C	13	Date and time that the session ended. This field is not set if the session is active.

Appendix E. Conversions

Converting Hexadecimal to Decimal

You can use the following table to convert a decimal number to a hexadecimal number, or to convert a hexadecimal number to a decimal number. Examples of how to use the table are included.

Figure E-1. Decimal and Hexadecimal Conversion

Position 4		Position 3		Position 2		Position 1	
Decimal	**Hex**	**Decimal**	**Hex**	**Decimal**	**Hex**	**Decimal**	**Hex**
0	0	0	0	0	0	0	0
4096	1	256	1	16	1	1	1
8192	2	512	2	32	2	2	2
12288	3	768	3	48	3	3	3
16384	4	1024	4	64	4	4	4
20480	5	1280	5	80	5	5	5
24576	6	1536	6	96	6	6	6
28672	7	1792	7	112	7	7	7
32768	8	2048	8	128	8	8	8
36864	9	2304	9	144	9	9	9
40960	A	2560	A	160	A	10	A
45056	B	2816	B	176	B	11	B
49152	C	3072	C	192	C	12	C
53248	D	3328	D	208	D	13	D
57344	E	3584	E	224	E	14	E
61440	F	3840	F	240	F	15	F

Hexadecimal to Decimal Example

To find the decimal value of hex 1FA, you would find that:

1. In position 3, hex 1 equals decimal 256
2. In position 2, hex F equals decimal 240
3. In position 1, hex A equals decimal 10

By adding these three decimal numbers together, you have the decimal value of hex 1FA.

```
256 + 240 + 10 = 506
```

Figure E-2. Hexadecimal to Decimal Conversion Example

Position 4		Position 3		Position 2		Position 1	
Decimal	**Hex**	**Decimal**	**Hex**	**Decimal**	**Hex**	**Decimal**	**Hex**
0	0	256	1	240	F	10	A

Decimal to Hexadecimal Example

To find the hexadecimal value of decimal 538, you would find that:

1. The next lower decimal number in the table is 512 in position 3. This is equal to hex 2.
2. Then subtract 512 from 538 and use the difference to find the next hexadecimal value.

   ```
   538 - 512 = 26
   ```

3. The next lower number in the table from 26 is 16 in position 2. This is equal to hex 1.
4. Then subtract 16 from 26 and use the difference to find the next hexadecimal value.

   ```
   26 - 16 = 10
   ```

5. The remaining 10 is found in position 1 of the table. This is equal to hex A.

You then combine the positions of the hexadecimal values. Thus, decimal 538 equals hex 21A.

Figure E-3. Decimal to Hexadecimal Conversion Example

Position 4		**Position 3**		**Position 2**		**Position 1**	
Decimal	**Hex**	**Decimal**	**Hex**	**Decimal**	**Hex**	**Decimal**	**Hex**
0	0	512	2	16	1	10	A

Bibliography

The IBM publications listed here contain information about topics described or referred to in this guide. The following manuals are listed with their full title and base order number. When these manuals are referred to in text, a shortened version of the title is used.

AS/400 Manuals

The following AS/400 system manuals contain information you may need when you use AS/400 APPN support.

