IBM

International Technical Support Centers

NETWORKING SERVICES/2 INSTALLATION, CUSTOMIZATION, AND OPERATION APPN FOR OS/2

GG24-3662-00

Networking Services/2
Installation, Customization, and Operation
APPN for OS/2

Document Number GG24-3662-00

July 28, 1991

International Technical Support Center
Raleigh

Take Note

Before using this information and the product it supports, be sure to read the general information under "Special Notices" on page xv.

First Edition (July 1991)

This edition applies to V1.0 of Networking Services/2, Program Number 5871-AAA for use with the OS/2 Operating System.

Order publications through your IBM representative or the IBM branch office serving your locality. Publications are not stocked at the address given below.

A form for reader's comments appears at the back of this publication. If the form has been removed, address your comments to:

IBM Corporation, International Technical Support Center
Dept. 985, Building 657
P.O.Box 12195
Research Triangle Park, NC 27709

When you send information to IBM, you grant IBM a non-exclusive right to use or distribute the information in any way it believes appropriate without incurring any obligation to you.

Abstract

Networking Services/2 allows any workstation running OS/2 EE to participate in an APPN network.

This document provides information on how to install, customize and operate Networking Services/2 in various APPN topologies.

The intended audience includes those planning to install Networking Services/2 and engineers specializing in OS/2 or networks.

Information about the APPC enhancements included in Networking Services/2 is not the focus of this book.

A knowledge of the APPN architecture and OS/2 Communications Manager is assumed.

CSYS PSYS (297 pages)

Contents

Figures

Special Notices

This publication is intended to help the customer install, customize and operate Networking Services/2 in an APPN environment. The information in this publication is not intended as the specification of the programming interfaces that are provided by Networking Services/2 for use by customers in writing programs to request or receive its services. See the PUBLICATIONS SECTION of the IBM Programming Announcement for more information about what publications are considered to be product documentation.

References in this publication to IBM products, programs or services do not imply that IBM intends to make these available in all countries in which IBM operates. Any reference to an IBM product, program, or service is not intended to state or imply that only IBM's product, program, or service may be used. Any functionally equivalent program that does not infringe any of IBM's intellectual property rights may be used instead of the IBM product, program or service.

Information in this book was developed in conjunction with use of the equipment specified, and is limited in application to those specific hardware and software products and levels.

IBM may have patents or pending patent applications covering subject matter in this document. The furnishing of this document does not give you any license to these patents. You can send license inquiries, in writing, to the IBM Director of Commercial Relations, IBM Corporation, Purchase, NY 10577.

The information contained in this document has not been submitted to any formal IBM test and is distributed AS IS. The use of this information or the implementation of any of these techniques is a customer responsibility and depends on the customer's ability to evaluate and integrate them into the customer's operational environment. While each item may have been reviewed by IBM for accuracy in a specific situation, there is no guarantee that the same or similar results will be obtained elsewhere. Customers attempting to adapt these techniques to their own environments do so at their own risk.

Any performance data contained in this document was determined in a controlled environment, and therefore, the results that may be obtained in other operating environments may vary significantly. Users of this document should verify the applicable data for their specific environment.

The following document contains examples of data and reports used in daily business operations. To illustrate them as completely as possible, the examples contain the names of individuals, companies, brands, and products. All of these names are fictitious and any similarity to the names and addresses used by an actual business enterprise is entirely coincidental.

Reference to PTF numbers that have not been released through the normal distribution process does not imply general availability. The purpose of including these reference numbers is to alert IBM customers to specific information relative to the implementation of the PTF when it becomes available to each customer according to the normal IBM PTF distribution process.

The following terms, which are denoted by an asterisk (*) in this publication, are trademarks of the International Business Machines Corporation in the United States and/or other countries:

ACF/VTAM
AS/400
ES/9000
IBM
MVS/ESA
MVS/XA
NetView
Operating System/2
OS/2
OS/400
Presentation Manager
PS/2
SAA
Systems Application Architecture
VTAM

Preface

This document is intended as a help in installing, customizing and operating Networking Services/2 in an APPN environment.

The focus of this publication is on the APPN functions implemented by Networking Services/2 While some information about APPC enhancements is provided, this publication is not focusing on them. Also, this publication is not intended to be a tutorial on the APPN architecture. Other publications provide tutorial information.

A knowledge of the APPN architecture, the OS/2 EE Communications Manager and the OS/2 environment is assumed.

Purpose

The introduction of Advanced Peer-to-Peer Networking (APPN) into the personal system environment will greatly ease the system definition burden in this environment as well as greatly increase networking flexibility.

With Networking Services/2, a workstation using the OS/2 EE operating system and Communications Manager may participate in an APPN network as a LEN node, end node or network node.

This publication is intended to assist APPN experts, OS/2 Communications Manager experts and beginners with the OS/2 EE operating system in quickly installing Networking Services/2 and customizing it for their needs.

Furthermore, the reader will gain an understanding of the function provided by Networking Services/2 and how to establish new networks as well as how to incorporate it into existing networks.

Audience

This publication is intended for any person who will need to install, customize and operate Networking Services/2:

- Customers:
  - Network designers
  - Network installation staff
  - Network operations
  - PS/2 users
- IBM employees:
  - Network or OS/2 system engineers
  - Sales representatives

Organization

- The first chapter provides information on the intended technical scope of this publication as well as where to go for additional information.
- Chapters 2 through 8 describe how to implement Networking Services/2 in a workstation. They explains the customization of the workstation for various types of connections that may be used and give examples of building an APPN network.
- Chapters 9 through 13 contain miscellaneous OS/2 APPN networking considerations (OS/2 network evolution, network management, performance consideration and debugging).
- The appendixes contain reference files needed to use Networking Services/2. Having these files as well as the definition files from Chapter 7, "Sample Configurations" in only one book will save a lot of time while building a configuration, operating the product or debugging a communications problem.

Chapters

The contents of the chapters are as follows:

- Chapter 1, "Introduction" on page 1 shows the different APPN network topologies used throughout the book. It details the different types of nodes documented in the book. Sections 1.1, "APPC Concepts Overview" on page 1, and 1.2, "APPN Concepts Overview" on page 4, give definitions of terms used in Networking Services/2. For more information refer to the "Related Publications" on page xxi.
- Chapter 2, "Overview of Networking Services/2" on page 13 explains the enhancements brought by Networking Services/2 to the Communications Manager.
- Chapter 3, "Planning Considerations" on page 17 assists in the planning of an APPN network and the preparation for installing Networking Services/2.
- Chapter 4, "Installation Procedures" on page 23 describes the installation and deinstallation of Networking Services/2.
- Chapter 5, "Configuration Procedure" on page 29 explains the relationships between the files used by Networking Services/2 and how to build them.
- Chapter 6, "Using the Presentation Manager Interface" on page 33 shows how to use the Presentation Manager screens of Networking Services/2. Although these screens allow you to define your workstation as a node, this is not discussed here in detail but in the following chapter.
- Chapter 7, "Sample Configurations" on page 57 describes step by step how to define any type of node with any type of connection with the Presentation Manager panels. Furthermore, you will find useful information about each type of configuration. If you don't know how to customize your node or if you are not sure of what you get with a selection proposed in a panel, this chapter will give you the answer. Use this chapter as a reference.
- Chapter 8, "Defaults Supplied by Networking Services/2" on page 111 lists the defaults for Networking Services/2.
- Chapter 9, "Network Design Evolution" on page 117 describes how to make your current network take the maximum advantages of Networking Services/2.

- Chapter 10, "Management Services" on page 123 discusses management considerations in the Networking Services/2 environment.
- Chapter 11, "AS/400 Considerations" on page 131 provides information that is useful to those who are connecting Networking Services/2 with AS/400 systems.
- Chapter 12, "Performance Study" on page 161 provides some benchmark comparisons between Networking Services/2 and the Communications Managers APPC.
- Chapter 13, "Debugging" on page 177 lists basic checks to do when you get in trouble. Then it explains how to use the tracing facilities.

Audience

The chapters that will be of the most interest to the following groups of people are:

- **Everyone** should read:

  Chapter 3, "Planning Considerations" on page 17,
  Chapter 4, "Installation Procedures" on page 23, and
  Chapter 5, "Configuration Procedure" on page 29.

- **Newcomers to APPN and APPC** should read:

  Chapter 1, "Introduction" on page 1.

- **PS/2 users** should read:

  Chapter 6, "Using the Presentation Manager Interface" on page 33.

- **Communications Manager specialists** should read:

  Chapter 2, "Overview of Networking Services/2" on page 13.

- **People connecting to AS/400s** should read:

  Chapter 11, "AS/400 Considerations" on page 131.

- **Support personal (designers, planners, installation staff, operations)** should read:

  Chapter 9, "Network Design Evolution" on page 117,
  Chapter 10, "Management Services" on page 123,
  Chapter 11, "AS/400 Considerations" on page 131,
  Chapter 12, "Performance Study" on page 161, and
  Chapter 13, "Debugging" on page 177.

- Useful reference chapters include:

  Chapter 7, "Sample Configurations" on page 57, and
  Chapter 8, "Defaults Supplied by Networking Services/2" on page 111.

Related Publications

The following publications are considered particularly suitable for a more detailed discussion of the topics covered in this document.

Prerequisite Publications

- *IBM Operating System/2* Extended Edition Version 1.2 End User Publications*, (S01F-0285-00) or *IBM Operating System/2 Extended Edition Version 1.3 End User Publications*, (S01F-0289-00) contains the publication set provided with the OS/2 program package. In this set you may find useful:
  - *IBM Operating System/2 Getting Started*
  - *IBM Operating System/2 Extended Edition Version 1.x User's Guide, Volume 2: Communications Manager*
- *APPN Architecture and Product Implementation*, GG24-3669

Additional Publications

Networking Services/2 Publications

- *Networking Services/2 Installation and Network Administrator's Guide*, SC52-1110
- *Networking Services/2 System Management Programming Reference*, SC52-1111
- *Networking Services/2 APPC Programming Reference*, SC52-1112
- *Networking Services/2 Problem Determination Guide*, SC52-1113
- *Networking Services/2 License Information*, SC52-1114

OS/2 Publications

- *OS/2 Extended Edition Version 1.2 System Administrator's Guide for Communications*, S01F-0261 (can no longer be ordered)
- *OS/2 Extended Edition Version 1.3 System Administrator's Guide*, G01F-0302
- *OS/2 Extended Edition Version 1.2 APPC Programming Reference*, S01F-0263
- *OS/2 Extended Edition Version 1.3 APPC Programming Reference*, S01F-0295

SNA Architecture Publications

- *IBM SNA Technical Overview*, GC30-3073
- *SNA Format and Protocol Reference Manual: Architecture Logic for LU Type 6.2*, SC30-3269
- *SNA Format and Protocol Reference Manual: Architecture Logic for Type 2.1 Nodes*, SC30-3422
- *SAA Common Programming Interface Communications Reference*, SC26-4399-03

- *IBM Systems Network Architecture Management Services Reference,* SC30-3346-03

AS/400 Publications

- *AS/400 PC Support: Technical Reference,* SC21-8091
- *AS/400 PC Support: Messages and Problem Analysis Guide,* SC21-8093
- *AS/400 PC Support: DOS Planning and Installation Guide,* SC21-8195
- *AS/400 PC Support: OS/2 Planning and Installation Guide,* SC21-8196
- *AS/400 PC Support: DOS Operations Reference,* SC21-8197
- *AS/400 PC Support: OS/2 Operations Reference,* SC21-8198
- *AS/400 PC Support: DOS User's Guide,* SC21-8199
- *AS/400 PC Support: OS/2 User's Guide,* SC21-8200
- *AS/400 Communications: User's Guide,* SC21-9601
- *AS/400 Communications: Advanced Peer-to-Peer Networking User's Guide,* SC21-8188
- *AS/400 Communications: Communications and Systems Management User's Guide,* SC21-9661

Other ITSC Publications

- *AS/400 PC Support,* GG24-3255
- *AS/400 PC Support under OS/2 Extended Edition Version 1.2,* GG24-3446
- *AS/400 Network Management in a Peer Environment,* GG24-3284
- *Management of AS/400 in Subarea Network using NetView Products,* GG24-3289
- *AS/400 Advanced Peer-to-Peer Networking (APPN),* GG24-3287

Acknowledgements

The advisor for this project was:

Jeff Carley
International Technical Support Center, Raleigh

The authors of this document are:

Henri Communal
IBM France

Claudio Rinaldi
IBM Brasil

Portions of this document were also contributed by:

Jeff Carley
International Technical Support Center, Raleigh

Thomas Rowe
IBM Networking Systems, Research Triangle Park, North Carolina

Brian Smith
International Systems Center, Gaithersburg

This publication is the result of a residency conducted at the International Technical Support Center, Raleigh.

Thanks to the following people for the invaluable advice and guidance provided in the production of this document:

Ray Collins
Shawn Walsh
Gail Wojton
International Technical Support Center, Raleigh

Lance Bader
Charles Burton
Chris Forte
John Mitchell
Gary Weichinger
Rich Wittmer
IBM Networking Systems, Research Triangle Park, North Carolina

Gary Shea
IBM United States, Gaithersburg, Maryland

Chapter 1. Introduction

Networking Services/2 greatly enhances the networking capabilities of personal workstations by providing Advanced Peer-to-Peer Networking (APPN) capability for systems running the OS/2* EE operating system. APPN provides a flexible routing scheme that improves network availability, determines the "best" route for exchanging data within a network and reduces the amount of configuration information the customer needs to define. In APPN all computers are treated as peers in a network, enabling customers to access data located anywhere in a network. Networking Services/2 also improves the performance of Advanced Program-to-Program Communications (APPC) and provides the Systems Application Architecture* (SAA*) Common Programming Interface for Communications (CPI-C) as well as an enhanced version of the APPC API available in Communications Manager. Networking Services/2 also significantly increases the ease-of-use of APPC in the OS/2 environment.

This document focuses on information about the APPN functions provided by Networking Services/2 in the OS/2 implementation. It is intended to assist customers in installing, customizing and operating Networking Services/2 through its Presentation Manager* interface.

This document does not focus on the APPC improvements or the programming interfaces for APPC. Information about the APPC programming interface can be found in the *IBM SAA Networking Services/2 APPC Programming Reference*. Information about the CPI-C programming interface can be found in Version 3 or later of the *SAA Common Programming Interface Communications Reference*. The appendix for Networking Services/2 will not be in a version earlier than Version 3.

This document also does not provide a tutorial on the Advanced Peer-to-Peer Networking architecture. An excellent tutorial on APPN can be found in the *APPN Architecture and Product Implementation* publication as well as an overview of the various product implementations of APPN.

1.1 APPC Concepts Overview

While a tutorial on APPC and APPN will not be presented, understanding of some basic terms and concepts will assist the APPC and APPN novice in understanding the functions provided by Networking Services/2.

The following are some APPC concepts that are used in NS/2.

Adapter

Physical communication device that is installed in the workstation. It may have a number if there are many of the same type.

Alias

Designates a resource instead of its real name.

Attach Manager

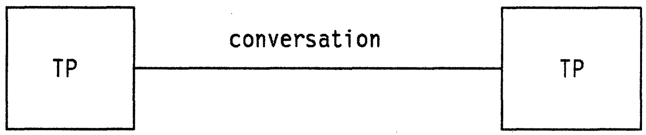
Part of the subsystem that starts a local remotely startable transaction program. When its status is "active" then a local transaction program may be started by a remote transaction program.

Class of Service

Set of information that is used to select the route that is acceptable for a session request and find the best available path.

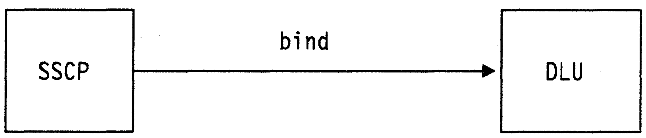
Conversation

Communications session between two transaction programs. A session may only support one conversation at a time.



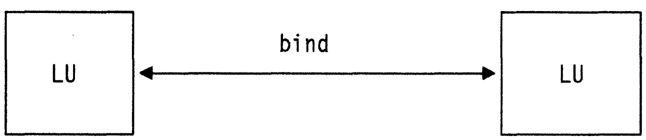
Dependent LU

An LU that depends on a host to be activated.



Independent LU

An LU that performs communications that do not require a host to send the bind.



Link

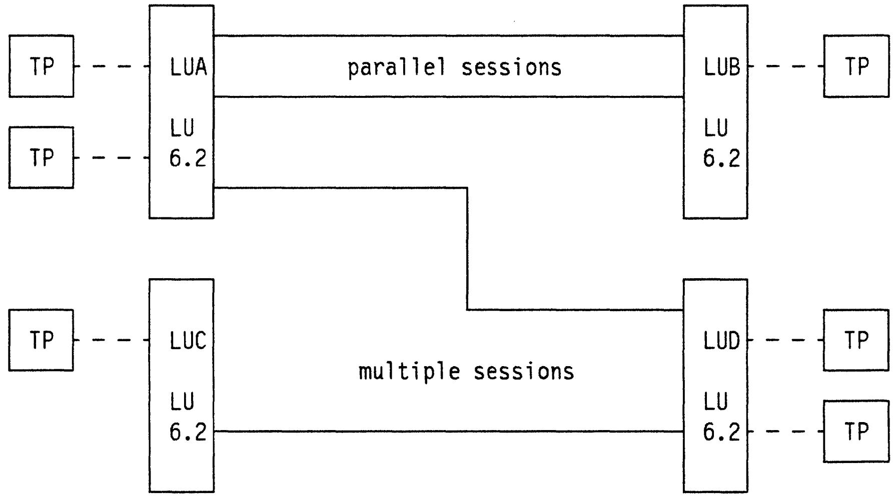
A logical link between two nodes.

Link Station

A control block (piece of storage) on the adapter. One link station is needed for one conversation or for one session.

LU Type 6.2

This is the only type of LU that can be "independent." When it is independent it supports multiple and parallel sessions.



LUA has multiple sessions (three sessions). The sessions with LUB are parallel sessions.

Mode

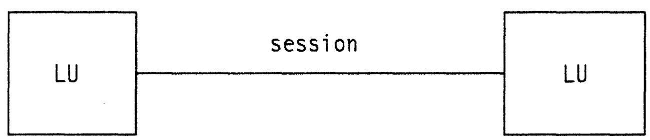
Defines session characteristics such as the size of the smallest message to be exchanged on a session. The mode also implies a "class of service."

Partner LU

An LU that the local LU wants to communicate with.

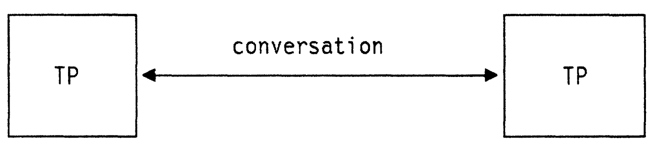
Session

A session is a path between two LUs that carries data. A session may only support one conversation at a time.



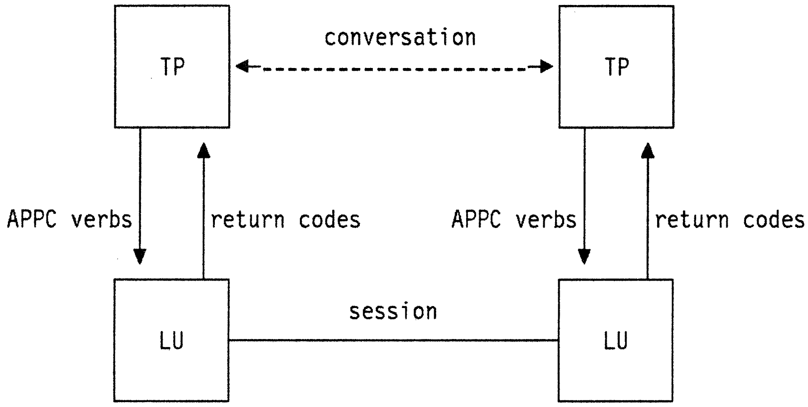
Transaction Program

Program that uses APPC to exchange information with another program.



Relationship between TPs and LUs

A TP will communicate with another TP by issuing verbs to its LU. That LU will communicate with the partner LU and will pass the information being communicated to the partner TP when the partner TP issues the appropriate verbs. The TPs will have a conversation by means of a series of such verbs being issued to the LUs.



1.2 APPN Concepts Overview

The following are some APPN concepts that are used in Networking Services/2:

APPN

Advanced peer-to-peer networking nodes provide a set of functions and protocols for participation in a peer-to-peer decentralized network.

A node in which APPN is fully implemented may only contain the definitions of its own resources (LUs, links to its neighbors) and will dynamically learn about the location and resources of the other nodes in the network.

T2.1 Node

Allows direct communication between two similar nodes without needing assistance from an SSCP in establishing the connection.

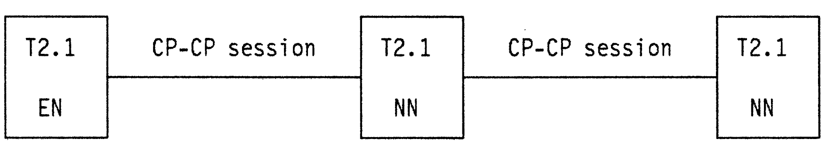
Control Point

Is responsible for managing the node and its resources and, in an APPN end node, for communicating with an adjacent network node server's control point to obtain APPN network services.

A control point is an LU and it may be the only LU of the node. **Whenever it is possible the CP should be the only LU of the node**. This saves resources in the node and the CP-LU name is more widely known. The CP-LU name for network nodes is in the topology database kept in every node and the CP-LU for an end node is known by the network node server.

CP-CP Sessions

To perform directory services and topology and route selection services, adjacent APPN network nodes throughout the APPN network use a pair of parallel CP-CP sessions to exchange network information and APPN end nodes get access to these services via a pair of CP-CP sessions with there network node server. Here are the two possible kinds of CP-CP sessions:

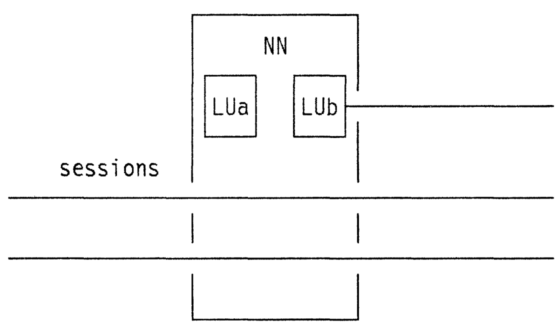


Network Node

A node capable of providing full APPN function can:

- Participate in network-wide distributed directory searches for LUs, caching search results, and directed verification of continued LU availability to the network. The APPN architecture allows these searches to be extended in the future to include a wide range of resource types, such as transaction programs and user IDs.
- Broadcast a network topology database update to other APPN network nodes whenever its own load level or the state of one of its local links changes significantly. In this way, every APPN network node has a copy of the network topology database (with information on network nodes and links between them).
- Dynamically compute session routes through an APPN network, based on the current topology information, the locations of the session partners, and the requested classes of service.
- Provide necessary DLC signaling information to APPN end nodes connected to a shared-access transmission facility, such as a token-ring LAN.
- Support intermediate session routing. This includes the activation/deactivation of session routes through an APPN network, as well as the hop-by-hop pacing and segmenting of session traffic.
- Provide management services support. This includes the ability to be defined as a management services entry point or focal point for network problem management.