- *Communications: Advanced Program-to-Program Communications Programmer's Guide*, SC41-8189, provides information for developing communications application programs that use APPC and for defining the communications environment for APPC communications. **Short title:** *Communications: Advanced Program-to-Program Communications Programmer's Guide.*
- *Communications and Systems Management Guide (Alerts and Distributed Systems Node Executive)*, SC41-9661, provides information for configuring an AS/400 system to use the remote management support (distributed host command facility), the change management support (distributed systems node executive), and the problem management support (alerts). **Short title:** *Communications and Systems Management Guide (Alerts and Distributed Systems Node Executive).*
- *Communications: Distribution Services Network Guide*, SC41-9588, provides the information about administering data communications applications on an AS/400 system. It also may be useful for working with data communications on an AS/400 system. **Short title:** *Communications: Distribution Services Network Guide.*
- *Communications: Intersystem Communications Function Programmer's Guide*, SC41-9590, provides the information needed to write application programs that use AS/400 communications and the ICF file. It also contains examples of communications programs and describes return codes. **Short title:** *Communications: Intersystem Communications Function Programmer's Guide.*
- *Communications: Local Area Network Guide*, SC41-0004, contains information on using an AS/400 system in a token-ring network, Ethernet network, or bridged network environment. **Short title:** *Local Area Network Guide.*
- *Communications: Management Guide*, SC41-0024, contains information on working with communications status, communications-related work management topics, communications errors, performance, line speed, and subsystem storage. **Short title:** *Communications Management Guide.*
- *Communications: Operating System/400* Communications Configuration Reference*, SC41-0001, contains general information about configuring such things as lines, controllers, devices, modes, class-of-service, network identifiers, and connection lists. **Short title:** *OS/400* Communications Configuration Reference.*
- *Communications: Remote Work Station Guide*, SC41-0002, contains information about using remote work stations, including the display station pass-through function. **Short title:** *Communications: Remote Work Station Guide.*
- *Communications: X.25 Network Guide*, SC41-0005, contains information on using AS/400 systems in an X.25 network. **Short title:** *Communications: X.25 Network Guide.*
- *Data Management Guide*, SC41-9658, contains information about managing files and creating job queues and output queues. **Short title:** *Data Management Guide.*
- *Device Configuration Guide*, SC41-8106, provides the information for doing an initial configuration and changing that configuration. **Short title:** *Device Configuration Guide.*
- *Distributed Data Management Guide*, SC41-9600, provides information for remote file processing. It tells how to create a distributed file, how to define a remote file to OS/400 DDM, what file utilities are supported through DDM, and the requirements of OS/400 DDM as related to other systems. **Short title:** *Distributed Data Management Guide.*
- *Guide to Programming for Printing*, SC41-8194, contains information on advanced function printing, and provides examples for configuring page printers for use with APPN/APPC communications support. **Short title:** *Guide to Programming for Printing.*
- *National Language Support Planning Guide*, GC41-9877, helps you to understand and use the national language support (NLS) function on the AS/400 system. This guide prepares the AS/400 user to plan, install, configure, and use NLS and a multilingual environment. **Short title:** *National Language Support Planning Guide.*
- *Network Planning Guide*, GC41-9861, provides an overview of network planning tasks, such as determining system or device involvement in the network, ensuring ordering of the proper equipment, defining the software to be used, and defining the procedures for using the communica-

tions network. **Short title:** *Network Planning Guide*.

- *Programming: Control Language Programmer's Guide*, SC41-8077, provides a wide-range discussion of AS/400 programming topics, such as a general discussion of objects and libraries, control language (CL) programming, messages and message handling, user-defined commands and menus, and application testing. **Short title:** *Programming: Control Language Programmer's Guide*.
- *Programming: Control Language Reference*, SC41-0030, provides the application programmer or system programmer with a description of the AS/400 control language (CL) and its commands. Command descriptions include a syntax diagram, parameters, default values, and keywords. **Short title:** *Programming: Control Language Reference*.
- *Programming: Distributed Relational Database Guide*, SC41-0025, provides information on accessing a database stored on one or more remote systems using SQL. **Short title:** *Distributed Database Guide*.
- *Programming: Work Management Guide*, SC41-8078, contains information on how to create and change a work management environment. **Short title:** *Programming: Work Management Guide*.
- *Publications Guide*, GC41-9678, lists manuals in the AS/400 library, and the tasks that are described in the manuals. **Short title:** *Publications Guide*.
- *Security Concepts and Planning*, SC41-8083, provides the system programmer (or person who is assigned the responsibilities of a security officer) with information about system security concepts, planning for security, and setting up security on the system. **Short title:** *Security Concepts and Planning*.
- *System Operator's Guide*, SC41-8082, provides information on starting and stopping the system, using commands, and solving problems. **Short title:** *System Operator's Guide*.

Other AS/400 Printed Information

The information contained in these manuals has not been submitted to any formal IBM test and is distributed on an as is basis without any warranty either express or implied. These manuals are written for a specific release and modification level of the OS/400 licensed program and may not describe all the functions available on your AS/400 system.