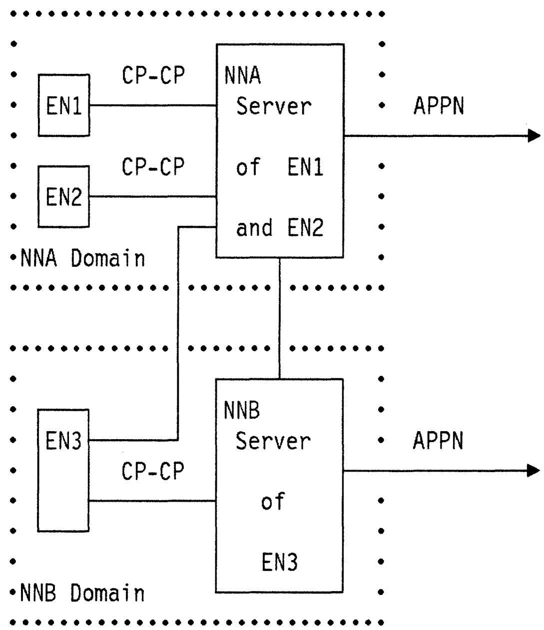
As the following diagram illustrates, a network node can be both the end point of sessions as well as provide the intermediate session routing.



Network Node Server

A network node whose role is to provide network services (directory services, route selection services, etc.) for specific end nodes attached to it. These end nodes are defined as being in its domain.

It receives resource registration messages from the APPN end nodes in its domain.



In this example an LU of the APPN network can locate EN3 and its LUs only through EN3's server NNB. EN3 can search for another LU only through its server NNB. Once the partner LU is located, the calculated route for the session may use the link from EN3 to NNA or the link form EN3 to NNB depending on which was considered to be preferred at that time for the class of service being used.

End Node

Operates in a peer environment for LU-LU sessions while providing additional APPN functions:

- Selecting an APPN network node to be its network node server.
- Dynamically registering its LUs with its network node server.
- Allowing itself to be searched for LUs that it chooses not to register with the network. Generic or wild-card entries can also represent the end node's resources at the server to reduce the directory load.
- Submitting distributed directory search requests to its network node server, and obtaining session-route calculations from its server when initiating LU-LU sessions.
- Supporting parallel links to other APPN nodes in an APPN network.

LEN Node

A low entry node implements the basic T2.1 end node protocols without the APPN enhancements obtained through CP-CP sessions.

A node capable of peer-to-peer communication, but unable to make direct use of the APPN functions contained within a network node server.

Primary Host

A S/370 or ES/9000*-based host containing a focal point (for example NetView*).

Sample APPN Network

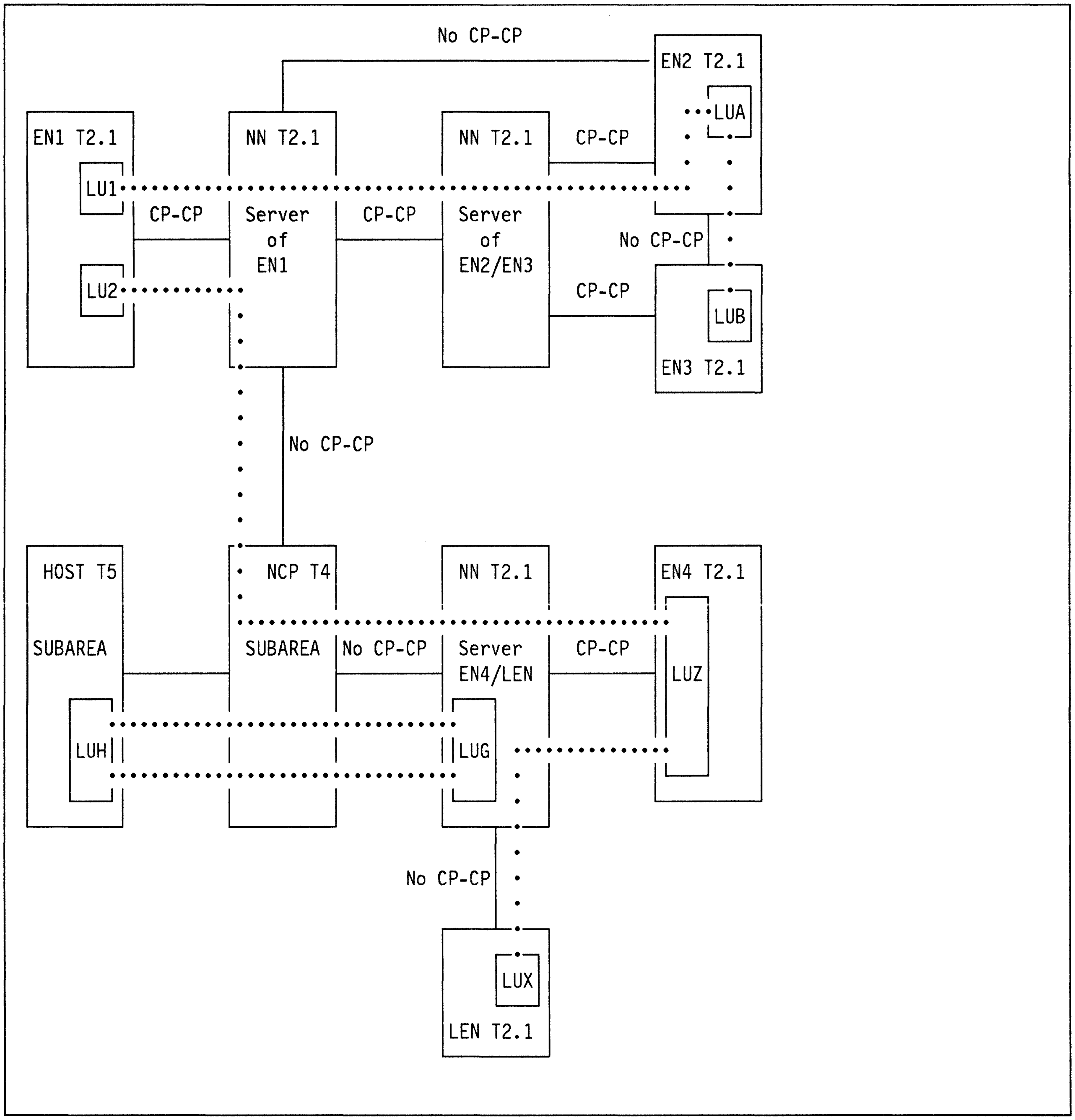


Figure 1. The following is an Example of an APPN Network

In this sample network there are six active sessions:

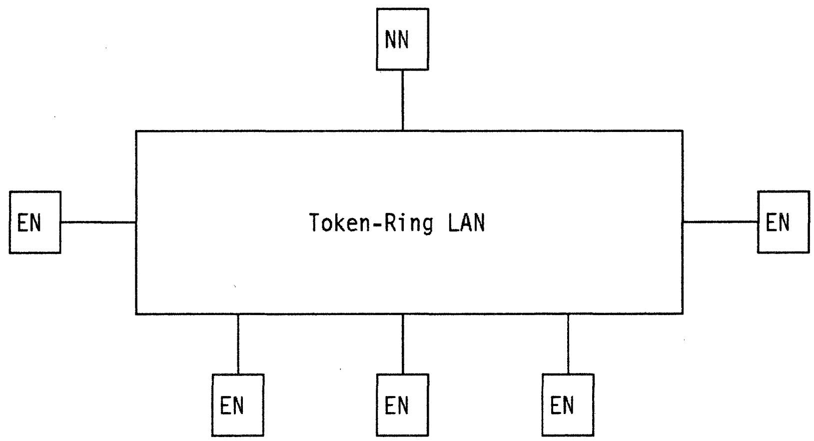
- LU1--LUA
- LUA--LUB
- LU2--LUZ
- LUX--LUZ
- LUH--LUG
- LUH--LUG

If APPC application programs were written and placed properly, any node in this network could directly communicate with any other.

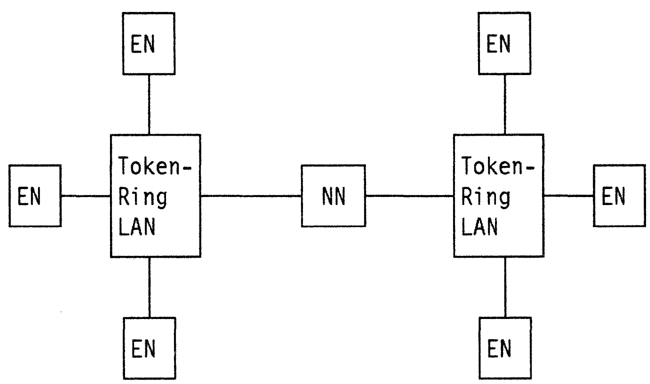
1.3 Test Environments Established

The following test environments were set up to obtain much of the information contained in this publication:

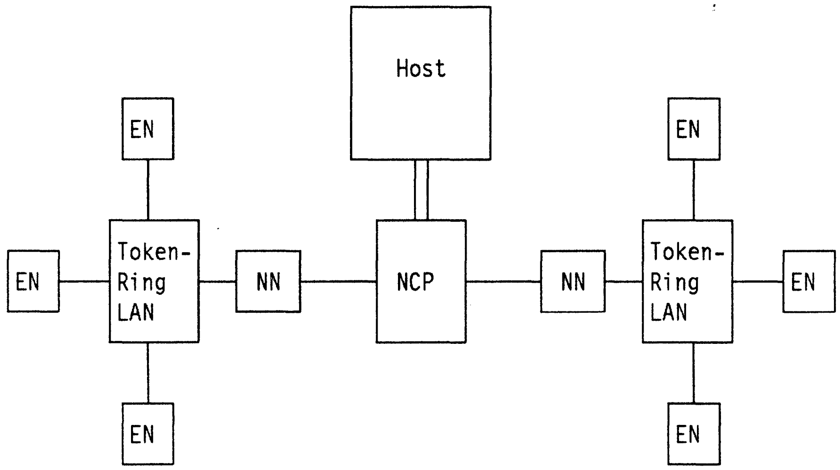
- An NS/2 network node with token-ring LAN-attached NS/2 end nodes:



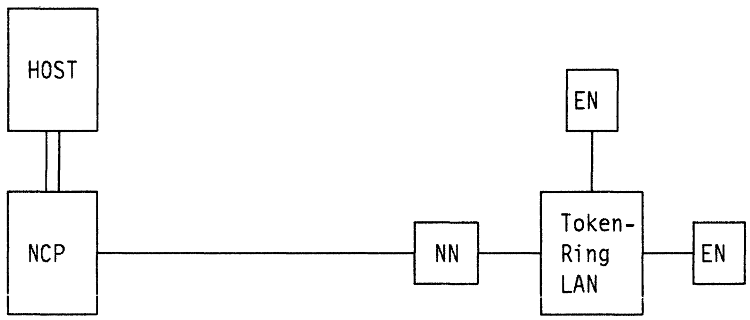
- An NS/2 network node with two token-ring LAN-attached NS/2 end nodes, each on a different token-ring LAN:



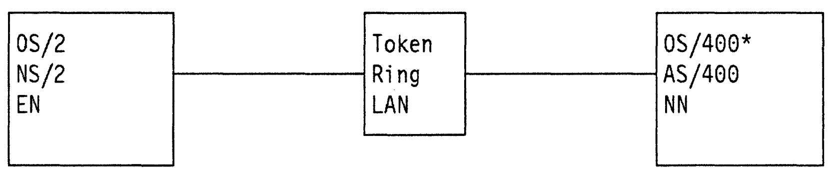
- Two NS/2 network nodes, connected through a subarea network, each with token-ring LAN-attached end nodes:



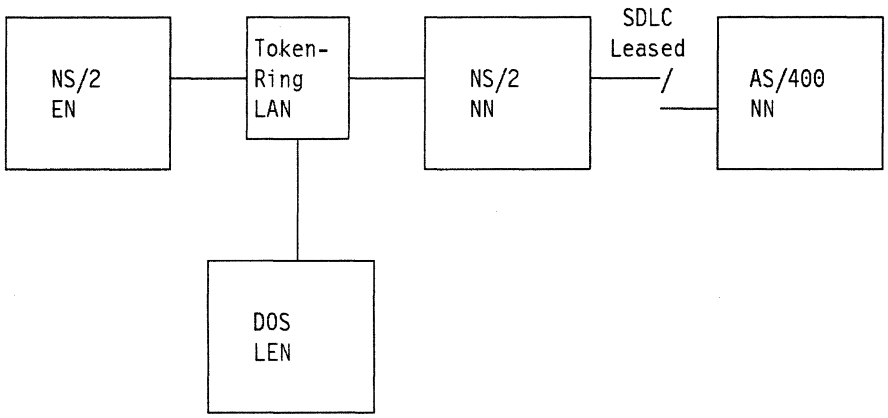
- An NS/2 network node, with token-ring LAN-attached NS/2 end nodes, attached to a subarea network:



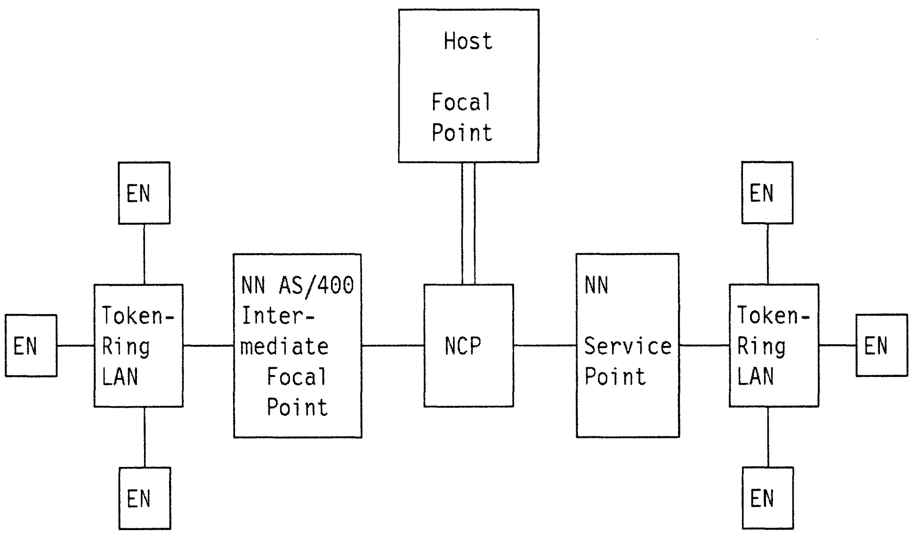
- An NS/2 end node token-ring LAN-attached to an AS/400* network node:



- An NS/2 network node with a token-ring LAN-attached NS/2 end node, a token-ring LAN-attached DOS LEN node and an SDLC-attached AS/400 network node:



- An AS/400 used in an APPN network as an intermediate focal point, with a focal point in a host:



1.4 Connection Types Documented in this Publication

This publication describes how to configure many of the different types of connections that would be needed in building a complex APPN network. For the most part, building the complex network consists of knowing how to configure each of the separate types of connections. This publication will give examples of the following types of node configurations:

1. An NS/2 end node migrated from an existing Communications Manager APPC configuration
2. A direct peer-to-peer connection to an LU in another adjacent node
3. An NS/2 network node providing network node services to end nodes
4. An NS/2 end node in the domain of a network node server
5. An NS/2 end node attached to a network node but not receiving network node services from that node
6. A NS/2 network node acting as a server for a LEN node

7. A NS/2 end node served by a network node but without CP-CP session and thus seen as a LEN node
8. An NS/2 network node connected to another network node
9. An NS/2 network node connected to another network node through a subarea
10. An NS/2 node connection to a host that contains LU 6.2 LUs
11. An NS/2 node connection to a primary host (host with a focal point).
12. An NS/2 end node connected to an AS/400 network node
13. An NS/2 network node connected to an AS/400 network node via SDLC
14. An NS/2 network node connected to an AS/400 network node through a subarea.

Chapter 2. Overview of Networking Services/2

Highlights

Networking Services/2 is an implementation of the SNA subsystem components for OS/2 EE Versions 1.2 and 1.3. This includes implementations of Advanced Peer-to-Peer Networking (APPN) protocols and Advanced Program-to-Program Communications (APPC) protocols. Networking Services/2 Version 1.0's implementation of APPC and APPN provides for LU 6.2 communications that is faster and easier to configure than was previously possible with OS/2 EE's Communications Manager alone. In addition, the APPC enhancements and APPN improve the usability of APPC with OS/2. Specifically, Networking Services/2 offers:

- APPN end node and network node support
- SAA Common Programming Interface Communications (CPI-C)
- APPC performance improvements - In the token-ring LAN environment, many applications see a 100% or more improvement in the speed of their communications over what they experienced with OS/2 EE Versions 1.2 and 1.3 without NS/2.
- Easier configuration - end node setup can require as few as two or three parameters
- New configuration process for SNA parameters
  - Presentation Manager-based panel input
  - Editable ASCII Networking Services/2 node definition files (.NDF)
  - API for dynamic configuration changes while APPC remains active
- Reduced system definition
  - Predefined modes and classes of service
  - Implicit partner LUs (inbound and outbound)
  - Implicit modes (inbound and outbound)
  - Ability to define default LU, mode and TP characteristics
  - Discovery of partner LU locations (via APPN)
  - Discovery of partner LU LAN addresses (via APPN)
- Local/remote transparency (partner LU in the same node)
- APPC improvements
  - Automatic initialization of session limits (via implicit CNOS)
  - New SEND_CONVERSATION and MC_SEND_CONVERSATION verbs
  - Improved diagnostics for allocation failures with sense data
- Management Services (MS) enhancements
  - API for user-written MS applications
  - Multiple Domain Support routing in the APPN network
  - APPN/subarea focal point transparency at MS API

  - "Pseudo" alert focal point support for served end nodes to subarea focal point
  - Held alerts for temporary loss of focal point
- Sample configuration files
- Sample programs:
  - APPCMGMT - Management sample program. Issues verbs such as Deactivate Logical Link and Deactivate Session (written in the C language).
  - APPCTELL - Sends a VIOPopUp message to the specified partner LU (written in the C language).
  - CPICOBOL - Samples from the *SAA Common Programming Interface Communications Reference* (written in the COBOL language).
  - CPICFILE - File transfer sample using CPI-Communications (written in the C language).
  - CPICREXX - Set and extract CPI-Communications side information from REXX.
  - DISPLAY - Requests and formats information using the DISPLAY and DISPLAY_APPN verbs. Both command line and PM versions are included (written in the C language).
  - FILE - File transfer sample using APPC (written in the C language).
  - FILECFG - Configuration sample program. Issues verbs such as Define Local LU and Define TP (written in the C language).
- Tools
  - Simplified tracing via CMTRACE and sample APPNT.CMD
  - Trace formatter via FMTTRACE and sample APPNF.CMD
  - Header include files for APPC verbs (C, COBOL, ASM and Pascal)
  - Header include files for CPI-Communications calls (all SAA CPI-Communications languages currently supported by OS/2)

Existing APPC applications need not be modified to take advantage of Networking Services/2 function.

Networking Services/2 also provides a migration utility to convert your existing Communications Manager configuration files to the new Networking Services/2 configuration files.

Performance

- LU 6.2 performance enhancements are in three main areas: new LAN DLC, a new OS/2 Frame Manager, and scrubbing of the internal code. As part of the APPN architectural additions, new "adaptive pacing" and "segmenting" help provide the maximal throughput among machines with different capacities.

Usability

- By taking advantage of APPN dynamics and judiciously applying defaults, Networking Services/2 is able to reduce the required user-configured parameters for LU 6.2 from around 50 to only three parameters, for an end node. SNA configuration information can be stored in a text file. This allows easy migration of configurations and makes it easy to modify a configuration with a text editor or through a program written by the user. In addition, most configuration verbs can be issued from the API, allowing dynamic change of the SNA configuration while Networking Services/2 is running. Changes can be activated without bringing down Communications Manager, only by specifying parameters when using the Networking Services/2 utility programs.
- For users who don't care to deal with the text files, a Presentation Manager-based configuration utility guides these users through the essential steps of setting up their workstation for Networking Services/2.
- For two transaction programs to talk to one another within one machine, the Communications Manager used to need either the LOCALDLC package or two adapter cards. With Networking Services/2, transaction programs can communicate as easily with local programs as with remote programs. **No adapter cards are required for "within-machine" communication**.

Networking Services/2 and Communications Manager

Networking Services/2 is not a replacement for OS/2 EE Communications Manager, but rather works with Communications Manager to provide new function and improved performance. Some of the SNA components of Communications Manager have been replaced by NS/2 while other components are used by NS/2.

- NS/2 replaces the LAN DLC component while the remaining Communications Manager DLCs will be used (SDLC, Twinaxial, and X.25). All of the DLCs are configured using the Communications Manager menus.
- NS/2 provides the support for the SNA gateway as well as the LU types (LU0, LU1, LU2, and LU3 and LU 6.2). The SNA gateway support and the LU application (LUA) profiles are still configured using Communications Manager menus.
- NS/2 uses the message logs and error logs that are a part of Communications Manager. It also uses the trace and dump files of Communications Manager. The message and error log files are viewed via the Communications Manager menus. The trace and dump facilities can be started using the Communications Manager menus or NS/2.
- Subsystem management can use either the Communications Manager menus or the NS/2 subsystem management verbs.
- APPC and APPN configuration is accomplished via NS/2. The definitions are entered in an ASCII file (.NDF). From this ASCII file the NS/2 verification program creates a binary file (.CF2) that is used during operation. For more information about the configuration files used by Communications Manager and NS/2 see section 5.1, "The Configuration Files" on page 29.

Chapter 3. Planning Considerations

This chapter gives an overview of hardware considerations, and software prerequisites as well as some suggested planning activities before installing Networking Services/2. However, for more detailed information consult the *OS/2 System Administrator's Guide* and the *IBM SAA Networking Services/2 Installation and Networking Administrator Guide*.

3.1 Hardware Considerations

The OS/2 workstation on which you plan to install Networking Services/2 should meet the basic hardware requirements described in the *OS/2 System Administrator's Guide*.

Hard Disk Storage

Networking Services/2 installation requires the following amount of fixed disk space:

1. If you do not install the sample programs and headers, you must have:

   3.4MB free on the target drive.

   - 2.7MB for files to be installed.
   - 700KB for temporary installation process overhead.

2. If you install only the samples and header include files, you must have:

   2.2MB free on the target drive.

   - 2.1MB for files to be installed.
   - 100KB for temporary installation process overhead.

3. If you install both, you must have:

   2.7MB free on the target drive and 2.2MB free on the drive chosen for the samples.

   - 2.7MB for the base code to be installed.
   - 2.1MB for the samples to be installed.
   - 100KB is for temporary installation process overhead. (The 700KB process overhead needed for code installation is taken out of the 2.1MB for the samples before the samples are installed.)

Networking Services/2 Memory Suggestions

There are many different operational factors that can affect your memory requirements. These include:

- Number of concurrent user sessions
- Amount of data to be sent and received
- RU sizes
- Type of pacing on adjacent nodes
- Node type (end node or network node)
- Number of end nodes supported

- Non-SNA communications
- Other OS/2 programs.

Networking Services/2 will use adaptive pacing whenever possible to make the best use of the memory available to it. Here are some suggestions to assist in estimating the amount of memory a PS/2 should have for running Networking Services/2 when adaptive pacing is used (the adjacent nodes are NS/2 nodes or AS/400s) and RU sizes of 2KB to 4KB are used. For more information on estimating memory requirements for OS/2 see the *OS/2 System Administrator's Guide*. These estimates should be added to the estimates for the rest of the system.

1. Add 1.8MB of storage for APPC/APPN communications to start with.
2. For each 75 end sessions (the LU is in this workstations) or 100 intermediate sessions (this is an intermediate routing node for these sessions) add an additional .5MB for NS/2 (this does not include application data buffers).
3. Network Nodes should add an additional 1MB for every 32 end nodes being supported.

These storage suggestions are without any other concurrent running programs. You should add requirements for other concurrent programs to these numbers.

Here is an example of an end node:

An end node supporting 15 concurrently active end point sessions.