The following International Technical Support Center manuals contain information about connecting an AS/400 system in a specific communications network:

- *APPN/Subarea Networking Design and Interconnection Considerations*, GG24-3364
- *AS/400 Communications Definitions Examples*, GG24-3449
- *AS/400, System/38 and PS/2 as T2.1 Nodes in a Subarea Network*, GG24-3420
- *Communications Migration*, GG24-3253
- *IBM AS/400 in Large Networks: A Case Study*, GG24-3447
- *Network Management in a Peer Environment*, GG24-3284
- *Office in a DIA/SNADS Network*, GG24-3268
- *PC Support*, GG24-3255
- *System/3x and AS/400 APPN Nodes Using the SNA/LEN Subarea Network*, GG24-3288

The following AS/400 Systems Support Center newsletters contain information that may be helpful for a specific network consideration:

- *Communications Problem Analysis Tips and Techniques*, GC21-8178
- *Communications with System/36, System/38 System/370: Configuration, Tips, and Techniques*, GC21-8180
- *Examples of APPC Between AS/400 and CICS Newsletter*, GC21-8183
- *PC Support Tips*, GC21-8162
- *Performance and Capacity Planning*, GC21-8175
- *Performance Information Newsletter*, ZC21-8166
- *Planning Communications Migration Tips Newsletter*, GC21-8169
- *System/38 Coexistence*, GC21-8173

PC Support Manuals

The following manuals have information about PC Support, as indicated by the manual titles:

- *PC Support/400: OS/2 Common Tasks and Commands*, SX41-0001
- *PC Support/400: DOS Common Tasks and Commands (PS/55)*, SX41-0005
- *PC Support/400: DOS Installation and Administration Guide*, SC41-0006
- *PC Support/400: OS/2 Installation and Administration Guide*, SC41-0007
- *PC Support/400: OS/2 Common Tasks and Commands (PS/55)*, SX41-0007
- *PC Support/400: DOS Installation and Administration Guide (PS/55)*, SC41-0008
- *PC Support/400: OS/2 Installation and Administration Guide (PS/55)*, SC41-0009
- *PC Support/400: DOS User's Guide (PS/55)*, SC41-2414

- *PC Support/400: OS/2 User's Guide (PS/55)*, SC41-2415
- *PC Support/400: DOS and OS/2 Technical Reference*, SC41-8091
- *PC Support/400: DOS User's Guide*, SC41-8199
- *PC Support/400: OS/2 User's Guide*, SC41-8200
- *PC Support/400: Application Program Interface Reference*, SC41-8254
- *PC Support/400: DOS Common Tasks and Commands*, SX41-9069

Programming Language Manuals

The following manuals supply detailed information on programming languages that are supported by AS/400 APPC/APPN communications:

- *Languages: Systems Application Architecture* C/400* Reference Summary*, SX09-1217
- *Languages: Systems Application Architecture* C/400* User's Guide*, SC09-1347
- *Languages: Systems Application Architecture* AD/Cycle* COBOL/400* Reference*, SC09-1380
- *Languages: Systems Application Architecture* AD/Cycle* COBOL/400* User's Guide*, SC09-1383
- *Languages: Systems Application Architecture* AD/Cycle* RPG/400* Reference*, SC09-1349
- *Languages: Systems Application Architecture* AD/Cycle* RPG/400* User's Guide*, SC09-1348

System/36 Communications Manuals

The following manuals provide detailed information about communications for IBM System/36 systems. Refer to these manuals for information about System/36 requirements when the System/36 is part of AS/400 APPC/APPN supported communications.

- *Advanced Peer-to-Peer Networking Guide*, SC21-9471
- *Distributed Data Management Guide*, SC21-8011
- *Interactive Communications Feature: Base Subsystems Reference*, SC21-9530
- *Interactive Communications Feature: Guide and Examples*, SC21-7911
- *Interactive Communications Feature: Programming for Subsystems and Intra Subsystem Reference*, SC21-9533
- *Using System/36 Communications*, SC21-9082

System/38 Communications Manuals

The following manuals provide detailed information about communications for IBM System/38 systems. Refer to these manuals for information about System/38 requirements when the System/38 is part of AS/400 APPC/APPN supported communications.