OS/2 EE	3.0MB
Communications Manager and NS/2	2.5MB
15 End Sessions	0.1MB
Total	5.6MB

Here are some examples for network nodes:

A network node supporting 32 end nodes and up to 300 concurrently active intermediate sessions.

OS/2 EE	3.0MB
Communications Manager and NS/2	2.5MB
32 End Nodes supported	1.0MB
300 Intermediate Sessions	1.5MB
Total	8.0MB

A network node supporting 64 end nodes and up to 500 concurrently active intermediate sessions.

OS/2 EE	3.0MB
Communications Manager and NS/2	2.5MB
64 End Nodes supported	2.0MB
500 Intermediate Sessions	2.5MB
Total	10.0MB

A network node supporting 128 end nodes and up to 1000 concurrently active intermediate sessions.

OS/2 EE	3.0MB
Communications Manager and NS/2	2.5MB
128 End Nodes supported	4.0MB
1000 Intermediate Sessions	4.0MB
Total	14.5MB

Processor Recommendations

An OS/2 system can be a Networking Services/2 end node. For network nodes that are going to be doing intermediate routing it is suggested that you use an 80386-based processor. If you are going to fully load the network node with 128 end nodes it is recommended that you use an 80486-based processor.

3.2 Software Requirements

Before you can install Networking Services/2 you must have:

1. OS/2 EE 1.2 or 1.3 installed on your machine
2. The Communications Manager installed
3. APPC configured and installed.

   APPC is installed if the APPC.DLL file is in your C:\CMLIB\DLL directory or if there is a C:\CMLIB\APPN directory, which would mean that Networking Services/2 has been previously installed.

   If APPC is not installed, please read "Installing and Configuring APPC" on page 23 for instructions on how to install it.
4. If your workstation is on a LAN, the LAN must be configured and installed.

This means that the Communications Manager has added a line "DEVICE=C:\CMLIB\LANDD.SYS" where C: is the disk letter where Communications Manager was installed.

Specifying IBMTRNET, IBMPCNET, or ETHERNET when installing the Communications Manager will insert the line and copy LANDD.SYS to C:\CMLIB.

3.3 Planning Considerations

As with any communications network, planning is key to an efficient APPN network. There are several things to keep in mind while planning your network.

Dedicated Network Nodes

Networking Services/2 does not restrict network nodes to network activities only. An end user can also be using that workstation. This might be fine if the network node is only providing a *directory service* for end nodes (for instance on a token-ring LAN). If, however, the network node is being used for intermediate session routing, the time slicing of OS/2 turns out to be rather disruptive to a human user and should probably be avoided.

Network Names

All of the nodes in the APPN network must have the same *NETID*. Two nodes will only communicate if they have the same *NETID* unless they go though an SNI gateway. You will want to make sure all your APPN nodes specify the same *NETID*.

Control point names and connection network names are a part of the NAU name space and in places will need to unique among NAU names (including LU names) within the network. All NAU names must be unique within the network.

3.4 Definition Considerations

Partner LU Definitions

Without NS/2 on the workstations you need to define every partner LU on every workstation even if the workstation is attached to an NS/2 network node. If you make the workstations NS/2 end nodes you do not need to define any partner LUs on the workstations if your transaction programs specify fully-qualified LU names for the partner when they do the attach. If they will be specifying aliases, then the partner LUs will still have to be defined. So, if at all possible, you want the TPs to specify fully- qualified LU names.

Partner Location

A network node is responsible for determining the location of the partner LU. If the workstations are not NS/2 end nodes then at the network node you will have to define what LUs are on each workstation. If the workstations are NS/2 end nodes, however, the network node will dynamically learn what LUs are on the end nodes. The subarea, unfortunately, is seen as a LEN node so you have to define on the network node every LU you want to communicate with in the subarea. This is where a WILDCARD can help you. The WILDCARD in effect says if it isn't found anywhere else, it is across this link. Of course typos or non-existent LUs will be "found" across that link and a BIND will be sent into the subarea. A little structuring of your LU names, however, might allow you to use partial WILDCARDs. A partial WILDCARD allows you to request to send anything that starts with "sub" across this link if you don't find it anywhere else. Partial WILDCARDs are definitely preferable over full WILDCARDs so structure your LU names to be able to use them if at all possible.

Chapter 4. Installation Procedures

In this chapter we will briefly describe the installation and the deinstallation of Networking Services/2.

4.1 Installing Networking Services/2

This section is intended to augment the installation guide.

Installing and Configuring APPC

First review Chapter 3, "Planning Considerations" on page 17 if you have not already done so and verify that you have met the requirements for installing Networking Services/2.

If APPC is already installed (APPC.DLL is in C:\CMLIB\DLL\) then go to "Conducting the Installation of Networking Services/2" on page 24.

We assume that Communications Manager is installed in your machine. If not refer to the *OS/2 Extended Edition/Installation Guide.*

Go to the Communications Manager Primary Menu and add APPC definitions to your current configuration file (here we call it CONFIG.CFG):

1. From the Communications Manager Primary Menu, do the following:

   Select `Advanced`

   Select `Configuration...`

   Keep your current configuration file `(CONFIG)`.

   In the Communication Configuration menu specify the proper DLC parameters in the required DLC profiles.

2. Select `SNA feature profiles`
3. Create the required SNA `Data Link Control (DLC) profiles...`

   Create dummy profiles for:

   a. `SNA Base profile`
   b. A local LU profile `(APPC logical unit (LU) profiles...)`
   c. A partner LU profile that uses the SNA link defined in your SNA DLC profile `(APPC partner logical unit profiles...)`
   d. A mode profile for the partner LU profile `(APPC transmission service mode profiles...)`
   e. A session limit profile for the mode profile `(APPC initial session limit profiles...)`

   For a dummy profile give any name (LU, PLU, Mode, ISL for example) and just use the default values. These profiles will be ignored so there is no reason to make them correct. Be sure to press Enter on every screen; if you press ESC the profile will not be created.

4. Verify the configuration file and fix any major problems.
5. Reinstall the Communications Manager as follows:

a. Have your OS/2 EE diskettes ready to be inserted into the diskette drive when requested

b. Under the OS/2 Command Interpreter type: `reinst`

c. In the Communications Manager Install menu select: `user configuration files and features`

d. On the next screen type: `C:\CMLIB`

e. Select your own configuration file (we call it here CONFIG)

f. You are back in the Communications Manager Install menu: press `F3`.

When you are finished, verify that APPC is actually installed. You must check in your C:\CMLIB\DLL directory to see if you now have the APPC.DLL file.

Conducting the Installation of Networking Services/2

After you have checked all items to install, stop the Communications Manager if it's running. This also includes stopping all 3270 sessions and any programs that use the Communications Manager (such as Networking Services/2 if it was already installed). Insert the first diskette in the A: or B: drive and type the following command at the OS/2 full-screen command prompt:

```
A:\INSTALL
    or
B:\INSTALL
```

The INSTALL command will migrate your default configuration (.CFG) file built under the Communications Manager. If you do not have an SNA Network Name specified, the migration will fail. The Network Name is specified under the SNA Base profile under SNA Feature profiles in the Communications Manager configuration. Be sure that you have the installation program migrate your current configuration (.CFG) file; otherwise, the Communications Manager will fail to start. You will also have to migrate any other Communications Manager configuration files prior to using them with Networking Services/2.

When you arrive at the IBM* panel presentation, press Enter to continue.

Read the new panel and remember:

- Press ESC to go back to the previous panel.
- Press F1 to request additional help information.
- Press F3 to exit the installation program.

Select which parts to install. If you are new to Networking Services/2 select `Both of the above` (what we are assuming you will do in this sample installation).

Type the name of the file where you want to save your CONFIG.SYS, since CONFIG.SYS will be modified by the installation.

You should leave the default directory C:\CMLIB\APPN for the sample programs and high-level language header files when prompted.

A panel will describe the directory tree where the files will go.

You will now be prompted to remove and insert the diskettes.

When you are prompted to create a .CF2 file, select YES.

The last panel reminds you how to reboot after the installation program is complete (when you have come back to your OS/2 window):

1. Remove the installation diskette.
2. Go to the Desktop Manager.
3. Select Desktop option.
4. Select Shutdown.
5. Reboot the system by pressing Ctrl+Alt+Del.

After you have installed it, the Desktop Manager will have been changed and a new option appears, called: **IBM SAA Networking Services/2**.

Figure 2. Desktop Manager Window

If you double-click on IBM SAA Networking Services/2, the following window appears:

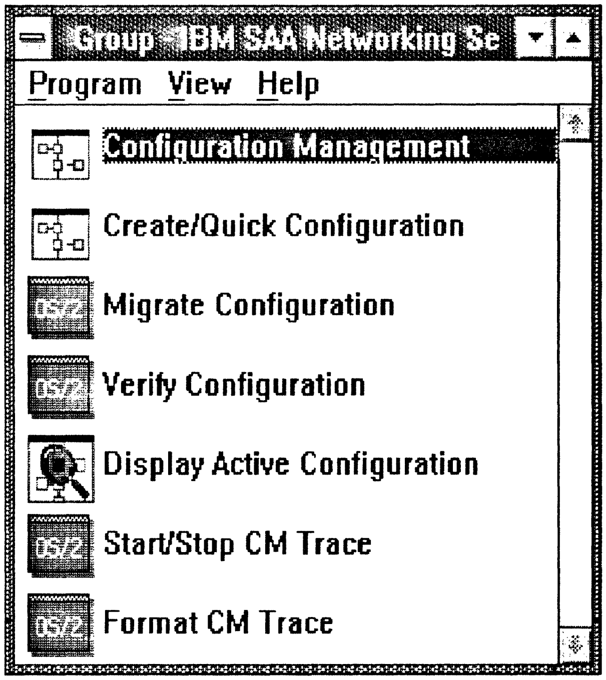


Figure 3. Group - IBM SAA Networking Services/2 Window

Completing the Installation

After you finish the installation and if you installed the Networking Services/2 with the option to install the samples program, you must have them in the following subdirectory:

`C:\CMLIB\APPN\SAMPLES`

Each sample program is contained in a subdirectory that matches its name.

To be able to use each one easily, either define its path in the CONFIG.SYS, or copy the files .EXE to another subdirectory defined in the path statement of your CONFIG.SYS.

The best way is to copy each .EXE in the subdirectory `C:\CMLIB\APPN\SAMPLES` and then define this subdirectory in the path statement of the CONFIG.SYS.

You may change the order of the subdirectories in the path statement BUT be sure that the `C:\CMLIB\APPN\` subdirectory stays BEFORE (on the left of) the `C:\CMLIB\` subdirectory.

4.2 Removing Networking Services/2

You may remove Networking Services/2 by doing the following:

1. Stop the Communications Manager if it is running. You'll need to insert the first installation diskette and type at the command prompt `A:\INSTALL\STOPFM`. STOPFM is a program that terminates a process running on behalf of the frame manager. Presently it is not terminated as part of stopping the Com-

munications Manager. Without running STOPFM, you can't erase CMKFMSMI.EXE from the CMLIB\APPN subdirectory or CMKFMAPI.DLL from the CMLIB\APPN\DLL subdirectory.

2. Delete all files in the subdirectory \CMLIB\APPN and any files in subdirectories within \CMLIB\APPN. To delete the file BLDLEVEL.APN you'll need to use ATTRIB. Type in the following: `ATTRIB BLDLEVEL.APN -R`. This will change it from read only.
3. Copy all DLLs in the \CMLIB\CMBACKUP subdirectory back into \CMLIB\DLL subdirectory and copy ACSAPLDR.EXE from the \CMLIB\CMBACKUP subdirectory back into the \CMLIB subdirectory. You can then remove the \CMLIB\CMBACKUP subdirectory and its contents.
4. Remove changes to CONFIG.SYS:
   - In path statements subdirectories \CMLIB\APPN and \CMLIB\APPN\DLL
   - In SET HELP statement subdirectory \CMLIB\APPN
   - In DEVICE statements for \CMLIB\APPN\ACSLDLAN.SYS and \CMLIB\APPN\CMKFMDD.SYS
5. You will need to reboot to make the CONFIG.SYS changes take effect.
6. After you have finished removing NS/2, the Group - IBM SAA Networking Services/2, is still in the Desktop Manager. To remove it you must first double-click on it, then delete all options (programs) from the GROUP - IBM SAA Networking Services/2 window and then delete the group from Desktop Manager.

4.3 Starting and Stopping Communications Manager and Networking Services/2

When you start Communications Manager with a .CFG file, in which APPC is configured, Networking Services/2 will automatically activate the APPN configuration contained in the .CF2 that has the same filename as the .CFG.

You can use Communications Manager with a .CFG in which APPC is not configured, only if it merely contains NetBIOS or X.25 without APPC definitions. Otherwise you can't use a .CFG that was not migrated.

When Communications Manager is stopped, you can still use the utility programs migration and verification, but there is no active APPN configuration. Your workstation is not considered a node.

Chapter 5. Configuration Procedure

In this chapter we will discuss the necessary configuration files for NS/2 and how to build them.

5.1 The Configuration Files

Communications Manager uses one configuration file whose extension is .CFG. This file is located in the C:\CMLIB directory. With Networking Services/2 you still need the .CFG since you still use the services of Communications Manager.

Furthermore, Networking Services/2 uses the DLC, gateway, 3270 LU, and LUA information of the .CFG file for its own purposes.

However, Networking Services/2 also uses its own binary file whose extension is .CF2. This file is used at startup to configure the workstation as a node. **If you modify this binary file while running Networking Services/2, it will have no effect until you stop and restart Communications Manager, except if you specify to update the current configuration that runs in the machine with the new modified .CF2**.

To build the .CF2 file you need an ASCII file, the Network Definition File, with an .NDF extension. Both the .CF2 file and the .NDF file are located in the C:\CMLIB\APPN directory.

The .NDF file contains the verbs needed to configure Networking Services/2. These verbs replace any SNA configuration that was done in the SNA Feature Profile under Communications Manager. In fact, Networking Services/2 ignores most of the configuration done under the SNA Feature Profile and relies upon what is in the binary .CF2 file that was built from the ASCII .NDF file for configuration.

That means that once you have installed Networking Services/2, **you should never change the following parameters in the SNA Feature Profile under Communications Manager:**

1. SNA base
2. LU (except 5250 emulation)
3. Partner LU (except 5250 emulation)
4. Modes (except 5250 emulation)
5. Initial session limits (except 5250 emulation)
6. Transaction programs
7. Conversation security.

But you still have to use the SNA Feature Profile for:

1. DLCs
2. LUA
3. LUs, partner LUs and modes used for 5250 emulation.

The last file used by Networking Services/2 is the .SEC file. This file contains the binary security configuration. You never have to do anything with this file.

Note:

Only .CFG and .CF2 are actually used by Networking Services/2. The .NDF is merely a way of building a .CF2 file.

The .CFG file is still used for everything that is not defined in the SNA Feature Profile.

The .CFG, .NDF, and .CF2 files must have the same name.

To dynamically register a new .CF2 file you have to specify an option when you verify the .NDF file (see "The Utility Programs" on page 31). If you use the Presentation Manager panels, you will be prompted for a dynamic update of your current configuration.

5.2 How to Build Your Configuration Files

Getting Your First .NDF File

The first time you build your ASCII node definition file, .NDF, you may be in one of the following situations:

1. You had previously made APPC definitions in the Communications Manager .CFG file that you want to use to build your .NDF file. Then you will have to migrate your current .CFG file (this is the option that is proposed when you run the installation).

   The APPNMIG program is intended for this purpose. It can be used from an OS/2 session or through the Presentation Manager interface by selecting `Migrate Configuration`. Once you have migrated, you may want to modify some definitions in your .NDF file. To do that either use the Presentation Manager interface or edit your .NDF file.

2. You have no previous APPC definitions in the .CFG file that you want to use. If you want to configure your workstation as an end node, you only have to select `Create/Quick Configuration` in the Networking Services/2 window under Presentation Manager. Otherwise, you must first configure APPC in the .CGF file as explained in "Installing and Configuring APPC" on page 23, and migrate it to an .NDF file. Then you may erase this .NDF file and create a new one with your editor. Or you may edit this .NDF file and erase all that follows the first ";" and use the Presentation Manager interface (which is much easier) by selecting `Configuration Management` (see "Creating Your .NDF File" on page 36).

In both cases the migration utility builds a .CF2 file from your new .NDF file.

Some verbs and parameters are not provided through the Presentation Manager interface and you may have to go into the Presentation Manager interface built .NDF file with an editor to add these definition verbs and parameters. 6.5, "What Is Not Supported by the Presentation Manager Interface" on page 54 explains which verbs are not supported by the Presentation Manager interface.

When building or modifying your ASCII node definition file with your editor, use the file **APPNV.CTL** in C:\CMLIB\APPN\ as a template. It is an example of all the verbs and their parameters. This file is reproduced in Appendix A, "File APPNV.CTL" on page 191.

Networking Services/2 System Management Programming Reference provides a complete description of every parameter.

The Utility Programs

The following are the four most important programs that you need to know about. Each of these programs can be invoked by typing its name on the OS/2 Command Interpreter or by selecting it on the Presentation Manager interface.

APPNMIG

APPNMIG is a program that extracts the SNA information from a Communications Manager-built .CFG file and builds the Networking Services/2 .NDF and .CF2 configuration files. So if you already have the Communications Manager configured for any SNA functions you can run APPNMIG against your .CFG file. It will build the configuration files you need to start running Networking Services/2. The installation procedure automatically runs APPNMIG against the configuration file of your choice.

The syntax of APPNMIG is: `APPNMIG filename` where filename without a file extension is the name of the .CFG file built by the Communications Manager. A useful option of APPNMIG is /r, which allows you to replace both old .NDF and .CF2 files.

You can invoke APPNMIG by clicking on `Migrate Configuration` in the Networking Services/2 window under Presentation Manager.

APPNC

APPNC allows you to build the .NDF and .CF2 files through a Presentation Manager interface instead of using an editor.

You can invoke APPNC by clicking on `Change Configuration` in the Networking Services/2 window under Presentation Manager.

APPNV

APPNV is the program that reads the ASCII .NDF file and verifies that all verbs are in order and parameters are correct and consistent. It also checks the binary .CFG file on the \CMLIB directory to verify that Networking Services/2 is to be started when the Communications Manager is loaded. In other words, it verifies that the Communications Manager calls ACSAPLDR.EXE, which is the program that loads Networking Services/2.

APPNV uses the file APPNV.CTL when verifying parameter and verb names. Look in APPNV.CTL for parameter and verb names if you get an error while running APPNV.

The output from APPNV is the binary file with a file extension of .CF2. This is the file that Networking Services/2 uses during startup.

When starting APPNV, you give the name of the ASCII file. When it goes to look in the .CFG file, it will be looking for it under the same name as the .NDF file.

The syntax of APPNV is: `APPNV filename` where filename without a file extension is the name of the .NDF file and the corresponding .CFG file. A useful option of APPNV is /e, which allows APPNV to update the current configuration used by the workstation.

Refer to the APPNV.DOC file in the \CMLIB\APPN subdirectory for more information.

You can invoke APPNV by clicking on `Verify Configuration` in the Networking Services/2 window under Presentation Manager.

APPNRST

APPNRST creates an ASCII .NDF file from an existing binary configuration file .CF2. This is useful if you only have the .CF2 file and want to modify your configuration.

The syntax of APPNRST is: `APPNRST filename` where filename without a file extension is the name of the .CF2 file.

Note:

> APPNMIG and APPNV accept all their parameters when being used under Presentation Manager.
>
> Except for APPNC these programs have online help facilities that give both syntax and options. For help, type the name of the program under the OS/2 Command Interpreter.

Chapter 6. Using the Presentation Manager Interface

The Presentation Manager interface of Networking Services/2 is simple to use and powerful. It allows you to build the definitions of the .NDF file. However, in some cases (listed in section 6.5, "What Is Not Supported by the Presentation Manager Interface" on page 54) you will have to complete your .NDF file by editing it.

You may use the Presentation Manager panels without having Communications Manager running (for example, to modify an .NDF file or create a .CF2 file).

If Communications Manager is required to be running for some operation, you will receive an error message requesting that it be started.

6.1 The Group - IBM SAA Networking Services/2

The window in Figure 4 on page 34 is the entry point of Networking Services/2 when using Presentation Manager. It allows you to:

1. Define or change a configuration:

   a. Change a configuration file:

      - Links with neighbors
      - Advanced SNA characteristics (previously defined in the SNA feature profile under Communications Manager)
      - APPN node characteristics

   b. Manage the subsystem by:

      - Activating or deactivating links
      - Displaying the active configuration

   c. Display a configuration log file

2. Quickly configure a node as an end node attached to a network node
3. Migrate a Communications Manager configuration file
4. Verify a node definition file (.NDF file)
5. Format a Communications Manager trace
6. Start or stop a Communications Manager trace
7. Display the active configuration (same option as 1.c above).

You can select what you want to do from the Group - IBM SAA Networking Services/2 window:

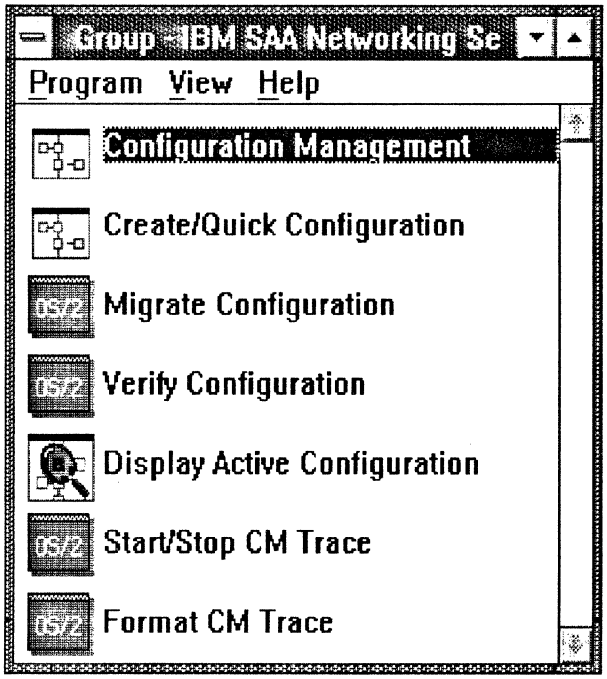


Figure 4. Group - IBM SAA Networking Services/2 Window

There are three kinds of windows that can be invoked from this window:

- Selection windows (Configuration Management and Create/Quick Configuration)
- Entrywindows (Migrate Configuration, Verify Configuration, Format CM Trace, and Start/Stop CM Trace) and
- Display windows (Display APPC/APPN Parameters).

6.2 The Configuration Management and Create/Quick Windows

The Create/Quick Configuration window entrywindow is very similar to the entrywindows in the Configuration Management window. Moreover, once you have made your quick configuration, a pushbutton allows you to go to the Configuration Management window. Therefore, we will now discuss the Configuration Management window, but if you are only interested in the Create/Quick Configuration window refer to "Filling the Entryfields of a Window" on page 41.

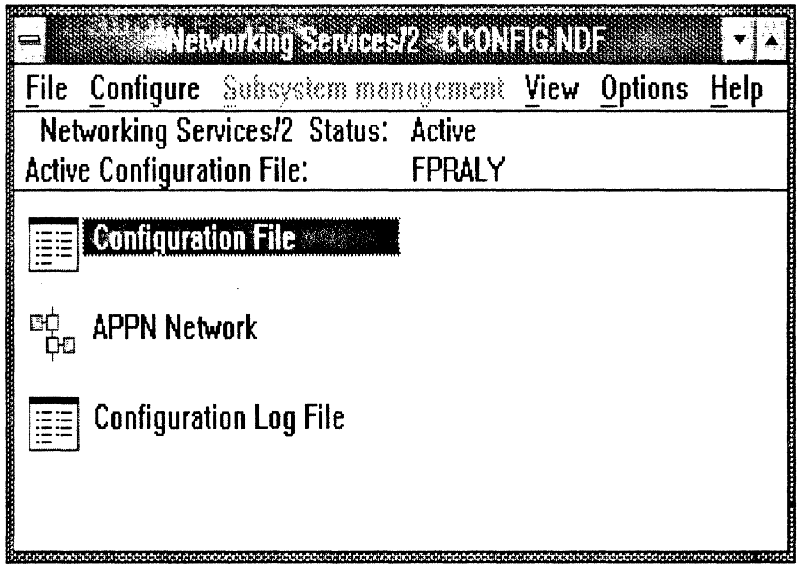


Figure 5. Configuration Management Window

First, notice that the title of this window is "Networking Services/2 - XXXXXXXX.NDF" where XXXXXXXX is the name of the .NDF file that you want to configure. It can be different from the name of the .CF2 file your workstation is using. While this XXXXXXXX.NDF file is in use by this window, you cannot edit it or use it with any other program.

If you have updated a configuration and you want to see the result in the .NDF file without exiting the Configuration Management window, you must open another .NDF configuration file (if you have one) by selecting `File -> Open` in the action bar. Then you can view the .NDF file with any editor.

To use the Configuration Management window, first select an item in the presentation space then choose an option in the action bar of the window.

Another way of using this window is to double-click on the item; you will get a window that prompts you for the action you want to perform. These actions are the same as those you can get with the action bar (see Figure 6 on page 38).

Once you have selected an item in the presentation space you will see that the options in the action bar are not all available. Furthermore, the same option in the action bar may have a different pull-down, depending on the item selected in the presentation space.

Figure 5 shows the Configuration Management window with `Configuration File` selected. In that case, the contents of the first two pull-downs are:

```
File                 Configure
    Open                 Connections
    Verify               Advanced SNA
    Save                 Local Node Characteristics
    Save as
```

No matter which selection is made in the presentation space, three choices on the action bar will always be available:

```
View            Options           Help
    Text            Small font        Help for help...
    Icon            Large font        Extended help...
                                      Keys help...
                                      Help index...
                                      Task Help...
                                      About...
```

Selecting Configuration File in the Configuration Management Window

This selection allows you to build or modify an .NDF file and the corresponding .CF2 file. Therefore, Communications Manager does not need to be running.

The rest of this section will describe:

- How to create and save .NDF files
- How to configure an .NDF file
- How to use the windows that offer selections
- How to fill the entrywindows.

Creating Your .NDF File

We will now see how to create an .NDF file from any .CFG. Then we will explain what you have to do to create a new .NDF file that uses a .CFG already used by another .NDF file. Once your .NDF is created you will have to configure it. The section "Configuring an .NDF File (Overview)" on page 38 gives an overview of the configuration process, whereas chapter Chapter 7, "Sample Configurations" on page 57 explains how to configure each type of node.

How to create an .NDF file from any .CFG file:

You can migrate a .CFG file without Communications Manager running.

If your .CFG file contains APPC definitions, migrate it. If you don't want to keep the APPC definitions you have migrated, edit the .NDF file, delete all that follows the first ";" and save it.

If your .CFG file does not contain APPC definitions, configure APPC as explained in "Installing and Configuring APPC" on page 23. Then migrate it, edit the .NDF file, delete all that follows the first ";" and save it.

Creating a new .NDF with the same .CFG definitions:

Once your .CFG file is migrated you have an .NDF and a .CF2 with the same filename. But you may wish to use another APPN configuration still using the same definitions for all that is not in the SNA Features Profiles of Communications Manager (for example if you want to do some testing).

Here is how to do it very quickly (we assume that your old configuration files have the filename "old" and you want to give the filename "new" to your new configuration files):

1. Issue the following commands under the OS/2 Command Interpreter:
   - In C:\CMLIB\ : `copy old.* new.*`
   - In C:\CMLIB\APPN\ : `copy old.* new.*`
2. Edit new.NDF and delete all that follows the first ";"
3. Configure your new configuration as explained below.

Saving an .NDF File

In all cases **you actually save** all your changes in the .NDF file only when you select `Verify`, `Save`, or `Save as` in the `File` pull-down of the action bar in the Configuration Management window.

When you have made some definitions or changes in the Advanced SNA window or in the Connections window, you may either save or verify the .NDF without closing these windows or close these windows to be back in the Configuration Management window. In both cases you have to use the `File` pull-down menu in the Configuration Management window.

When you select `Save` in the Configuration Management window you receive a warning panel because you have not verified your file, but your .NDF file will be saved. So select `Yes` to continue with the close if you don't want to verify your saved .NDF file.

When you select `Verify` in the Configuration Management window and the verification is successful the .NDF and .CF2 files are created. If the file you are working on has the same filename as the currently used configuration, then you can update the current configuration with your modifications. You merely have to press the `Update` pushbutton that appears in this case. However, be careful; there are some modifications that cannot be used to update the current configuration. So, after updating the current configuration, examine the .LOG file to see if there is any warning. If you have any doubt, stop and restart Communications Manager.

No dynamic updates to your running configuration are applied to anything active in your configuration. In some cases, the information affected by the dynamic update will be made pending the completion of a running TP or session. For example, when you change something for a mode, it creates a new mode definition. However, this mode definition will not go into effect until all the sessions started under the old definition have been terminated.

Configuring an .NDF File (Overview)

The title of the window contains the name of the .NDF file that you intend to modify.

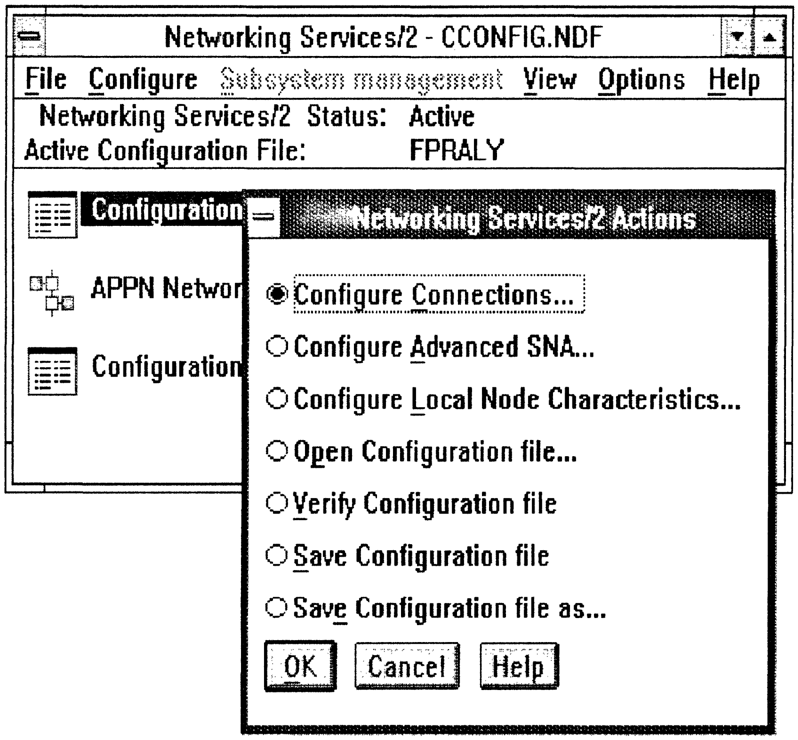


Figure 6. Configuration Management Window

Figure 6 shows the Configuration Management window when you double-click on Configuration File. The list box presents the same choices as can be selected with the action bar.

If you want to work with another file, select `File` in the action bar and `Open...` in the pull-down. A window will prompt you to choose the .NDF file you want to modify.

Once you have selected the .NDF file the system parses both the .NDF and the .CFG files. If there are errors, they will be logged in the .LOG file, which you can examine by selecting `Configuration Log` in the same window (see "Selecting Configuration Log File in the Configuration Management Window" on page 43).

To configure your network definition file select `Configure` on the action bar.

From the pull-down menu select:

`Connections` to define links with (if you are a network node):

- Network node
- End node
- LEN node
- Primary host

or with (if you are an end node):

- Network node

- Peer node
- Primary host

`Advanced SNA` to define:

- Transaction programs
- Transaction program defaults
- Transaction program security
- Partner LUs
- Local LUs
- Conversation security
- LU to LU security (LU to LU password)
- CPI-C side information (for any PLU)
- Modes

`Local Node Characteristics` to define:

- Node name
- Network name (netid)
- Node ID
- Alias
- Type (end node or network node)
- Activate attach manager at startup.

Examples of configuring nodes are given in Chapter 7, "Sample Configurations" on page 57. See especially "Building the Node with the Presentation Manager Screens" on page 64 where many definitions are made.

Note:

If you want to define a LEN node, use "End node" in the Local Node Characteristics. Then connect your node with other nodes by choosing "Peer node" in the Connections pull-down menu; a LEN node is an end node without CP-CP sessions with its neighbors.

In the whole APPN network you may have only one connection to a "primary host", that is, a host that contains a focal point to manage the network (such as NetView).

In other cases, when you want to go through a subarea network or define a connection to a host that contains LU 6.2 LUs, use the connection to a "LEN node".

Defining or Modifying Items in a Window

Usually you have to first select an item in the presentation space of the window and then to act on this item, either by double-clicking on it or by choosing an option in the action bar of the window.

Some windows use a presentation similar to the one used in the main window of the File Manager:

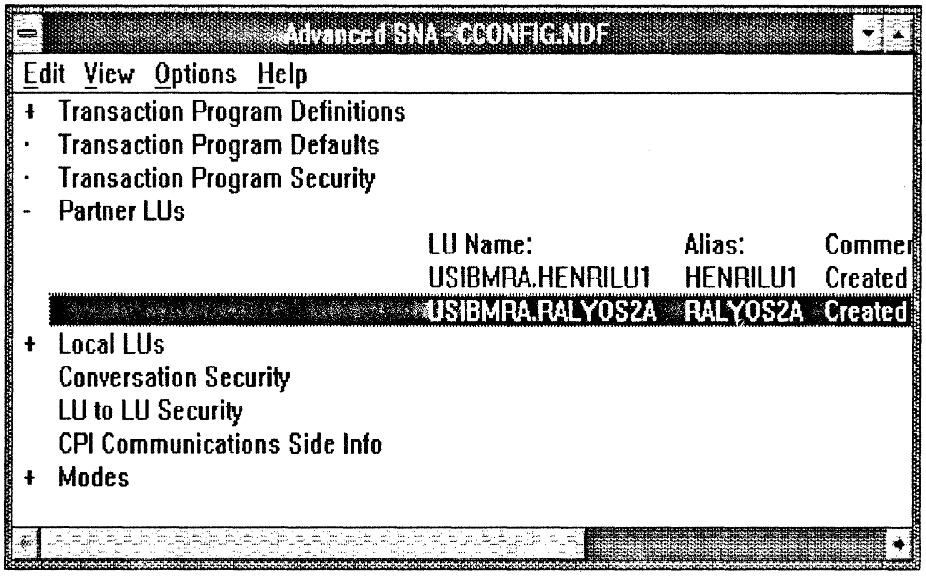


Figure 7. Advanced SNA Window

In this window "Transaction program", "Transaction Program Defaults", and "Conversation Security" are items, whereas "USIBMRA.HENRILU1..." and "USIBMRA.RALYOS2A..." are sub-items of the item "Partner LU".

Note that items cannot be deleted. Only a sub-item, if any, can be created, changed, or deleted.

Here are the meanings of the signs you may find in front of an item:

+ Means that you can expand this item by clicking on the sign "+". Thus you will view all the sub-items of this item and a "-" will replace the "+".

- Means that this item is expanded; you can collapse it by clicking on the "-" and a "+" will replace the "-".

. Means that this item cannot have sub-items. When you double-click on it you go to an entrywindow.

If no sign precedes the item, it does not contain any sub-item, but you may define some. For example, if you have not defined any partner LU, there will be no sign in front of the item "Partner LU".

To create a sub-item, double-click on the item. You will go in an entrywindow.

To change a sub-item, double-click on it. You will go in an entrywindow.

To delete a sub-item, select it and then use `Delete` in the `Edit` option of the action bar.

You can also select and use the `Edit` option to create or change a sub-item but that takes more time.

Filling the Entryfields of a Window

For those windows that require the user to type in information, the information to be typed is always very simple. For help, place the cursor on the field you want information about and select the help pushbutton or press F1.

To move the cursor from one field to another use the TAB key.

Don't worry about the length or syntax of what is to be typed, since it is imposed by the presentation of the windows. If you cannot type a character, check with the help facility.

Be warned that many fields are case sensitive. Check with the help facility.

Some fields are marked "(optional)" but very often you must fill them if you want to add more information. For instance, if you create a connection to a LEN node, you must fill the Partner Network Name and the Partner Node Name to be allowed to use the pushbutton `Define Partner LUs`.

Whenever a default name is proposed, replace it with a more significant name in your configuration. For example, replace LINK0001 by LNNBB118 if this link leads to the network node in room BB118.

You can always cancel what you are defining by clicking on `Cancel` or closing the window.

When you have finished completing the fields, click on `OK` to validate or continue to the next window if you have to (in which case use a pushbutton whose name ends with: ...).

Selecting APPN in the Configuration Management Window

This allows you to manage the links and to display the active configuration. Therefore, Communications Manager needs to be running.

The only selectable action on the action bar is "Subsystem Management."

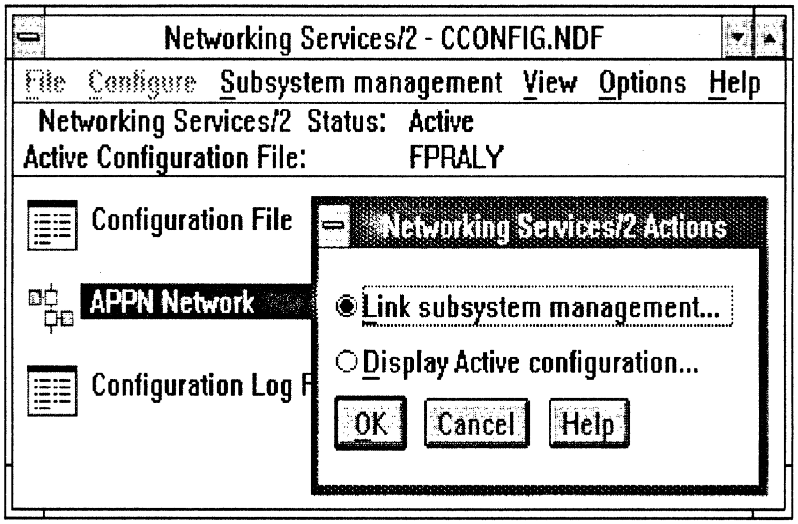


Figure 8. Configuration Management Window when You Double-Click on APPN

The option "Display Active Configuration..." in the pull-down of Subsystem Management is the same as "Display APPC/APPN Parameters" in the Group IBM SAA Networking Services/2 window. It is discussed in section 6.4, "The Display APPC/APPN Parameters Windows" on page 49.

When you select `Links...` you will see a window that displays the defined links and their status.

The action bar gives the following options:

```
Change Status          Display
  Activate               Refresh
  Deactivate Hard        Details
  Deactivate Soft
```

Change Status allows you to activate or deactivate a selected link. After changing the status you must select `Refresh` to see the result. If the performed action requires some time to complete, the status will be pending active or inactivate as long as it's not completed.

Deactivate Hard will deactivate the link immediately.

Deactivate Soft will deactivate the link once all the conversations using this link are terminated.

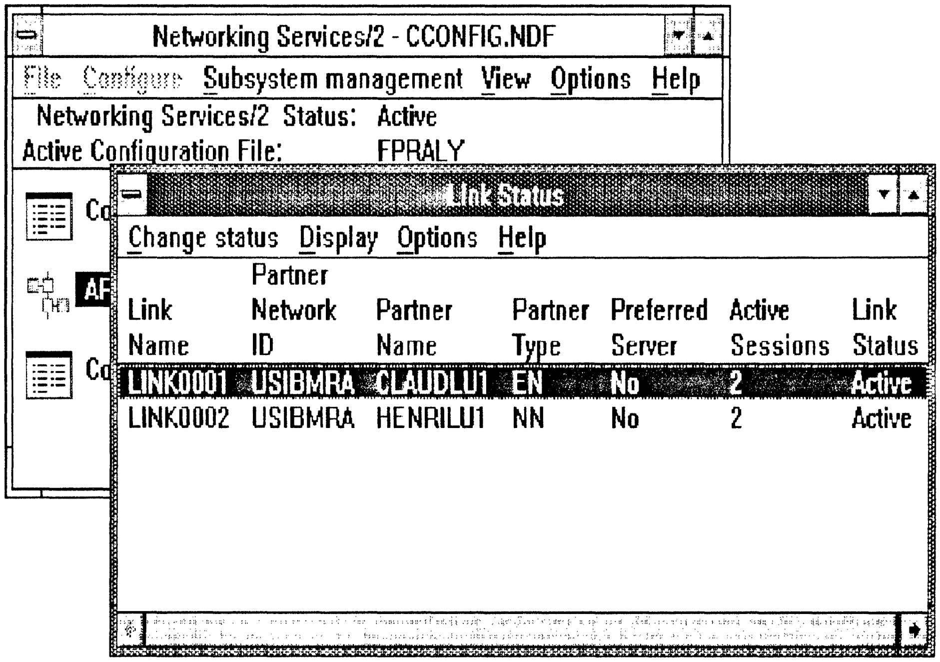


Figure 9. Link Subsystem Management Window

Selecting Configuration Log File in the Configuration Management Window

Here Communications Manager does not need to be running.

The only selectable action on the action bar is "File."

Select `Open` in the File pull-down menu (there is no other choice) and you will get a window with all the .LOG files. Open the one you want to see. The .LOG files contain information on warnings and errors registered during operations on an .NDF file, such as migration or verification.

6.3 The Migrate, Verify, Format, Start/Stop CM Trace Windows

All these windows are Presentation Manager entrywindows, where you only have to type a filename and/or flags.

When you use these windows, first fill in the entryfield and then select Open to activate the utility programs. An OS/2 window appears where you can follow what is happening. As soon as the program has ended, the title of the window will indicate "completed." Then you must close the window yourself.

Using the migrate and verify windows will update the .LOG file.

Selecting Migrate Configuration in the Group Window

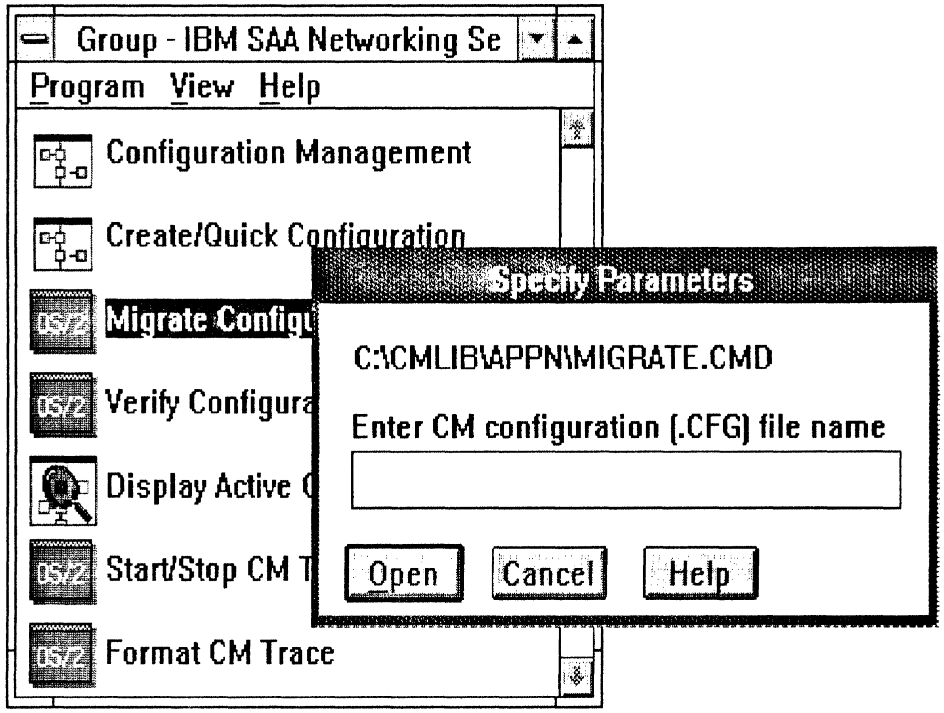


Figure 10. Migrate Configuration Window

This window is intended to run APPNMIG (see "The Utility Programs" on page 31).

Type the filename of your .CFG file followed by any needed flags. To get information about the flags, open the window without any parameters or type `APPNMIG` in a full-screen OS/2 session.

The flag /r allows you to replace both .NDF and .CF2 when you migrate.

Example: `CONFIG /r`

Selecting Verify Configuration in the Group Window

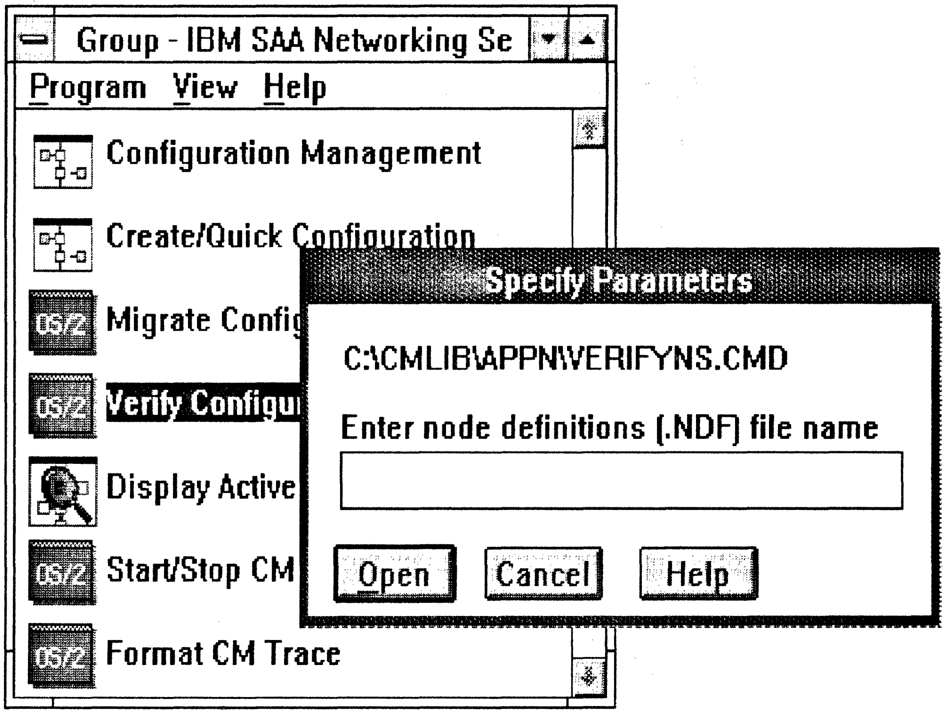


Figure 11. Verify Configuration Window

This window is intended to run APPNV (see "The Utility Programs" on page 31).

Type the filename of your .NDF file followed by any needed flags. To get information about the flags, open the window without any parameters or type `APPNV` in a full-screen OS/2 session.

The flag /e allows you to update the current configuration with the configuration being verified.