- *Data Communications Programmer's Guide*, SC21-7828
- *System/38 Communications Administrator's Guide*, SC21-8035
- *System/38 Distributed Data Management User's Guide*, SC21-8036
- *System/38 Implementation of IBM Communications Architectures*, SC21-8033

Systems Network Architecture (SNA) Hosts

The following manuals provide detailed information about the SNA communications controllers and the network programs. Refer to these manuals for network-dependent information.

- *ACF/NCP/VS NCP (System Support Program) General Information*, GC30-3058
- *ACF/NCP/VS NCP (System Support Program) Installation*, SC30-3142
- *3704/3705/3705-II Communications Controllers Principles of Operation*, GC30-3004

Customer Information Control System/Virtual Storage (CICS/VS): The following manuals provide detailed information on CICS/VS. Refer to these manuals for information on communicating with CICS/VS.

- *CICS General Information*, GC33-0155
- *CICS/VS Application Programmer's Reference Manual (RPG II)*, SC33-0085
- *CICS/DOS/VS Messages and Codes*, SC33-0081
- *CICS/DOS/VS Problem Determination Guide*, SC33-0089
- *CICS/DOS/VS System/Application Design Guide*, SC33-0068
- *CICS/DOS/VS Installation and Operations Guide*, SC33-0070
- *CICS/DOS/VS System Programmer's Reference Manual*, SC33-0069

Advanced Communications Function for Virtual Telecommunications Access Method (ACF/VTAM): The following manuals contain detailed information on ACF/VTAM. Refer to these manuals for information on attaching an AS/400 system to a network with ACF/VTAM.

- *ACF/VTAM Diagnostic Techniques*, SY38-3029
- *ACF/VTAM General Information: Concepts*, GC27-0463
- *ACF/VTAM General Information: Introduction*, GC27-0462
- *ACF/VTAM Installation*, SC27-0468
- *ACF/VTAM Macroinstruction Language Reference*, SC38-0261
- *ACF/VTAM Messages and Codes*, SC27-0470
- *ACF/VTAM Pre-Installation Planning*, SC27-0469
- *ACF/VTAM Programmer's Reference*, SC27-0449
- *ACF/VTAM Program Operator's Guide*, SC38-0257
- *ACF/VTAM System Programmer's Guide*, SC38-0258

Communications Architectures

The following manuals provide information on the communications protocols: SNA via synchronous data link control (SDLC) or X.25 packet-switched data networks, and IBM Token-Ring networks. Refer to these manuals for descriptions of communications protocols.

- *Data Communications: Connecting to a System/370 Using 3270 Device Emulation and Remote Job Entry*, SA21-9987
- *Guide to SNA Publications*, GC30-3438
- *Network Program Products General Information*, GC30-3350
- *SNA Concepts and Products*, GC30-3072
- *SNA Format and Protocol Reference Manual: Architecture Logic*, SC30-3112
- *SNA Format and Protocol Reference Manual: Architecture Logic for LU Type 6.2*, SC30-3269, TNL: SN30-3562
- *SNA LU 6.2 Reference: Peer Protocols*, SC31-6808
- *SNA Type 2.1 Node Reference*, SC30-3422
- *SNA Formats*, GA27-3136
- *SNA Technical Overview*, GC30-3073
- *SNA Transaction Programmer's Reference Manual for LU Type 6.2*, GC30-3084
- *SNA: Sessions Between Logical Units*, GC20-1868
- *IBM Synchronous Data Link Control Concepts*, GA27-3093
- *SNA/Distribution Services Reference*, SC30-3098
- *SNA/File Services Reference*, SC31-6807
- *The X.25 Interface for Attaching IBM SNA Nodes to Packet-Switched Data Networks—General Information Manual*, GA27-3345
- *Token-Ring Network Architecture Reference*, SC30-3374

Systems Application Architecture

The following manual supplies information about CPI Communications:

- *Systems Application Architecture: Common Programming Interface Communications Reference*, SC26-4399.

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