Example: `CONFIG /e`

Selecting Format CM Trace in the Group Window

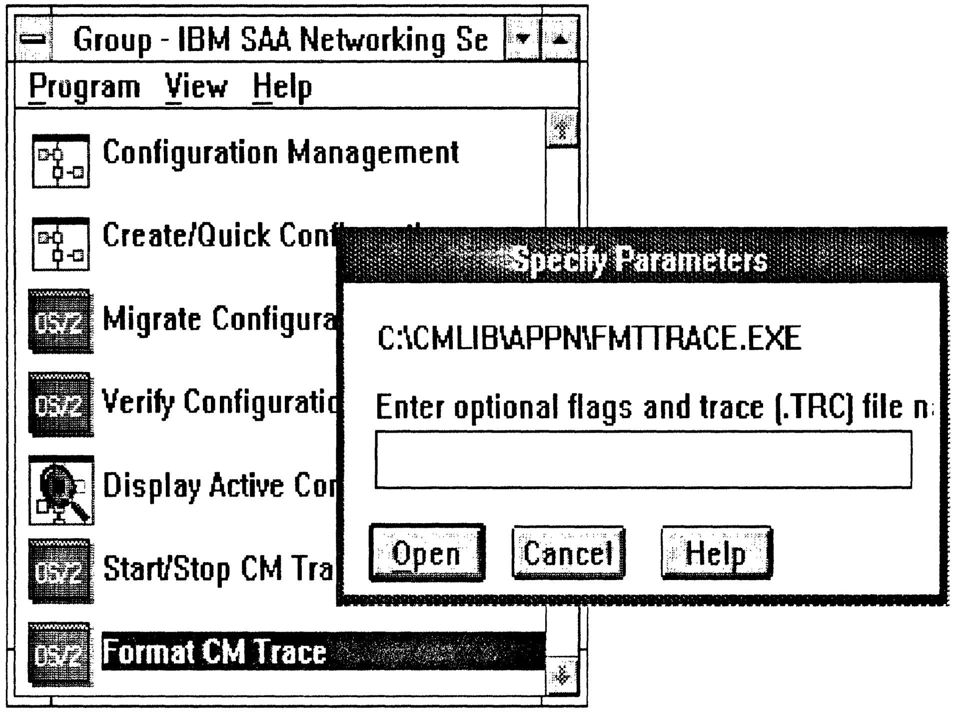


Figure 12. Format CM Trace Window

This window is intended to run FMTTRACE (see "The Format CM Trace Facility" on page 182).

The optional flags can be grouped together (/sD is the same as /s /D). They must be typed in front of the drive, path, filename, and extension of your trace file. If not specified, the drive and path default to the current ones (C:\CMLIB\APPN\), and the extension defaults to .TRC.

For information about the flags, open the window without any parameters or type `FMTTRACE ?` in a full-screen OS/2 session.

The flag `/D` is recommended to get a detail file .DET.

For example: `/Ds C:\TRACES\TRACE`

Selecting Start/Stop CM Trace in the Group Window

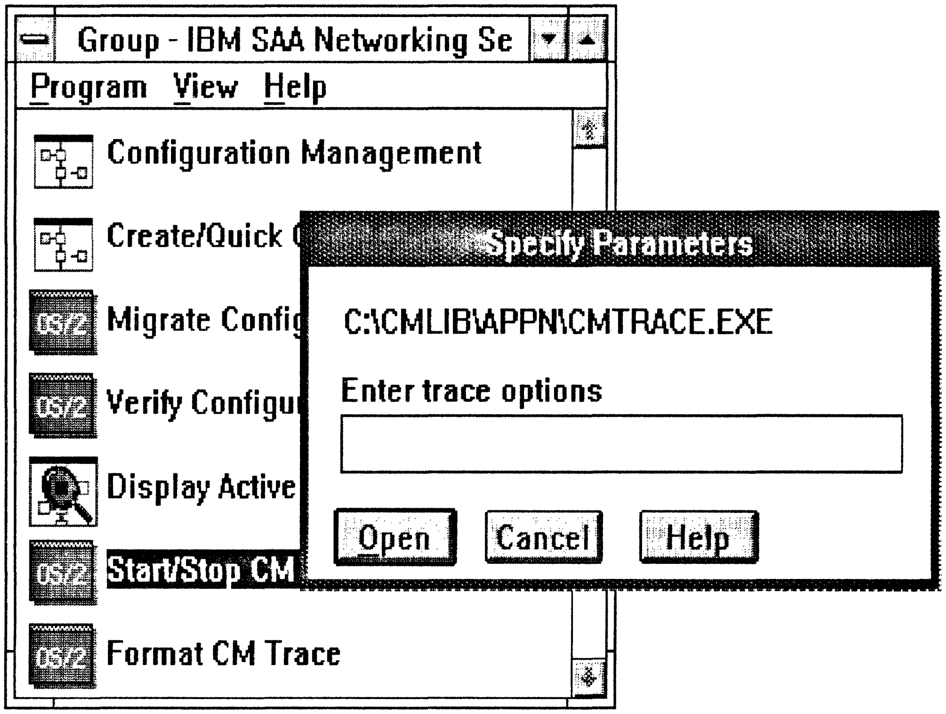


Figure 13. START/STOP CM Trace Window

This window is intended to run CMTRACE (see "The CM Trace Facility" on page 180).

Four options can be entered from this panel: `AutoStart`, `START`, `STOP`, and `COPY`. For information about the syntax, open the window without any parameters or type `CMTRACE ?` in a full-screen OS/2 session.

Autostart

To allow the tracing of what is happening during the Communications Manager initialization, type `AUTOSTART` followed by the desired flags and their parameters.

For example:

```
AUTOSTART /api appc services
          /data ibmtrnet
          /event 5 12
          /storage 3
```

You cannot deactivate the `AUTOSTART` without going into Communications Manager. It is easier to make it trace nothing by typing `AUTOSTART` without flags. The result is exactly the same.

Start

To start a trace, type `START` followed by the desired flags and their parameter(s).

You may either start all the categories you want at the same time or start them one after the other. For instance `START /api appc` followed by `START /api services` and `START /event 5 12` is the same as `START /api appc services /event 5 12`.

The recommended usage is:

```
START /reset
      /api appc services
      /data ibmtrnet           <- if you are using a token-ring LAN
      /event 5 12
      /storage 3
```

Stop

To stop a trace, type `STOP` followed by flags and their parameters.

The same considerations as above apply to the STOP command. If you merely type `STOP` you will stop tracing all categories. But it won't stop the autotrace.

Copy

Once you have stopped tracing, your trace is not yet in a file. To copy the trace to a file, type `COPY` followed by the path of the file.

The default directory is the current one (C:\CMLIB\APPN\). If you do not give an extension there will be no default and you won't be able to format the file because, as we saw just before, FMTTRACE will suppose that the extension is .TRC. Therefore, you should give .TRC as the extension.

Example: `COPY C:\TRACES\TRACE.TRC`

Where to Put the Traces

The choice is simple: either you use the defaults and your traces will be in the C:\CMLIB\APPN\ directory, or you decide to store them in a specific place and each time you will have to type the full path in the CM Trace and the Format CM Trace windows.

6.4 The Display APPC/APPN Parameters Windows

The Display APPC/APPN Parameters window is intended to display the active configuration that is being used by the node.

Unless you have specified the /e parameter when you ran the verification program it will not display changes made to the current .CF2 file since Communications Manager was started. Your active configuration and your .CF2 file can be different.

Your present .CF2 becomes your active configuration only if you verify the .NDF file with the /e option and you get no warning in the .LOG file or if you stop and restart Communications Manager.

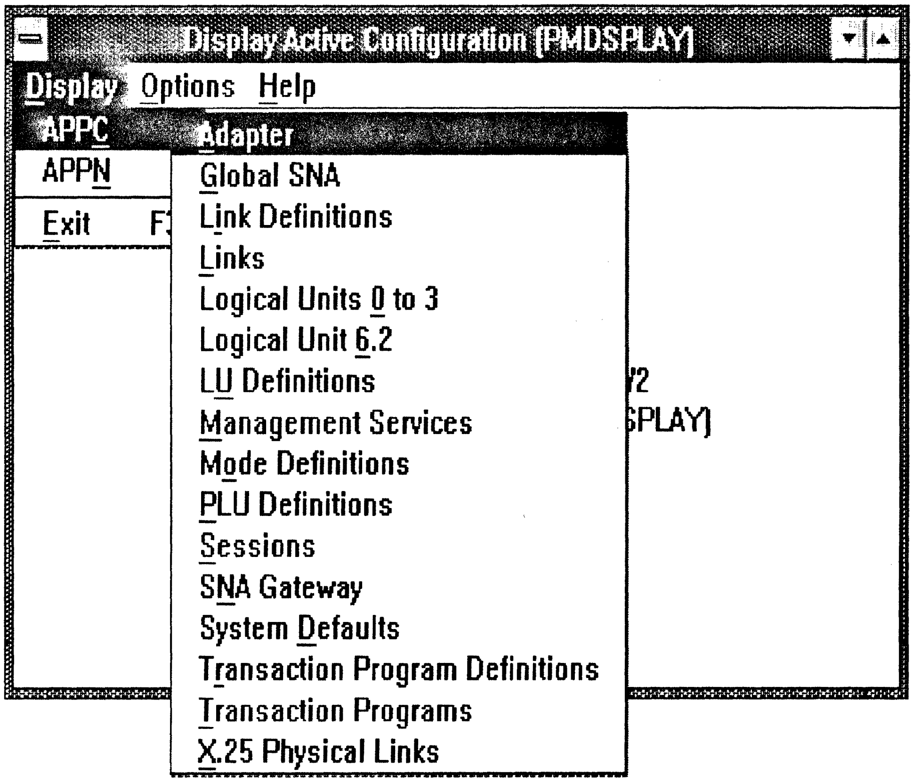


Figure 14. Display APPC/APPN Parameters Window

To use this program from an OS/2 command line, type PMDSPLAY. The action bar gives the following pull-downs:

```
Display          Options
    APPC             Display to Screen
    APPN             Display to File
    Exit             Select Target
                     Refresh
```

To view APPC or APPN parameters, select `Display` from the action bar. In the pull-down menu choose `APPC` or `APPN`.

Choose `Select Target` to view the active configuration of another workstation instead of yours. In the target workstation the program C:\CMLIB\APPN\SAMPLES\DISPLAY\RDSPSRVR.EXE must be defined as remotely startable:

- Either add a TP definition for it in the .NDF file
- Or use the DEFINE_DEFAULTS verb in the .NDF file: put the parameter IMPLICIT_INBOUND_PLU_SUPPORT(YES) and give a DIRECTORY_FOR_INBOUND_ATTACHES where you put this program. You may specify DIRECTORY_FOR_INBOUND_ATTACHES(*). That means this program will be looked for in the directories of the path statement in your CONFIG.SYS.

The second choice is better.

Choose `Refresh` to refresh the content of the display.

Selecting APPC from the Display Window

When you select APPC you get the following pull-down menu:

```
APPC
      Adapter
      Global SNA
      Link Definitions
      Links
      Logical Units 0 to 3
      Logical Unit 6.2
      LU Definitions
      Management Services
      Mode Definitions
      PLU Definitions
      Sessions
      SNA Gateway
      System Defaults
      Transaction Program Definitions
      Transaction Programs
      X.25 Physical Links
```

Appendix B, "What PMDSPLAY Shows" on page 219 shows an example of what can be viewed with each item.

The following lists only the most significant information for each selectable item.

For more information, refer to the *Networking Services/2 System Management Programming Reference*.

Adapter information includes:

Number of adapters and their characteristics, including:

DLC name, link station role, security, maximum number of link stations.

Global SNA information includes:

Machine model, version of softwares, network and CP names, CP alias, node ID, node type.

Link definitions information includes:

Number of defined links and their characteristics, including:

Link name, adjacent node CP name and type, DLC name, adapter number, destination address, CP-CP session support, preferred network node server (the adjacent node), auto activate, transmission group number, limited resource (if you want the link to be activated only when there is a session), solicit SSCP session, init self, bind support, physical characteristics, security.

Links information includes:

Number of currently active links and their characteristics, including:

Link name, DLC name, adapter number, destination address, state, adjacent node CP name and type, connection type, physical characteristics, security.

Logical units 0 to 3 information includes:
Number of active LU 0, 1, 2,and 3 LUs and their characteristics, including:

Access type (for example, 3270 emulation), LU type, local address, short and long names, LU-LU session ID, DLC name and adapter number, remote DLC address, SSCP-LU and LU-LU sessions state.

Logical unit 6.2 information includes:
Number of active local LU 6.2 LUs and their characteristics. A list of its partner LUs and their characteristics for each LU. A list of modes and their characteristics for each partner LU.

LU definitions information includes:
Number of defined local LU 6.2 and their name, alias, local address.

Management Services information includes:
Number of held MDS alerts, NMVT alerts, focal points, MS applications, active transactions.

Mode definitions information includes:
Number of defined modes and their mode name, class of service, parameters.

You will find here the IBM-supplied modes and your own defined modes.

PLU definitions information includes:
Partner LUs that are currently known by the node. These are the partner LUs that you have defined in your .NDF file and the ones your node has learned about.

Number of known partner LUs and their name, alias, uninterpreted name, maximum logical record send size, conversation security, parallel session support.

Sessions information includes:
Number of active sessions and their characteristics, including:

Session and conversation IDs, LU and partner LU alias, mode name, parameters, connection type (host or peer), conversation group ID, local and partner LU names, pacing type.

SNA gateway information includes:
Size of the gateway LU section, number of gateways, parameters for each one.

System defaults information includes:
Default mode name, local LU, implicit partner LU support (binds are accepted from undefined partners), defaults for TPs.

Transaction program definitions information includes:
State of attach manager, number of configured transaction programs and their definitions, including:

Name, file specification, parameter string, synchronization level, conversation type, incoming allocate parameters, receive allocate parameters, transaction program type, program state, conversation security information required, process ID, program type, remotely initiated, icon file specification.

Transaction programs information includes:

Number of active transaction programs, and for each:

TP name and ID, where initiated, local LU alias, partner LU, number of conversations for this TP and for each:

Conversation ID, state (send, receive, ...), session ID, synchronization level, conversation type.

X.25 physical links information includes:

Information defined in Communications Manager.

Selecting APPN from the Display Window

When you select APPN you get the following pull-down menu:

```
APPN
      Class of Service
      Connection Network
      Directory
      Intermediate Sessions
      Node
      Topology
```

Appendix B, "What PMDSPLAY Shows" on page 219 shows an example of what can be viewed with each item.

The following lists only the most significant information for each selectable item.

For more information, refer to the *Networking Services/2 System Management Programming Reference*.

Class of service information includes:

Number of classes of service known in the node and for each:

Name, priority, number of node rows and TG rows, characteristics of each node row and each TG row.

You will find here the IBM-supplied classes of service and your own defined classes of service.

Connection network information includes:

Number of connection network definitions and for each:

Connection network name, physical characteristics, number connection network adapters; for each: adapter DLC name and adapter number.

Directory information includes:

Number of directory entries and of network node entries. For each network node: CP name and number of associated LUs. For each LU: name, owning CP name and type ("home" if the network node CP entry is the same as the owning CP, "register" if the node is a network node and the LU is defined in an end node that belongs to the network node domain, "cache" if the node is a network node and the LU has been previously found through a search).

Intermediate sessions information includes:
Number of sessions that go through the network node and for each: CP name of the adjacent node from which the bind came, CP name of the adjacent node to which the bind went, name of the link over which the bind was received, name of the link over which the bind was sent, fully-qualified procedure correlation identifier (FQPCID).

Node information includes:
Route additional resistance, maximum number of resources that can be cached in directory, current number of entries in the directory cache, number of updates before directory is saved.

Topology information includes:
Number of network nodes and for each: state, description of every TG that leaves the node.

6.5 What Is Not Supported by the Presentation Manager Interface

The following cannot be defined with the windows:

DEFINE_LOCAL_CP parameters

- Nau address (set to independent_lu)
- Max_memory_segments (set to system limit)

DEFINE_CONNECTION_NETWORK parameters

- No support for the verb with the Configuration Management window
- Connection network name is set to C&SM LAN ID for end nodes defined with the Create/Quick Configuration window

DEFINE_LOGICAL_LINK parameters

- CP-CP session support (set to YES if connection to LEARN or NN and set to NO if connection to LEN)
- Activate_at_startup (set to YES if connection to LEARN or NN and set to NO if connection to LEN)
- Limited_resource (set to USE_ADAPTER_DEFINITION)
- Link_station_role (set to USE_ADAPTER_DEFINITION)
- Cost_per_connect_time (set to USE_ADAPTER_DEFINITION)
- Cost_per_byte (set to USE_ADAPTER_DEFINITION)
- Link_speed (set to USE_ADAPTER_DEFINITION)
- Security (set to USE_ADAPTER_DEFINITION)
- User_defined_1 (set to USE_ADAPTER_DEFINITION)
- User_defined_2 (set to USE_ADAPTER_DEFINITION)
- User_defined_3 (set to USE_ADAPTER_DEFINITION)

DEFINE_PARTNER_LU parameters

- Partner_Lu_Uninterpreted_Name (set to binary zeroes)
- Parallel_session_support (set to YES)
- Max_mc_ll_size (set to 32767)

DEFINE_PARTNER_LU_LOCATION parameters

- Wildcard_entry (set to NO)
- Fq_serving_nn_cp_name (set to binary zeroes)

DEFINE_COS

- No support for this verb

DEFINE_DEFAULTS parameters

- Default_mode_name (set to "BLANK" mode name)
- Inbound_implicit_partner_lu_support (set to YES)
- Max_mc_ll_size (set to 32767)
- Default_tp_conv_security_rqd (set to NO)
- Max_held_alerts (set to 10)

DEFINE_TP parameters

- Conversation_type (set to EITHER)
- Sync_level (set to EITHER)
- Queue_depth_limit (set to 255)
- Incoming_allocate_timeout (set to HOLD_FOREVER)
- Receive_allocate_timeout (set to HOLD_FOREVER)

ACTIVATE_DLC

- Generation based on configured adapters

CNOS

- No support for this verb.

Chapter 7. Sample Configurations

An APPN network can be looked at like a puzzle: depending on what you need, you will take certain basic types of connectivity and put them together to build your network. In this chapter we will describe the following basic connectivity pieces in the APPN puzzle:

1. End node obtained by migrating a .CFG file that contains APPC definitions
2. End node configured for a direct peer connection with another node
3. Network node connected to other nodes:
   - End node in its domain
   - End node out of its domain
   - End node defined with no CP-CP sessions (served by another network node)
   - End node with a network node defined as a backup server
   - Network node
4. Connection network
5. Network node acting as a bridge between two token-ring LANs
6. Subarea network and APPN network:
   - Two parts of an APPN network connected through a subarea network
   - LU 6.2 in a subarea network enabled to have a session with an LU of the APPN network
   - Connection to a primary host (host that contains a focal point).

For each of these basic pieces you will find the corresponding .NDF file.

The last section of this chapter gives a complete description of how to build a sample APPN network.

For more information about the verbs and their parameters, see Appendix A, "File APPNV.CTL" on page 191. You can find a detailed explanation of the verbs in the *Networking Services/2 System Management Programming Reference*.

7.1 End Node Obtained by Migrating an APPC-Configured .CFG File

We will first give some highlights on the migration process and then give an example of what you obtain when you migrate a .CFG file in which APPC is configured.

Highlights

You will find an overview of the process to follow to have your workstation fully participate in the APPN network. Then we will see what you must do before migrating. Finally, we will discuss the compatibility between migrated and non-migrated workstations.

How to Have Your Workstation Take Full Benefit of APPN

The migration of your configuration is intended to make your workstation participate in the APPN network as a LEN node. A LEN node does not implement the full capacity of APPN nodes. So, after the migration you should transform your LEN node into an end node or network node.

To let it become an end node you have to define a link to a network node server as explained in section 7.7, "End Node in the Domain of a Network Node Server Defined with the Configuration Management Window" on page 75. To let it become a network node you have to define its type as being network node and then connect it to any network node or end node you wish as explained in sections 7.14, "Network Node Connected to Another Network Node" on page 86 and 7.5, "Network Node Server of the Domain" on page 71.

Once you have either an end node or a network node, you should delete the DEFINE_PARTNER_LU_LOCATION verbs issued for the partner LUs that are in a network node or end node. Do, however, keep these verbs for every workstation that has not been migrated. The reason to delete these verbs is that with APPN you don't have to define the partner LU's location. With APPN, the location of an LU is dynamically found.

What to Do before the Migration

Here are the rules you must respect if you want your workstation to participate in an APPN network:

- You must give a name to the network (also known as NETID). A blank name is not valid.
- Each LU name must be unique within the network.
- Consider that the PU name is an LU name and thus must be different from any LU name. This consideration may be ignored if you have kept the default PU name: PU000000.
- Consider as well that the C&SM LAN ID specified for the adapter in Communications Manager under:

  ```
  SNA feature profiles
     Data Link Control (DLC) profiles...
        IBM Token-Ring Network...
  ```

  is an LU name and must be different from any LU name.

Compatibility with Non-Migrated Workstations

You do not have to migrate all of your workstations to Networking Services/2. The ones you migrate will keep the same capabilities they had before the migration.

If two workstations used TPs to communicate before migration, they will still be able to communicate after the migration of one or both of them. No intervention is required on either machine.

Since an end node obtained by migrating an APPC configuration file (.CFG) will not support CP-CP sessions with its neighbors, it is indeed a LEN node, as it was before the migration. From the Networking Services/2 point of view, migrating your node without changing anything in the .NDF makes no difference.

Here we assume you have a .CFG file with Network ID, LUs, PLUs, modes, initial session limit, and transaction programs already defined.

Definitions in Your .CFG File

Let's suppose you have the following definitions:

- LAN feature profiles
  - Adapter 0 configured
- SNA feature profiles
  - SNA base profile
    - Physical unit (PU) name: CARLEY
    - Network name: USIBMMK
    - Node ID (in hex): 32222
    - Auto-activate APPC attach manager: Yes
  - Data Link Control (DLC) profiles... IBM Token-Ring Network...
    - Adapter number: 0
    - Free unused link: Yes
    - C&SM LAN ID: CARLEY
  - APPC logical unit (LU) profiles...
    - LU alias: FILEREQ
    - Comment: Sample APPC program LU for requester
    - LU name: CARLEY
    - Default LU: YES
    - LU local address (NAU address): 00
    - LU session limit: 255
    - Maximum number of transaction programs: 0
  - APPC partner logical unit profiles...
    - Partner LU (PLU) alias: FILESVR
    - Comment: APPC Sample programs
    - Fully-qualified PLU name: .LAB00001
    - LU alias: FILEREQ
    - Adapter/directory entry: 0
    - Destination address (in hex): 400030010020
    - PLU session limit: 15 sessions
    - Maximum mapped conversation logical record length: 32767
    - LU-LU session security: No
    - Conversation security: No
    - Conversation security verified: No
    - Permanent connection: No
    - Solicit SSCP session: No
    - Mode name: MODE1
    - Initial Session Limit: ISL
  - APPC transmission service mode profiles...
    - Mode name: MODE1
    - Comment: Model Transmission Service Mode (model only)
    - Minimum RU size: 256
    - Maximum RU size: 1024
    - Receive pacing limit: 8
    - Session limit: 10
  - APPC initial session limit profiles...
    - Initial session limit profile: ISL
    - Comment: Model Initial Session Limits (model only)

- Minimum number of contention winners source: 0
- Minimum number of contention winners target: 0
- Number of automatically activated sessions: 0

— APPC remotely attachable transaction program (TP) profiles...

- TP profile name: FILESVR
- Comment: Model Remotely Attachable Transaction Program (model only)
- Service TP: No
- TP name: FILEMSVR
- TP filespec: C:\SAMPLE\FILECSVR.EXE
- Sync level: Either
- Conversation type: Either
- Conversation security: No
- TP operation: Non-queued - attach started
- Queued allocates timeout: 480
- TP receive timeout: 480
- Max attach queue depth: 5
- Program type: Background.

Migration of Your .CFG File

To migrate this .CFG file you can:

- Either select Migrate Configuration in the Group - IBM SAA Networking Services/2 window and enter the filename of this .CFG in the entry-window
- Or type appnmig and the filename of this .CFG under the OS/2 Command Interpreter.

On the screen will appear:

```
Networking Services/2 Configuration Migration Utility   V1.00
(C) Copyright IBM Corporation 1990,1991.  All Rights Reserved.

Messages will be logged to the file 'C:\CMLIB\APPN\jeff.LOG'.

Parsing of the Communications Manager configuration file started.
Parsing of the Communications Manager configuration file was successful.
Migration of the Communications Manager configuration started.
Update of the node definitions file started.
Update of the node definitions file was successful.
Update of the security information file started.
Update of the security information file was successful.
Verification of the Networking Services/2 configuration started.
Verification of the Networking Services/2 configuration was successful.
Update of the Networking Services/2 configuration file started.
Update of the Networking Services/2 configuration file was successful.
Migration of the Communications Manager configuration was successful.
```

Figure 15. What Appears on the Screen when You Migrate

Four files are created with the filename of the configuration file and file extensions of: .LOG, .NDF, .SEC, and .CF2. The first two files are in ASCII format and can be viewed or edited.

The .LOG file contains the description of the operation:

```
*****************************************************************************

-----------------------------------------------------------------------------
Configuration Migration Utility started on 02-07-91 at 01:17p
-----------------------------------------------------------------------------

Command line: appnmig jeff

Parsing of the Communications Manager configuration file started.
Parsing of the Communications Manager configuration file was successful.
Migration of the Communications Manager configuration started.
APN0768I   'USIBMMK.CARLEY' has been set as the local control point name.
           This name matches an independent LU definition in the
           Communications Manager configuration, so the control point's alias
           is set to the LU's alias and the control point is defined as an
           independent LU.  Applications can use the control point as an
           independent local LU.  The control point name will be used to
           identify your workstation to your network management focal point
           (such as NetView).

APN0784I   The partner LU with the name 'USIBMMK.LAB00001' in the
           Communications Manager configuration indicates that it does not
           support conversation security.  All Networking Services/2 partner
           LUs support conversation security.  The Communications Manager
           partner LU definition with the alias 'FILESVR' is still added to
           the Networking Services/2 configuration.

Update of the node definitions file started.
Update of the node definitions file was successful.
Update of the security information file started.
Update of the security information file was successful.
Verification of the Networking Services/2 configuration started.
Verification of the Networking Services/2 configuration was successful.
Update of the Networking Services/2 configuration file started.
Update of the Networking Services/2 configuration file was successful.
Migration of the Communications Manager configuration was successful.
-----------------------------------------------------------------------------
Configuration Migration Utility ended on 02-07-91 at 01:18p
-----------------------------------------------------------------------------
```

Figure 16. The .LOG File Created by the Migration Utility

Contents of Your .NDF File after Migration

The following is the created .NDF file which describes the APPN capabilities of your workstation:

```
DEFINE_LOCAL_CP  FQ_CP_NAME(USIBMMK.CARLEY   )
           DESCRIPTION(Created by the migration utility on 02-07-91 at 01:17p)
           CP_ALIAS(FILEREQ )
           NAU_ADDRESS(INDEPENDENT_LU)
           NODE_TYPE(EN)
           NODE_ID(X'32222')
           HOST_FP_SUPPORT(NO);

DEFINE_LOGICAL_LINK  LINK_NAME(LINK0001)
             DESCRIPTION(Created by the migration utility on 02-07-91 at 01:17p)
             FQ_ADJACENT_CP_NAME(USIBMMK.CP000002 )
             ADJACENT_NODE_TYPE(LEN)
             DLC_NAME(IBMTRNET)
             ADAPTER_NUMBER(0)
             DESTINATION_ADDRESS(X'400030010020')
             CP_CP_SESSION_SUPPORT(NO)
             ACTIVATE_AT_STARTUP(NO)
             LIMITED_RESOURCE(USE_ADAPTER_DEFINITION)
             LINK_STATION_ROLE(USE_ADAPTER_DEFINITION)
             SOLICIT_SSCP_SESSION(NO)
             EFFECTIVE_CAPACITY(USE_ADAPTER_DEFINITION)
             COST_PER_CONNECT_TIME(USE_ADAPTER_DEFINITION)
             COST_PER_BYTE(USE_ADAPTER_DEFINITION)
             SECURITY(USE_ADAPTER_DEFINITION)
             PROPAGATION_DELAY(USE_ADAPTER_DEFINITION)
             USER_DEFINED_1(USE_ADAPTER_DEFINITION)
             USER_DEFINED_2(USE_ADAPTER_DEFINITION)
             USER_DEFINED_3(USE_ADAPTER_DEFINITION);

DEFINE_PARTNER_LU  FQ_PARTNER_LU_NAME(USIBMMK.LAB00001 )
            DESCRIPTION(Created by the migration utility on 02-07-91 at 01:17p)
            PARTNER_LU_ALIAS(FILESVR)
            MAX_MC_LL_SEND_SIZE(32767)
            CONV_SECURITY_VERIFICATION(NO)
            PARALLEL_SESSION_SUPPORT(YES);

DEFINE_PARTNER_LU_LOCATION  FQ_PARTNER_LU_NAME(USIBMMK.LAB00001 )
                DESCRIPTION(Created by the migration utility on 02-07-91 at 01:17p)
                WILDCARD_ENTRY(NO)
                FQ_OWNING_CP_NAME(USIBMMK.CP000002 )
                LOCAL_NODE_NN_SERVER(YES);
```

Figure 17 (Part 1 of 2). The .NDF File Created by the Migration Utility

```
DEFINE_MODE  MODE_NAME(MODE1   )
         DESCRIPTION(Created by the migration utility on 02-07-91 at 01:17p)
         COS_NAME(#CONNECT)
         DEFAULT_RU_SIZE(NO)
         MAX_RU_SIZE_UPPER_BOUND(1024)
         RECEIVE_PACING_WINDOW(8)
         MAX_NEGOTIABLE_SESSION_LIMIT(32767)
         PLU_MODE_SESSION_LIMIT(10)
         MIN_CONWINNERS_SOURCE(5);

DEFINE_DEFAULTS  IMPLICIT_INBOUND_PLU_SUPPORT(NO)
           DESCRIPTION(Created by the migration utility on 02-07-91 at 01:17p)
           DEFAULT_MODE_NAME(BLANK)
           DEFAULT_LOCAL_LU_ALIAS(FILEREQ )
           MAX_MC_LL_SEND_SIZE(32767)
           DIRECTORY_FOR_INBOUND_ATTACHES(*)
           DEFAULT_TP_OPERATION(NONQUEUED_AM_STARTED)
           DEFAULT_TP_PROGRAM_TYPE(BACKGROUND)
           DEFAULT_TP_CONV_SECURITY_RQD(NO)
           MAX_HELD_ALERTS(10);

DEFINE_TP  TP_NAME(FILEMSVR)
        DESCRIPTION(Created by the migration utility on 02-07-91 at 01:17p)
        FILESPEC(C:\SAMPLE\FILECSVR.EXE)
        CONVERSATION_TYPE(EITHER)
        CONV_SECURITY_RQD(NO)
        SYNC_LEVEL(EITHER)
        TP_OPERATION(NONQUEUED_AM_STARTED)
        PROGRAM_TYPE(BACKGROUND)
        RECEIVE_ALLOCATE_TIMEOUT(INFINITE);

START_ATTACH_MANAGER;

CNOS  LOCAL_LU_ALIAS(FILEREQ )
    FQ_PARTNER_LU_NAME(USIBMMK.LAB00001 )
    MODE_NAME(MODE1   )
    SET_NEGOTIABLE(NO)
    PLU_MODE_SESSION_LIMIT(10)
    MIN_CONWINNERS_SOURCE(0)
    MIN_CONWINNERS_TARGET(0)
    AUTO_ACTIVATE(0);
```

Figure 17 (Part 2 of 2). The .NDF File Created by the Migration Utility

Note:

- There is no link that supports CP-CP sessions with a network node server, so this end node is a LEN node.
- The link name LINK0001 and the CP name CP000002 were created by the migration program. You should change them with more significant names such as LOFFICE1 and COFFICE1. Since a CP name can be the same as a link name the best may be to name both of them OFFICE1.
- The CNOS verb is always built. This verb may be deleted if you prefer the CNOS to take place the first time the partners attempt to

use that mode. For more information about CNOS see section 8.8, "Implicit CNOS" on page 115.

- The IMPLICIT_INBOUND_PLU_SUPPORT is set to NO in the DEFINE_DEFAULTS parameters which is very restrictive; only the defined PLU LAB0001 is allowed to have a conversation with a local LU.

7.2 Node in a Direct Peer Connection with Another Node

In this section we suppose you want to configure your workstation as an end node or network node with a direct peer connection to another node. We call direct connection a connection where the machines are physically connected to each other.

Nodes using a direct peer connection don't use the APPN capability of Networking Services/2 with this connection, but they can have other connections that allow them to participate in an APPN network. On this connection they are in the same situation as workstations using the APPC capability of Communications Manager.

The location of each partner LU must be defined. You do not have to associate local LUs and partner LUs. A local LU may have a session with any defined partner LU.

The following describes how to build an end node that uses direct peer connections with other nodes (end nodes or network nodes). We will only define one direct peer connection.

In the following section we assume you know how to create a new .NDF file and how to use the Presentation Manager panels of Networking Services/2. If you don't, "Creating Your .NDF File" on page 36 explains how to proceed.

Building the Node with the Presentation Manager Screens

To configure the network node, follow the these steps:

1. Go to the Configuration Management window and double-click on `Configuration File`.
2. If the name of the configuration file .NDF you want to work with is not the name of the configuration file .NDF that is in the title bar of the Configuration Management window, open the configuration file you want to work with by selecting `Open Configuration File...`
3. Keep or change the Local Node Characteristics, for example:
   - Network ID: `USIBMRA`
   - Local node name: `RALYOS2A`
   - Local node ID: `22222`
   - Local node alias name: `FILEREQ`
   - Node type: `End Node`
   - `Activate Attach Manager at start up`
   - Comment: `Created with the PM interface`
   - Click on `OK` to validate.
4. Configure the connection to the adjacent node (which is in fact a LEN node):
   - In the Connections window double-click on `Peer Node`.

- In the Adapter List window double-click on the currently configured adapter you want to use (we assume you use IBMTRNET adapter 01).
- Define the link, for example:
  - Link name: LINKLAB
  - Partner network ID: USIBMRA
  - Partner node name: LAB00001
  - LAN destination address: 400000022221
  - Comment: Connection peer to the LAB.
- Click on Define Partner LUs... to define all the LUs, including the CP, in the end node that you intend to speak with. For example, we define:
  - LU name: LABLU001
  - Alias: FILESVR
  - Comment: PLU created while building the link LABLINK
  - Click on Update
  - Click on OK to validate the PLU definition.

  Click on OK to validate the link definition.
- Close the Connections window.

5. Go to the advanced SNA window and configure as follows:
   - Double-click on Transaction Program Definitions to add a remotely startable TP. We defined:
     - TP name: FILEMSVR
     - Path: C:\SAMPLE\FILECSVR.EXE
     - Comment: FILE SERVER.
   - Double-click on Transaction Program Defaults to define, for example:
     - Default program directory: C:\TP
     - Presentation type: Presentation Manager
     - Operation type: Non-queued, Attach Manager started.
   - Double-click on Transaction Program Security if you want to change a TP's security.
   - Double-click on Local LUs if you intend to create a local LU.
   - Double-click on LU-LU Security to define LU-to-LU passwords.
   - Double-click on CPI Communications Side Info to create side information for any PLU.
   - Double-click on Modes to add a mode definition to the IBM-supplied modes, for example:
     - Mode name: MODE1
     - Class of service: #CONNECT
     - Mode session limit: 10
     - Minimum contention winners: 5
     - Receive pacing window: 8
     - RU size: Maximum RU size: 1024
     - Comment: Used by the TPs FILECSVR.EXE and FILECREQ.EXE.
   - Close the Advanced SNA window.
6. Verify the configuration.

The .NDF File

The following shows the .NDF file that was just built:

```
DEFINE_LOCAL_CP  FQ_CP_NAME(USIBMMK.RALYOS2A )
            DESCRIPTION(Created with the PM interface)
            CP_ALIAS(FILEREQ )
            NAU_ADDRESS(INDEPENDENT_LU)
            NODE_TYPE(EN)
            NODE_ID(X'22222')
            HOST_FP_SUPPORT(NO);

DEFINE_LOGICAL_LINK  LINK_NAME(LINKLAB )
              DESCRIPTION(Connection peer to the LAB)
              FQ_ADJACENT_CP_NAME(USIBMRA.LAB00001 )
              ADJACENT_NODE_TYPE(LEARN)
              DLC_NAME(IBMTRNET)
              ADAPTER_NUMBER(0)
              DESTINATION_ADDRESS(X'400000022221')
              CP_CP_SESSION_SUPPORT(NO)
              ACTIVATE_AT_STARTUP(NO)
              LIMITED_RESOURCE(USE_ADAPTER_DEFINITION)
              LINK_STATION_ROLE(USE_ADAPTER_DEFINITION)
              SOLICIT_SSCP_SESSION(NO)
              EFFECTIVE_CAPACITY(USE_ADAPTER_DEFINITION)
              COST_PER_CONNECT_TIME(USE_ADAPTER_DEFINITION)
              COST_PER_BYTE(USE_ADAPTER_DEFINITION)
              SECURITY(USE_ADAPTER_DEFINITION)
              PROPAGATION_DELAY(USE_ADAPTER_DEFINITION)
              USER_DEFINED_1(USE_ADAPTER_DEFINITION)
              USER_DEFINED_2(USE_ADAPTER_DEFINITION)
              USER_DEFINED_3(USE_ADAPTER_DEFINITION);

DEFINE_PARTNER_LU  FQ_PARTNER_LU_NAME(USIBMRA.LABLU001 )
             DESCRIPTION(PLU created while building the link LABLINK)
             PARTNER_LU_ALIAS(FILESVR)
             MAX_MC_LL_SEND_SIZE(32767)
             CONV_SECURITY_VERIFICATION(NO)
             PARALLEL_SESSION_SUPPORT(YES);

DEFINE_PARTNER_LU_LOCATION  FQ_PARTNER_LU_NAME(USIBMRA.LABLU001 )
                DESCRIPTION(PLU created while building the link LABLINK)
                WILDCARD_ENTRY(NO)
                FQ_OWNING_CP_NAME(USIBMRA.LAB00001 )
                LOCAL_NODE_NN_SERVER(NO);
```

Figure 18 (Part 1 of 2). Node in a Direct Peer Connection

```
DEFINE_MODE  MODE_NAME(MODE1   )
          DESCRIPTION(Used by the TPs FILECSVR.EXE and FILECREQ.EXE)
          COS_NAME(#CONNECT)
          DEFAULT_RU_SIZE(NO)
          MAX_RU_SIZE_UPPER_BOUND(1024)
          RECEIVE_PACING_WINDOW(8)
          MAX_NEGOTIABLE_SESSION_LIMIT(32767)
          PLU_MODE_SESSION_LIMIT(10)
          MIN_CONWINNERS_SOURCE(5);

DEFINE_DEFAULTS  IMPLICIT_INBOUND_PLU_SUPPORT(YES)
             MAX_MC_LL_SEND_SIZE(32767)
             DIRECTORY_FOR_INBOUND_ATTACHES(C:\TP)
             DEFAULT_TP_OPERATION(NONQUEUED_AM_STARTED)
             DEFAULT_TP_PROGRAM_TYPE(PRESENTATION_MANAGER)
             DEFAULT_TP_CONV_SECURITY_RQD(NO)
             MAX_HELD_ALERTS(10);

DEFINE_TP  TP_NAME(FILEMSVR)
        DESCRIPTION(FILE SERVER)
        FILESPEC(C:\SAMPLE\FILECSVR.EXE)
        CONVERSATION_TYPE(EITHER)
        CONV_SECURITY_RQD(NO)
        SYNC_LEVEL(EITHER)
        TP_OPERATION(NONQUEUED_AM_STARTED)
        PROGRAM_TYPE(BACKGROUND)
        RECEIVE_ALLOCATE_TIMEOUT(INFINITE);

START_ATTACH_MANAGER;
```

Figure 18 (Part 2 of 2). Node in a Direct Peer Connection

Note:

This end node, which is in fact a LEN node, can have a conversation with the following end node obtained by migrating an APPC configured .CFG file and adding the definition of the LU LABLU001 with the Presentation Manager interface.

```
DEFINE_LOCAL_CP  FQ_CP_NAME(USIBMRA.LAB00001 )
          DESCRIPTION(Created by the migration utility on 02-07-91 at 03:04p)
          CP_ALIAS(FILEREQ )
          NAU_ADDRESS(INDEPENDENT_LU)
          NODE_TYPE(EN)
          NODE_ID(X'22221')
          HOST_FP_SUPPORT(NO);

DEFINE_LOGICAL_LINK  LINK_NAME(LINK0001)
            DESCRIPTION(Created by the migration utility on 02-07-91 at 03:04p)
            FQ_ADJACENT_CP_NAME(USIBMRA.CP000002 )
            ADJACENT_NODE_TYPE(LEN)
            DLC_NAME(IBMTRNET)
            ADAPTER_NUMBER(0)
            DESTINATION_ADDRESS(X'400000022222')
            CP_CP_SESSION_SUPPORT(NO)
            ACTIVATE_AT_STARTUP(NO)
            LIMITED_RESOURCE(USE_ADAPTER_DEFINITION)
            LINK_STATION_ROLE(USE_ADAPTER_DEFINITION)
            SOLICIT_SSCP_SESSION(NO)
            EFFECTIVE_CAPACITY(USE_ADAPTER_DEFINITION)
            COST_PER_CONNECT_TIME(USE_ADAPTER_DEFINITION)
            COST_PER_BYTE(USE_ADAPTER_DEFINITION)
            SECURITY(USE_ADAPTER_DEFINITION)
            PROPAGATION_DELAY(USE_ADAPTER_DEFINITION)
            USER_DEFINED_1(USE_ADAPTER_DEFINITION)
            USER_DEFINED_2(USE_ADAPTER_DEFINITION)
            USER_DEFINED_3(USE_ADAPTER_DEFINITION);

DEFINE_LOCAL_LU  LU_NAME(LABLU001)
          LU_ALIAS(LABLU001)
          NAU_ADDRESS(INDEPENDENT_LU);

DEFINE_PARTNER_LU  FQ_PARTNER_LU_NAME(USIBMRA.RALYOS2A )
           DESCRIPTION(Created by the migration utility on 02-07-91 at 03:04p)
           PARTNER_LU_ALIAS(FILESVR)
           MAX_MC_LL_SEND_SIZE(32767)
           CONV_SECURITY_VERIFICATION(NO)
           PARALLEL_SESSION_SUPPORT(YES);
```

Figure 19 (Part 1 of 2). Node That May Support a Peer Connection with the Previously Created End Node

```
DEFINE_PARTNER_LU_LOCATION  FQ_PARTNER_LU_NAME(USIBMRA.RALYOS2A )
                    DESCRIPTION(Created by the migration utility on 02-07-91 at 03:04p)
                    WILDCARD_ENTRY(NO)
                    FQ_OWNING_CP_NAME(USIBMRA.CP000002 )
                    LOCAL_NODE_NN_SERVER(YES);

DEFINE_MODE  MODE_NAME(MODE1   )
          DESCRIPTION(Created by the migration utility on 02-07-91 at 03:04p)
          COS_NAME(#CONNECT)
          DEFAULT_RU_SIZE(NO)
          MAX_RU_SIZE_UPPER_BOUND(1024)
          RECEIVE_PACING_WINDOW(8)
          MAX_NEGOTIABLE_SESSION_LIMIT(32767)
          PLU_MODE_SESSION_LIMIT(10)
          MIN_CONWINNERS_SOURCE(5);

DEFINE_DEFAULTS  IMPLICIT_INBOUND_PLU_SUPPORT(NO)
            DESCRIPTION(Created by the migration utility on 02-07-91 at 03:04p)
            DEFAULT_MODE_NAME(BLANK)
            DEFAULT_LOCAL_LU_ALIAS(FILEREQ )
            MAX_MC_LL_SEND_SIZE(32767)
            DIRECTORY_FOR_INBOUND_ATTACHES(*)
            DEFAULT_TP_OPERATION(NONQUEUED_AM_STARTED)
            DEFAULT_TP_PROGRAM_TYPE(BACKGROUND)
            DEFAULT_TP_CONV_SECURITY_RQD(NO)
            MAX_HELD_ALERTS(10);

DEFINE_TP  TP_NAME(FILEMSVR)
        DESCRIPTION(Created by the migration utility on 02-07-91 at 03:04p)
        FILESPEC(C:\SAMPLE\FILECSVR.EXE)
        CONVERSATION_TYPE(EITHER)
        CONV_SECURITY_RQD(NO)
        SYNC_LEVEL(EITHER)
        TP_OPERATION(NONQUEUED_AM_STARTED)
        PROGRAM_TYPE(BACKGROUND)
        RECEIVE_ALLOCATE_TIMEOUT(INFINITE);

START_ATTACH_MANAGER;

CNOS  LOCAL_LU_ALIAS(FILEREQ )
    FQ_PARTNER_LU_NAME(USIBMRA.RALYOS2A )
    MODE_NAME(MODE1   )
    SET_NEGOTIABLE(NO)
    PLU_MODE_SESSION_LIMIT(10)
    MIN_CONWINNERS_SOURCE(0)
    MIN_CONWINNERS_TARGET(0)
    AUTO_ACTIVATE(0);
```

Figure 19 (Part 2 of 2). Node That May Support a Peer Connection with the Previously Created End Node

7.3 Network Node

A network node can have two kinds of connections with another node:

- With CP-CP session support
- Without CP-CP session support.

An end node can have a pair of active CP-CP sessions with its serving network node. This allows the network node to learn what LUs are on the end node. So, when a search for an LU on this end node arrives on the network node, the network node gives a positive response.

When an LU of an end node intends to speak to another LU of the network, the LU contacts the network node that it has CP-CP sessions with. This network node is the entry-point in the APPN network for the end node. It is called the preferred server of the end node. The end nodes served by a network node are said to be in the domain of the network node.

An end node may have many links that support CP-CP sessions with network nodes but it may only have one active CP-CP session at a time. That means an end node may only belong to one domain.

You should always give to each end node the capability to have CP-CP sessions with a network node and define this network node as the preferred server of the end node. These definitions are made in the end node. It is the easiest way to make the end node participate in the APPN network.

The link that supports a CP-CP session must always stay active. If you don't have such a link, for example, if your end node is attached to a network node through a switched link, there is still a way to define the end node and the network node where the network node will provide servers to the end node. In that case, the end node will in fact be a LEN node.

We will now see how to define:

- A network node connected to an end node in its domain
- A network node connected to an end node out of its domain
- A network node acting as a server for a LEN node
- A network node backup server of an end node
- A network node connected to another network node.

7.4 Network Node Server of an End Node in Its Domain

If you are using a token-ring LAN, also see section 7.15, "Connection Network" on page 87.

In the following section we assume you know how to create a new .NDF file and how to use the Presentation Manager panels of Networking Services/2. If you don't, "Creating Your .NDF File" on page 36 explains how to proceed.

We will first see how to configure the network node and then an end node in its domain. This can be done either with the Create/Quick Configuration window or with the Configuration Management window.

7.5 Network Node Server of the Domain

To configure the network node server of the domain, follow the next steps:

1. Go to the Configuration Management window and double-click on `Configuration File`.
2. If the name of the configuration file .NDF you want to work with is not the name of the configuration file .NDF that is in the title bar of the Configuration Management window, open the configuration file you want to work with by selecting `Open Configuration File...`
3. Keep or change the Local Node Characteristics, for example:
   - Network ID: `USIBMRA`
   - Local node name: `RALYOS2A`
   - Local node ID: `22222`
   - Local node alias name: `RALYOS2A` (keep the node name)
   - Node type: `Network Node`
   - `Activate Attach Manager at start up`
   - Comment: `Created with the PM interface`
   - Click on `OK` to validate.
4. Configure the connection to the end node:
   - In the Connections window double-click on `End Node (or Unknown Node Type)`.
   - In the Adapter List window double-click on the currently configured adapter you want to use (we assume you use IBMTRNET adapter 00).
   - Define the link, for example:
     - Link name: `EN1`
     - LAN destination address: `400000022221`
     - Comment: `Link to an EN of the Domain.`
   - Close the Connections window.
5. Define the advanced SNA capabilities of the node (LU, TP, Mode, etc...). You should at least define the defaults.
6. Verify the configuration.

The .NDF File

Here is the .NDF that has been created:

```
DEFINE_LOCAL_CP  FQ_CP_NAME(USIBMRA.RALYOS2A )
            DESCRIPTION(Created with the PM interface)
            CP_ALIAS(RALYOS2A)
            NAU_ADDRESS(INDEPENDENT_LU)
            NODE_TYPE(NN)
            NODE_ID(X'22222')
            HOST_FP_SUPPORT(NO);

DEFINE_LOGICAL_LINK  LINK_NAME(EN1     )
              DESCRIPTION(Link to an EN of the Domain)
              ADJACENT_NODE_TYPE(LEARN)
              DLC_NAME(IBMTRNET)
              ADAPTER_NUMBER(0)
              DESTINATION_ADDRESS(X'400000022221')
              CP_CP_SESSION_SUPPORT(YES)
              ACTIVATE_AT_STARTUP(YES)
              LIMITED_RESOURCE(USE_ADAPTER_DEFINITION)
              LINK_STATION_ROLE(USE_ADAPTER_DEFINITION)
              SOLICIT_SSCP_SESSION(NO)
              EFFECTIVE_CAPACITY(USE_ADAPTER_DEFINITION)
              COST_PER_CONNECT_TIME(USE_ADAPTER_DEFINITION)
              COST_PER_BYTE(USE_ADAPTER_DEFINITION)
              SECURITY(USE_ADAPTER_DEFINITION)
              PROPAGATION_DELAY(USE_ADAPTER_DEFINITION)
              USER_DEFINED_1(USE_ADAPTER_DEFINITION)
              USER_DEFINED_2(USE_ADAPTER_DEFINITION)
              USER_DEFINED_3(USE_ADAPTER_DEFINITION);

START_ATTACH_MANAGER;
```

Figure 20. Network Node Server of a Domain

Note:

You do not have to define in the network node server, the modes you define in the end nodes that the network node serves. A mode only needs to be defined in the nodes that contain the TPs using it.

7.6 End Node in the Domain of a Network Node Server Defined with the Create/Quick Configuration Window

When you use the Create/Quick window you do not need to have an .NDF file to modify. The .CFG alone is sufficient.

Using the Create/Quick window, you have to type very little information, for example:

1. If you have two adapters configured you have to click on the one you intend to use (we suppose you select adapter 00)
2. Type the requested information:
   - Network ID: `USIBMRA`
   - Local node name: `ENCN`
   - Network node server address: `400000022222`

3. If you have made a mistake and want to use the other adapter select `Cancel`; otherwise, select `Verify`.
4. You may then select `Additional Configuration` to go to the Configuration Management window (see section 7.7, "End Node in the Domain of a Network Node Server Defined with the Configuration Management Window" on page 75) or `Cancel` (twice if you have two configured adapters) to exit.

If you have two configured adapters, here is what you must NOT do:

1. Select one adapter, type information, select `Verify` and select `Cancel`
2. Select the other adapter, type information, select `Verify` and select `Cancel` twice to exit.

This would give two preferred network node servers to your workstation. During the second verification a warning would tell you to look at the .LOG file where this error would be written.

Here is the .NDF we have just built. You will notice that many definitions were automatically added to the information you gave; for example, the DEFINE_DEFAULTS and START_ATTACH_MANAGER verbs.

Moreover, there are definitions for the connection network for each configured adapter (even the one you did not select!). This is discussed in section 7.15, "Connection Network" on page 87.

The .NDF File

Here is the .NDF that has been created:

```
DEFINE_LOCAL_CP  FQ_CP_NAME(USIBMRA.ENCN     )
           CP_ALIAS(ENCN    )
           NAU_ADDRESS(INDEPENDENT_LU)
           NODE_TYPE(EN)
           NODE_ID(X'00000')
           HOST_FP_SUPPORT(NO);

DEFINE_CONNECTION_NETWORK  FQ_CN_NAME(USIBMRA.PU000000 )
                 ADAPTER_INFO( DLC_NAME(IBMTRNET)
                          ADAPTER_NUMBER(0));

DEFINE_CONNECTION_NETWORK  FQ_CN_NAME(USIBMRA.BB119    )
                 ADAPTER_INFO( DLC_NAME(IBMTRNET)
                          ADAPTER_NUMBER(1));

DEFINE_LOGICAL_LINK  LINK_NAME(LINK0001)
             ADJACENT_NODE_TYPE(NN)
             PREFERRED_NN_SERVER(YES)
             DLC_NAME(IBMTRNET)
             ADAPTER_NUMBER(0)
             DESTINATION_ADDRESS(X'400000022222')
             CP_CP_SESSION_SUPPORT(YES)
             ACTIVATE_AT_STARTUP(YES)
             LIMITED_RESOURCE(USE_ADAPTER_DEFINITION)
             LINK_STATION_ROLE(USE_ADAPTER_DEFINITION)
             SOLICIT_SSCP_SESSION(NO)
             EFFECTIVE_CAPACITY(USE_ADAPTER_DEFINITION)
             COST_PER_CONNECT_TIME(USE_ADAPTER_DEFINITION)
             COST_PER_BYTE(USE_ADAPTER_DEFINITION)
             SECURITY(USE_ADAPTER_DEFINITION)
             PROPAGATION_DELAY(USE_ADAPTER_DEFINITION)
             USER_DEFINED_1(USE_ADAPTER_DEFINITION)
             USER_DEFINED_2(USE_ADAPTER_DEFINITION)
             USER_DEFINED_3(USE_ADAPTER_DEFINITION);

DEFINE_DEFAULTS  IMPLICIT_INBOUND_PLU_SUPPORT(YES)
           DEFAULT_MODE_NAME(BLANK)
           MAX_MC_LL_SEND_SIZE(32767)
           DIRECTORY_FOR_INBOUND_ATTACHES(*)
           DEFAULT_TP_OPERATION(NONQUEUED_AM_STARTED)
           DEFAULT_TP_PROGRAM_TYPE(BACKGROUND)
           DEFAULT_TP_CONV_SECURITY_RQD(NO)
           MAX_HELD_ALERTS(10);

START_ATTACH_MANAGER;
```

Figure 21. End Node in a Domain Created with the Create/Quick Configuration Window

7.7 End Node in the Domain of a Network Node Server Defined with the Configuration Management Window

If you intend to use the Configuration Management window directly, follow these steps:

1. Go to the Configuration Management window and double-click on `Configuration File`.
2. If the name of the configuration file .NDF you want to work with is not the name of the configuration file .NDF that is in the title bar of the Configuration Management window, open the configuration file you want to work with by selecting `Open Configuration File...`
3. Keep or change the Local Node Characteristics, for example:
   - Network ID: `USIBMRA`
   - Local node name: `EN1`
   - Local node ID: `22221`
   - Local node alias name: `EN1` (keep the node name)
   - Node type: `End Node`
   - `Activate Attach Manager at start up`
   - Comment: `Created with the PM interface`
   - Click on `OK` to validate.
4. Configure the connection to the network node:
   - In the Connections window double-click on `Network Node`.
   - In the Adapter List window double-click on the currently configured adapter you want to use (we assume you use IBMTRNET adapter 00).
   - Define the link, for example:
     - Link name: `NNSERVER`
     - LAN destination address: `400000022222`
     - Select `Use this network node connection as your preferred server`
     - Comment: `Link to the Network Node Server of the Domain.`
   - Close the Connections window.
5. Define the advanced SNA capabilities of the node (LU, TP, Mode, etc...). You should at least define the defaults.
6. Verify the configuration.

The .NDF File

Here is the .NDF that has been created:

```
DEFINE_LOCAL_CP  FQ_CP_NAME(USIBMRA.EN1      )
            DESCRIPTION(Created with the PM interface)
            CP_ALIAS(EN1     )
            NAU_ADDRESS(INDEPENDENT_LU)
            NODE_TYPE(EN)
            NODE_ID(X'22222')
            HOST_FP_SUPPORT(NO);

DEFINE_LOGICAL_LINK  LINK_NAME(NNSERVER)
              DESCRIPTION(Link to the Network Node Server of the Domain)
              ADJACENT_NODE_TYPE(NN)
              PREFERRED_NN_SERVER(YES)
              DLC_NAME(IBMTRNET)
              ADAPTER_NUMBER(0)
              DESTINATION_ADDRESS(X'400000022222')
              CP_CP_SESSION_SUPPORT(YES)
              ACTIVATE_AT_STARTUP(YES)
              LIMITED_RESOURCE(USE_ADAPTER_DEFINITION)
              LINK_STATION_ROLE(USE_ADAPTER_DEFINITION)
              SOLICIT_SSCP_SESSION(NO)
              EFFECTIVE_CAPACITY(USE_ADAPTER_DEFINITION)
              COST_PER_CONNECT_TIME(USE_ADAPTER_DEFINITION)
              COST_PER_BYTE(USE_ADAPTER_DEFINITION)
              SECURITY(USE_ADAPTER_DEFINITION)
              PROPAGATION_DELAY(USE_ADAPTER_DEFINITION)
              USER_DEFINED_1(USE_ADAPTER_DEFINITION)
              USER_DEFINED_2(USE_ADAPTER_DEFINITION)
              USER_DEFINED_3(USE_ADAPTER_DEFINITION);

START_ATTACH_MANAGER;
```

Figure 22. End Node in a Domain Created with the Configuration Management Window

7.8 Network Node and Non-Domain End Node

In the following section we assume you know how to create a new .NDF file and how to use the Presentation Manager panels of Networking Services/2. If you don't, "Creating Your .NDF File" on page 36 explains how to proceed.

The definition of the network node is the same as in section 7.14, "Network Node Connected to Another Network Node" on page 86.

To configure an end node out of the domain of a network node, follow the next steps:

1. Go to the Configuration Management window and double-click on `Configuration File`
2. If the name of the configuration file .NDF you want to work with is not the name of the configuration file .NDF that is in the title bar of the Configuration Management window, open the configuration file you want to work with by selecting `Open Configuration File...`
3. Keep or change the Local Node Characteristics, for example:

- Network ID: USIBMRA
- Local node name: EN2
- Local node ID: 22223
- Local node alias name: EN2 (keep the node name)
- Node type: End Node
- Activate Attach Manager at start up
- Comment: Created with the PM interface
- Click on OK to validate.

4. Configure the connection to the network node:
   - In the Connections window double-click on Network Node.
   - In the Adapter List window double-click on the currently configured adapter you want to use (we assume you use IBMTRNET adapter 00).
   - Define the link, for example:
     - Link name: NN
     - LAN destination address: 400000022222
     - **Do not select** Use this network node connection as your preferred server
     - Comment: Link to a Network Node out of the Domain.
   - Close the Connections window.
5. Define the advanced SNA capabilities of the node (LU, TP, Mode, etc...). You should at least define the defaults.
6. Verify the configuration.

The .NDF File

Here is the .NDF that has been created:

```
DEFINE_LOCAL_CP  FQ_CP_NAME(USIBMRA.EN2     )
          DESCRIPTION(Created with the PM interface)
          CP_ALIAS(EN2    )
          NAU_ADDRESS(INDEPENDENT_LU)
          NODE_TYPE(EN)
          NODE_ID(X'22223')
          HOST_FP_SUPPORT(NO);

DEFINE_LOGICAL_LINK  LINK_NAME(NN      )
            DESCRIPTION(Link to a Network Node out of the Domain)
            ADJACENT_NODE_TYPE(NN)
            PREFERRED_NN_SERVER(NO)
            DLC_NAME(IBMTRNET)
            ADAPTER_NUMBER(0)
            DESTINATION_ADDRESS(X'400000022222')
            CP_CP_SESSION_SUPPORT(YES)
            ACTIVATE_AT_STARTUP(YES)
            LIMITED_RESOURCE(USE_ADAPTER_DEFINITION)
            LINK_STATION_ROLE(USE_ADAPTER_DEFINITION)
            SOLICIT_SSCP_SESSION(NO)
            EFFECTIVE_CAPACITY(USE_ADAPTER_DEFINITION)
            COST_PER_CONNECT_TIME(USE_ADAPTER_DEFINITION)
            COST_PER_BYTE(USE_ADAPTER_DEFINITION)
            SECURITY(USE_ADAPTER_DEFINITION)
            PROPAGATION_DELAY(USE_ADAPTER_DEFINITION)
            USER_DEFINED_1(USE_ADAPTER_DEFINITION)
            USER_DEFINED_2(USE_ADAPTER_DEFINITION)
            USER_DEFINED_3(USE_ADAPTER_DEFINITION);

START_ATTACH_MANAGER;
```

Figure 23. End Node Out of a Domain

7.9 Network Node Acting as a Server for an End Node without CP-CP Session (LEN Node)

In the following section we assume you know how to create a new .NDF file and how to use the Presentation Manager panels of Networking Services/2. If you don't, "Creating Your .NDF File" on page 36 explains how to proceed.

We will see first how to configure the network node and then an end node attached to it as a LEN node. We will illustrate this configuration with a sample APPN network.

7.10 Network Node Acting as a Server for a LEN Node

To configure the network node with an end node attached to it as a LEN node, follow these steps:

1. Go to the Configuration Management window and double-click on `Configuration File`.

2. If the name of the configuration file .NDF you want to work with is not the name of the configuration file .NDF that is in the title bar of the Configuration Management window, open the configuration file you want to work with by selecting `Open Configuration File...`

3. Keep or change the Local Node Characteristics, for example:

   - Network ID: `USIBMRA`
   - Local node name: `NN1`
   - Local node ID: `22221`
   - Local node alias name: `NN1` (keep the node name)
   - Node type: `Network Node`
   - `Activate Attach Manager at start up`
   - Comment: `Created with the PM interface`
   - Click on `OK` to validate.

4. Configure the connection to the end node (which is in fact a LEN node):

   - In the Connections window double-click on `LEN Node`.
   - In the Adapter List window double-click on the currently configured adapter you want to use (we assume you use IBMTRNET adapter 01).
   - Define the link, for example:
     - Link name: `EN1`
     - Partner network ID: `USIBMRA`
     - Partner node name: `EN1`
     - LAN destination address: `400032BB119B`
     - Comment: `Link to an EN defined as a LEN Node.`
   - Click on `Define Partner LUs...` to define all the LUs in the end node, including the CP. For example, we define:
     - The CP of the end node
       - LU name: `EN1`
       - Alias: `EN1`
       - Comment: `Definition of the EN's CP`
       - Click on `Update`.
     - An LU in the end node
       - LU name: `LU1`
       - Alias: `LU1`
       - Comment: `Other LU in the EN defined as a LEN Node`
       - Click on `Update`.
     - Click on `OK` to validate the PLU definitions.

     Click on `OK` to validate the link definition.
   - Close the Connections window.

5. Define the advanced SNA capabilities of the node (LU, TP, Mode, etc...).

6. Verify the configuration.

The .NDF File

Here is the .NDF that has been created:

```
DEFINE_LOCAL_CP  FQ_CP_NAME(USIBMRA.NN1      )
            DESCRIPTION(Created with the PM interface)
            CP_ALIAS(NN1     )
            NAU_ADDRESS(INDEPENDENT_LU)
            NODE_TYPE(NN)
            NODE_ID(X'22221')
            HOST_FP_SUPPORT(NO);

DEFINE_LOGICAL_LINK  LINK_NAME(EN1     )
               DESCRIPTION(Link to an EN defined as a LEN Node)
               FQ_ADJACENT_CP_NAME(USIBMRA.EN1      )
               ADJACENT_NODE_TYPE(LEN)
               DLC_NAME(IBMTRNET)
               ADAPTER_NUMBER(1)
               DESTINATION_ADDRESS(X'400032BB119B')
               CP_CP_SESSION_SUPPORT(NO)
               ACTIVATE_AT_STARTUP(YES)
               LIMITED_RESOURCE(USE_ADAPTER_DEFINITION)
               LINK_STATION_ROLE(USE_ADAPTER_DEFINITION)
               SOLICIT_SSCP_SESSION(NO)
               EFFECTIVE_CAPACITY(USE_ADAPTER_DEFINITION)
               COST_PER_CONNECT_TIME(USE_ADAPTER_DEFINITION)
               COST_PER_BYTE(USE_ADAPTER_DEFINITION)
               SECURITY(USE_ADAPTER_DEFINITION)
               PROPAGATION_DELAY(USE_ADAPTER_DEFINITION)
               USER_DEFINED_1(USE_ADAPTER_DEFINITION)
               USER_DEFINED_2(USE_ADAPTER_DEFINITION)
               USER_DEFINED_3(USE_ADAPTER_DEFINITION);

DEFINE_PARTNER_LU  FQ_PARTNER_LU_NAME(USIBMRA.EN1      )
              DESCRIPTION(Definition of the EN's CP)
              PARTNER_LU_ALIAS(EN1)
              MAX_MC_LL_SEND_SIZE(32767)
              CONV_SECURITY_VERIFICATION(NO)
              PARALLEL_SESSION_SUPPORT(YES);

DEFINE_PARTNER_LU  FQ_PARTNER_LU_NAME(USIBMRA.LU1      )
              DESCRIPTION(Other LU in the EN defined as a LEN Node)
              PARTNER_LU_ALIAS(LU1)
              MAX_MC_LL_SEND_SIZE(32767)
              CONV_SECURITY_VERIFICATION(NO)
              PARALLEL_SESSION_SUPPORT(YES);

DEFINE_PARTNER_LU_LOCATION  FQ_PARTNER_LU_NAME(USIBMRA.EN1      )
                    DESCRIPTION(Definition of the EN's CP)
                    WILDCARD_ENTRY(NO)
                    FQ_OWNING_CP_NAME(USIBMRA.EN1      )
                    LOCAL_NODE_NN_SERVER(YES);
```

Figure 24 (Part 1 of 2). Network Node Defined as the Server of a LEN Node

```
DEFINE_PARTNER_LU_LOCATION  FQ_PARTNER_LU_NAME(USIBMRA.LU1      )
                            DESCRIPTION(Other LU in the EN defined as a LEN Node)
                            WILDCARD_ENTRY(NO)
                            FQ_OWNING_CP_NAME(USIBMRA.EN1      )
                            LOCAL_NODE_NN_SERVER(YES);

START_ATTACH_MANAGER;
```

Figure 24 (Part 2 of 2). Network Node Defined as the Server of a LEN Node

7.11 End Node Attached to a Network Node as a LEN Node

To configure the end node attached to the network node as a LEN node, follow these steps:

1. Go to the Configuration Management window and double-click on `Configuration File`.
2. If the name of the configuration file .NDF you want to work with is not the name of the configuration file .NDF that is in the title bar of the Configuration Management window, open the configuration file you want to work with by selecting `Open Configuration File...`
3. Keep or change the Local Node Characteristics, for example:
   - Network ID: `USIBMRA`
   - Local node name: `EN1`
   - Local node ID: `00001`
   - Local node alias name: `EN1` (keep the node name)
   - Node type: `Network Node`
   - `Activate Attach Manager at start up`
   - Comment: `EN attached to a NN as a LEN Node`
   - Click on `OK` to validate.
4. Configure the connection to the network node:
   - In the Connections window double-click on `Peer Node`.
   - In the Adapter List window double-click on the currently configured adapter you want to use (we assume you use IBMTRNET adapter 00).
   - Define the link, for example:
     - Link name: `NN1`
     - Partner network ID: `USIBMRA`
     - Partner node name: `NN1`
     - LAN destination address: `400032BB119A`
     - Comment: `Connection to a NN that will serve this Node.`

     Click on `OK` to validate the link definition.
   - Close the Connections window.
5. Go to the Advanced SNA window and configure as follow:
   - Double-click on `Transaction Program Defaults` to define, for example:
     - Default program directory: *
     - Presentation type: `Background`
     - Operation type: `Non-queued, Attach Manager started.`

- Double-click on `Local LUs` to define, for example:
  - LU name: `LU1`
  - Alias: `LU1`
  - NAU address: `Independent`
  - Comment: `Created with the PM interface.`
- Close the Advanced SNA window.

6. Verify the configuration.
7. Edit the .NDF file:
   - In the DEFINE_LOGICAL_LINK verb:
     - If you keep the ACTIVATE_AT_STARTUP to NO, you will have to activate the link from an application or manually by selecting `APPN -> Subsystem Management` from the Configuration Management window.
   - Add the following verb, which allows any local LU to speak to any LU in the APPN network of the network node:

```
DEFINE_PARTNER_LU_LOCATION  WILDCARD_ENTRY(FULL)
                            FQ_OWNING_CP_NAME(USIBMRA.NN1      )
                            LOCAL_NODE_NN_SERVER(NO);
```

The .NDF File

Here is the .NDF that has been created:

```
DEFINE_LOCAL_CP  FQ_CP_NAME(USIBMRA.EN1      )
            DESCRIPTION(EN attached to a NN as a LEN Node)
            CP_ALIAS(EN1     )
            NAU_ADDRESS(INDEPENDENT_LU)
            NODE_TYPE(EN)
            NODE_ID(X'00001')
            HOST_FP_SUPPORT(NO);

DEFINE_LOGICAL_LINK  LINK_NAME(NN1     )
               DESCRIPTION(Connection to a NN that will serve this Node)
               FQ_ADJACENT_CP_NAME(USIBMRA.NN1      )
               ADJACENT_NODE_TYPE(LEARN)
               DLC_NAME(IBMTRNET)
               ADAPTER_NUMBER(0)
               DESTINATION_ADDRESS(X'400032BB119A')
               CP_CP_SESSION_SUPPORT(NO)
               ACTIVATE_AT_STARTUP(YES)
               LIMITED_RESOURCE(USE_ADAPTER_DEFINITION)
               LINK_STATION_ROLE(USE_ADAPTER_DEFINITION)
               SOLICIT_SSCP_SESSION(NO)
               EFFECTIVE_CAPACITY(USE_ADAPTER_DEFINITION)
               COST_PER_CONNECT_TIME(USE_ADAPTER_DEFINITION)
               COST_PER_BYTE(USE_ADAPTER_DEFINITION)
               SECURITY(USE_ADAPTER_DEFINITION)
               PROPAGATION_DELAY(USE_ADAPTER_DEFINITION)
               USER_DEFINED_1(USE_ADAPTER_DEFINITION)
               USER_DEFINED_2(USE_ADAPTER_DEFINITION)
               USER_DEFINED_3(USE_ADAPTER_DEFINITION);

DEFINE_LOCAL_LU  LU_NAME(LU1     )
            DESCRIPTION(Created with the PM interface)
            LU_ALIAS(LU1     )
            NAU_ADDRESS(INDEPENDENT_LU);

DEFINE_PARTNER_LU_LOCATION  WILDCARD_ENTRY(FULL)
                    FQ_OWNING_CP_NAME(USIBMRA.NN1      )
                    LOCAL_NODE_NN_SERVER(NO);

DEFINE_DEFAULTS  IMPLICIT_INBOUND_PLU_SUPPORT(YES)
            DESCRIPTION(Created under PM)
            MAX_MC_LL_SEND_SIZE(32767)
            DIRECTORY_FOR_INBOUND_ATTACHES(*)
            DEFAULT_TP_OPERATION(NONQUEUED_AM_STARTED)
            DEFAULT_TP_PROGRAM_TYPE(BACKGROUND)
            DEFAULT_TP_CONV_SECURITY_RQD(NO)
            MAX_HELD_ALERTS(10);

START_ATTACH_MANAGER;
```

Figure 25. End Node Served by a Network Node without CP-CP Session

7.12 Sample APPN Network with an End Node Attached to a Network Node as a LEN Node

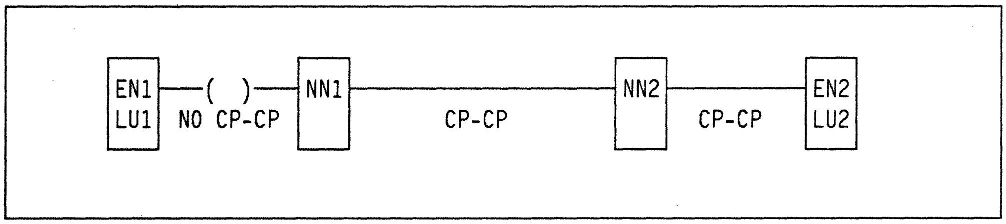


Figure 26. Sample APPN Network with a LEN Node Served by a Network Node

In this APPN network, the nodes EN1 and NN1 are configured as explained above. Any LU of the network can have a session with any other LU.

There is no definition for LU1 in NN2 or EN2. The only definitions for LU1 are in NN1 and EN1.

For an LU in EN1, all the LUs of the APPN network are seen as being located in NN1. NN1 is the server for LUs in EN1 and LUs in the APPN network can find them though the APPN directory function.

7.13 Network Node Backup Server of an End Node

Networking Services/2 has not implemented a backup network node server function. You may define a network node to act like a backup server, but there are some inconveniences.

The backup network node server is nothing more than a network node to which the end node is attached as a LEN node.

End Node Definition

To define the end node follow these steps:

1. Define the end node and its connection to its network node server (see section 7.7, "End Node in the Domain of a Network Node Server Defined with the Configuration Management Window" on page 75)
2. Define the connection to the backup network node server (see section 7.11, "End Node Attached to a Network Node as a LEN Node" on page 81).

Network Node Definition

To define the network node backup see section 7.10, "Network Node Acting as a Server for a LEN Node" on page 78. You must define in the backup all the LUs that are in the end node.

Comments

The following figure shows the difference between the definitions of the server and of its backup:

```
Network Node Server and Network Node Backup of an End Node

                                                                NNServer
                                              LINK
                                                 cp_cp_session_support(yes)
                                                 adjacent_node_type(learn)

  LINK
     adjacent_node_type(nn)
     preferred_nn_server(yes)
     cp_cp_session_support(yes)

EN

  LINK
     fq_adjacent_cp_name(NET.NNB)
     adjacent_node_type(learn)
     preferred_nn_server(yes)
     cp_cp_session_support(no)

  DEFINE PLU LOCATION
     wildcard_entry(full)
     fq_owning_cp_name(NET.NNB)
                                                                NNBackup
                                              LINK
                                                 cp_cp_session_support(no)
                                                 adjacent_node_type(len)
                                                 fq_adjacent_cp_name(NET.EN)

                                              DEFINE PLU LOCATION -> for each lu in EN
                                                 fq_partner_lu_name(NET.lu)
                                                 wildcard(no)
                                                 fq_owning_cp_name(NET.EN)
                                                 local_node_nn_server(yes)
```

Figure 27. Differences in the Definitions of a Network Node Server and a Network Node Backup

The definitions at EN allow it to issue outbound allocates even if its network node server NNS goes down. The definitions at NNB allow allocates to reach the EN if NNS is down. However, if the network is completely up, both network nodes will answer network searches for EN, and you might not get the optimal route.

What we mean is that NNB will answer for EN as a LEN node, and the calculated route will always be through NNB, while NNS would consider all the possible network routes and calculate the best one. NNB will also usually be the first to respond to a network search, because NNS will send a message to its served EN to verify it is still there; so, you'll likely see the route go through NNB.

7.14 Network Node Connected to Another Network Node

In the following section we assume you know how to create a new .NDF file and how to use the Presentation Manager panels of Networking Services/2. If you don't, "Creating Your .NDF File" on page 36 explains how to proceed.

To configure a network node with a connection to another network node follow these steps:

1. Go to the Configuration Management window and double-click on `Configuration File`.
2. If the name of the configuration file .NDF you want to work with is not the name of the configuration file .NDF that is in the title bar of the Configuration Management window, open the configuration file you want to work with by selecting `Open Configuration File...`
3. Keep or change the Local Node Characteristics, for example:
   - Network ID: `USIBMRA`
   - Local node name: `NN1`
   - Local node ID: `22221`
   - Local node alias name: `NN1` (keep the node name)
   - Node type: `Network Node`
   - `Activate Attach Manager at start up`
   - Comment: `Created with the PM interface`
   - Click on `OK` to validate.
4. Configure the connection to the network node:
   - In the Connections window double-click on `Network Node`.
   - In the Adapter List window double-click on the currently configured adapter you want to use (we assume you use IBMTRNET adapter 00).
   - Define the link, for example:
     - Link name: `NN2`
     - LAN destination address: `400000022222`
     - Comment: `Link to another NN`.
   - Close the Connections window.
5. Define the advanced SNA capabilities of the node (LU, TP, Mode, etc...).
6. Verify the configuration.

The .NDF File

Here is the .NDF that has been created:

```
DEFINE_LOCAL_CP  FQ_CP_NAME(USIBMRA.NN1      )
            DESCRIPTION(Created with the PM interface)
            CP_ALIAS(NN1     )
            NAU_ADDRESS(INDEPENDENT_LU)
            NODE_TYPE(NN)
            NODE_ID(X'22221')
            HOST_FP_SUPPORT(NO);

DEFINE_LOGICAL_LINK  LINK_NAME(NN2     )
               ADJACENT_NODE_TYPE(NN)
               PREFERRED_NN_SERVER(NO)
               DLC_NAME(IBMTRNET)
               ADAPTER_NUMBER(0)
               DESTINATION_ADDRESS(X'400000022222')
               CP_CP_SESSION_SUPPORT(YES)
               ACTIVATE_AT_STARTUP(YES)
               LIMITED_RESOURCE(NO)
               LINK_STATION_ROLE(USE_ADAPTER_DEFINITION)
               SOLICIT_SSCP_SESSION(NO)
               EFFECTIVE_CAPACITY(USE_ADAPTER_DEFINITION)
               COST_PER_CONNECT_TIME(USE_ADAPTER_DEFINITION)
               COST_PER_BYTE(USE_ADAPTER_DEFINITION)
               SECURITY(USE_ADAPTER_DEFINITION)
               PROPAGATION_DELAY(USE_ADAPTER_DEFINITION)
               USER_DEFINED_1(USE_ADAPTER_DEFINITION)
               USER_DEFINED_2(USE_ADAPTER_DEFINITION)
               USER_DEFINED_3(USE_ADAPTER_DEFINITION);

START_ATTACH_MANAGER;
```

Figure 28. Network Node Connected to Another Network Node

7.15 Connection Network

When you use a token-ring LAN you should use the connection network facility which is explained in section 9.2, "Connection Networks" on page 117. Only end nodes and network nodes may be on a connection network.

An end node may belong to a connection network while its network node server does not, or is in a different connection network.

The connection network name must be unique throughout all the LU names in the network.

To define a connection network, you merely have to add the following verb in the .NDF files of the network nodes and end nodes (you must edit the files).

Here, we call CONNETW1 the connection network and we use IBMTRNET adapter number 01:

```
DEFINE_CONNECTION_NETWORK  FQ_CN_NAME(USIBMRA.CONNETW1 )
                    ADAPTER_INFO( DLC_NAME(IBMTRNET)
                              ADAPTER_NUMBER(1));
```

Figure 29. Verb to Be Added in the .NDF file to Define the Node as Part of a Connection Network

If you define an end node with the Create/Quick Configuration window, the end node .NDF file will automatically contain this verb for each configured token-ring LAN adapter, with the following parameters:

- FQ_CN_NAME: it is the C&SM LAN ID specified for the adapter in Communications Manager under:

```
SNA feature profiles
   Data Link Control (DLC) profiles...
      IBM Token-Ring Network...
```

- DLC_NAME of the adapter
- ADAPTER_NUMBER of the adapter.

If you have two configured adapters and you only use one during the Quick Configuration, you will still have two connection network definitions, one for each adapter.

If you intend to define many connection networks on the same token-ring LAN, you obviously cannot keep the default connection network name. You can define, however, many connection networks on the same token-ring LAN to partition it.

7.16 Network Node Acting as a Router between Two Token-Ring LANs

A network node can act as a network level router for LU 6.2 session traffic between any of the supported Communications Manager DLC types whether they are two token-ring LANs, a token-ring LAN and an SDLC link, or a CSMA/CD LAN and an X.25 connection.

We will now use a workstation with two token-ring LAN configured adapters and define it as a network node. Each adapter is on a different token-ring LAN. Simply follow these steps:

1. Define the network node with the Configuration Management window:
   - Network node
   - Links to every node of each token-ring LAN.
2. You may edit the .NDF file of the network node and add the definitions that allow it to serve one or two connection networks.
3. Define the other workstations with the Create/Quick Configure window:
   - End node
   - Link to the router as preferred network node server.
4. Edit the .NDF of each workstation if you do not intend to keep the default names for the connection networks (C&SM LAN ID).

If you have too many workstations on each token-ring LAN, do the following:

1. Define as many connection networks as you need on each token-ring LAN with a different network node server for each connection network
2. Define a link from each network node server to the router node
3. Define the links from the router node to each network node server
4. For each network node server:
   - Define a link to every workstation it serves
   - Define in every workstation a link to its network node server.

This will cause sessions to be routed through intermediate nodes on the token-ring LAN. The network nodes (including the router node) do not have to be dedicated, but if they will be carrying much intermediate traffic users would notice their system being interrupted all the time.

The .NDF File

Here is the .NDF file of a network node router. On one token-ring LAN it is connected to another network node that could be a connection network server. On the other token-ring LAN it is a connection network server, serving one end node.

```
DEFINE_LOCAL_CP  FQ_CP_NAME(USIBMMK.ROUTER )
            DESCRIPTION(Created under PM)
            CP_ALIAS(ROUTER)
            NAU_ADDRESS(INDEPENDENT_LU)
            NODE_TYPE(NN)
            NODE_ID(X'22221')
            HOST_FP_SUPPORT(NO);

DEFINE_CONNECTION_NETWORK  FQ_CN_NAME(USIBMRA.BB119    )
                   ADAPTER_INFO( DLC_NAME(IBMTRNET)
                             ADAPTER_NUMBER(1));

DEFINE_LOGICAL_LINK  LINK_NAME(RALYOS2A)
               DESCRIPTION(NN of LAN #1)
               ADJACENT_NODE_TYPE(NN)
               PREFERRED_NN_SERVER(NO)
               DLC_NAME(IBMTRNET)
               ADAPTER_NUMBER(0)
               DESTINATION_ADDRESS(X'400000022222')
               CP_CP_SESSION_SUPPORT(YES)
               ACTIVATE_AT_STARTUP(YES)
               LIMITED_RESOURCE(NO)
               LINK_STATION_ROLE(USE_ADAPTER_DEFINITION)
               SOLICIT_SSCP_SESSION(NO)
               EFFECTIVE_CAPACITY(USE_ADAPTER_DEFINITION)
               COST_PER_CONNECT_TIME(USE_ADAPTER_DEFINITION)
               COST_PER_BYTE(USE_ADAPTER_DEFINITION)
               SECURITY(USE_ADAPTER_DEFINITION)
               PROPAGATION_DELAY(USE_ADAPTER_DEFINITION)
               USER_DEFINED_1(USE_ADAPTER_DEFINITION)
               USER_DEFINED_2(USE_ADAPTER_DEFINITION)
               USER_DEFINED_3(USE_ADAPTER_DEFINITION);
```

Figure 30 (Part 1 of 2). Network Node Connected to Another Network Node

```
DEFINE_LOGICAL_LINK  LINK_NAME(SESBB119)
                     DESCRIPTION(to EN with CP-CP connection in LAN #2)
                     ADJACENT_NODE_TYPE(LEARN)
                     DLC_NAME(IBMTRNET)
                     ADAPTER_NUMBER(1)
                     DESTINATION_ADDRESS(X'400032BB119B')
                     CP_CP_SESSION_SUPPORT(YES)
                     ACTIVATE_AT_STARTUP(YES)
                     LIMITED_RESOURCE(NO)
                     LINK_STATION_ROLE(USE_ADAPTER_DEFINITION)
                     SOLICIT_SSCP_SESSION(NO)
                     EFFECTIVE_CAPACITY(USE_ADAPTER_DEFINITION)
                     COST_PER_CONNECT_TIME(USE_ADAPTER_DEFINITION)
                     COST_PER_BYTE(USE_ADAPTER_DEFINITION)
                     SECURITY(USE_ADAPTER_DEFINITION)
                     PROPAGATION_DELAY(USE_ADAPTER_DEFINITION)
                     USER_DEFINED_1(USE_ADAPTER_DEFINITION)
                     USER_DEFINED_2(USE_ADAPTER_DEFINITION)
                     USER_DEFINED_3(USE_ADAPTER_DEFINITION);

START_ATTACH_MANAGER;
```

Figure 30 (Part 2 of 2). Network Node Connected to Another Network Node

7.17 Subarea Network and APPN Network

An APPN network may use a subarea network:

- Because the APPN network is split in pieces connected together through the subarea.
- Because some transaction programs reside in the host and are intended to have conversations with transaction programs in the APPN network.
- Because a focal point is implemented in the host, which is a tool to monitor the network (for example NetView).

In all cases, the LU and mode names that are used for a conversation must be defined in the subarea network.

The link that connects a node to the subarea contains the following parameter: ADJACENT_NODE_TYPE(LEN). Also, there will be no CP name verification during the XID exchange. Thus you may specify any name for the partner node name in the link definition.

However, if later you wanted to modify, with an editor, the parameter FQ_ADJACENT_CP_NAME in the link definition, you must not forget to modify as well the parameter FQ_OWNING_CP_NAME in the PLU location definitions. If you use the Presentation Manager screens to do such a modification, both parameters are updated in the .NDF file.

7.18 Connection through a Subarea Network

We suppose here that your APPN network is split into two pieces connected through a subarea. To make this connection, each piece must have a network node with a link to the subarea. Each piece is allowed to have *one and only one* connection into the subarea. We describe here how to configure such a network node. The network node sees the subarea as a LEN node. It acts as a server for the subarea.

You must define, in the network node, all the PLUs that are located in the other part of the APPN network. Usually the PLUs will be defined with full or partial wildcards. You may only have one full wildcard in each part of the network. This is one reason why the partial wildcard is strongly recommended. Every LU you can reach with partial wildcards must begin with the same character(s). Therefore, using partial wildcards supposes that you have a naming convention for each part of the APPN network.

We will now configure a network node so that every LU in the part of the APPN network where the node being configured is located can speak to:

1. The LU-CP HENRILU1
2. Every LU whose name begins with CLA, which are in the other part of the APPN network.

The following figure shows the network. We will configure the node RALYOS2A.

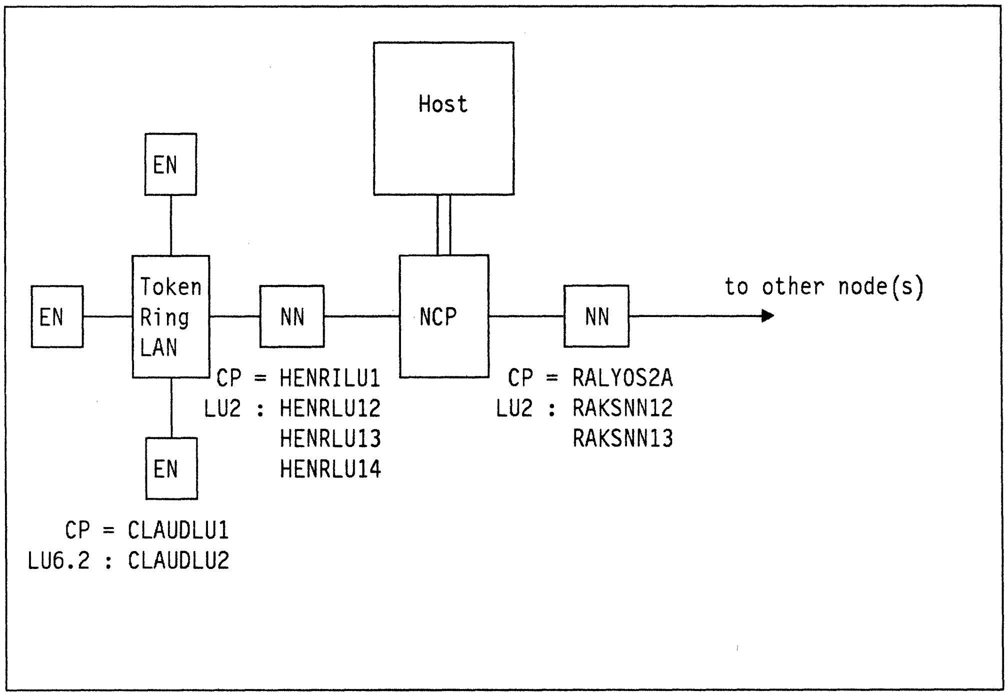


Figure 31. APPN Network Using a Connection through a Subarea

We assume you know how to create a new .NDF file and how to use the Presentation Manager panels of Networking Services/2. If you don't, "Creating Your .NDF File" on page 36 explains how to proceed.

1. Go to the Configuration Management window and double-click on `Configuration File`.

2. If the name of the configuration file .NDF you want to work with is not the name of the configuration file .NDF that is in the title bar of the Configuration Management window, open the configuration file you want to work with by selecting `Open Configuration File...`
3. Keep or change the Local Node Characteristics, for example:
   - Network ID: `USIBMRA`
   - Local node name: `RALYOS2A`
   - Local node ID: `22222`
   - Local node alias name: `RALYOS2A` (keep the node name)
   - Node type: `Network Node`
   - `Activate Attach Manager at start up`
   - Comment: `Created with the PM interface`
   - Click on `OK` to validate.
4. Configure the connection(s) to this part of the APPN network. It may be connection(s) to end node(s) and/or network node(s). To have a simpler file we don't define any connection here, so this part of the APPN network only contains the network node.
5. Configure the connection to the subarea (which is seen as a LEN node):
   - In the Connections window double-click on `LEN Node`.
   - In the Adapter List window double-click on the currently configured adapter you want to use (we assume you use IBMTRNET adapter 00).
   - Define the link, for example:
     - Link name: `RAKNCP`
     - Partner network ID: `USIBMRA`
     - Partner node name: `RAK`
     - LAN destination address: `400001240000`
     - Comment: `Link to SA20`.
   - Click on `Define Partner LUs...` if you intend to define PLUs in the other part of the APPN network (don't forget the CPs that you may have to use as ordinary LUs). For example, we define:
     - The LU-CP HENRILU1
       - LU name: `HENRILU1`
       - Alias: `HENRI`
       - Comment: `CP of the Network Node HENRILU1`
       - Click on `Update`.
     - An LU from which we will define the wildcard
       - LU name: `CLAUDLU1`
       - Alias: `CLAUDLU1`
       - Comment: `CP of the End Node CLAUDLU1`
       - Click on `Update`.
     - Click on `OK` to validate the PLU definitions.

     Click on `OK` to validate the link definition.
   - Close the Connections window.
6. Define the advanced SNA capabilities of the node (LU, TP, Mode, etc...).
7. Verify the configuration.
8. Edit the .NDF file:
   - In the DEFINE_LOGICAL_LINK verb:

  – Change the ACTIVATE_AT_STARTUP to YES unless you intend to keep the default NO.
- Modify the DEFINE_PARTNER_LU_LOCATION verb issued for CLAUDLU1 to define the partial wildcard:

```
DEFINE_PARTNER_LU_LOCATION  FQ_PARTNER_LU_NAME(USIBMRA.CLA     )
                    DESCRIPTION(Wildcard to reach every LU whose name begins with CLA)
                    WILDCARD_ENTRY(PARTIAL)
                    FQ_OWNING_CP_NAME(USIBMRA.RAK)
                    LOCAL_NODE_NN_SERVER(YES);
```

The .NDF File

Here is the .NDF that has been created:

```
DEFINE_LOCAL_CP  FQ_CP_NAME(USIBMRA.RALYOS2A )
            DESCRIPTION(Created with the PM interface)
            CP_ALIAS(RALYOS2A)
            NAU_ADDRESS(INDEPENDENT_LU)
            NODE_TYPE(NN)
            NODE_ID(X'22222')
            HOST_FP_SUPPORT(NO);

DEFINE_LOGICAL_LINK  LINK_NAME(RAKNCP  )
               DESCRIPTION(Link to SA20)
               FQ_ADJACENT_CP_NAME(USIBMRA.RAK     )
               ADJACENT_NODE_TYPE(LEN)
               DLC_NAME(IBMTRNET)
               ADAPTER_NUMBER(0)
               DESTINATION_ADDRESS(X'400001240000')
               CP_CP_SESSION_SUPPORT(NO)
               ACTIVATE_AT_STARTUP(YES)
               LIMITED_RESOURCE(USE_ADAPTER_DEFINITION)
               LINK_STATION_ROLE(USE_ADAPTER_DEFINITION)
               SOLICIT_SSCP_SESSION(NO)
               EFFECTIVE_CAPACITY(USE_ADAPTER_DEFINITION)
               COST_PER_CONNECT_TIME(USE_ADAPTER_DEFINITION)
               COST_PER_BYTE(USE_ADAPTER_DEFINITION)
               SECURITY(USE_ADAPTER_DEFINITION)
               PROPAGATION_DELAY(USE_ADAPTER_DEFINITION)
               USER_DEFINED_1(USE_ADAPTER_DEFINITION)
               USER_DEFINED_2(USE_ADAPTER_DEFINITION)
               USER_DEFINED_3(USE_ADAPTER_DEFINITION);

DEFINE_PARTNER_LU  FQ_PARTNER_LU_NAME(USIBMRA.HENRILU1 )
             DESCRIPTION(CP of the Network Node HENRILU1)
             PARTNER_LU_ALIAS(HENRI)
             MAX_MC_LL_SEND_SIZE(32767)
             CONV_SECURITY_VERIFICATION(NO)
             PARALLEL_SESSION_SUPPORT(YES);

DEFINE_PARTNER_LU  FQ_PARTNER_LU_NAME(USIBMRA.CLAUDLU1 )
             DESCRIPTION(CP of the End Node CLAUDLU1)

             PARTNER_LU_ALIAS(CLA)
             MAX_MC_LL_SEND_SIZE(32767)
             CONV_SECURITY_VERIFICATION(NO)
             PARALLEL_SESSION_SUPPORT(YES);

DEFINE_PARTNER_LU_LOCATION  FQ_PARTNER_LU_NAME(USIBMRA.HENRILU1 )
                   DESCRIPTION(CP of the Network Node HENRILU1)
                   WILDCARD_ENTRY(NO)
                   FQ_OWNING_CP_NAME(USIBMRA.RAK     )
                   LOCAL_NODE_NN_SERVER(YES);
```

Figure 32 (Part 1 of 2). Network Node Used to Connect an APPN Network to a Subarea Network

```
DEFINE_PARTNER_LU_LOCATION  FQ_PARTNER_LU_NAME(USIBMRA.CLA      )
                    DESCRIPTION(Wildcard to reach every LU whose name begins with CLA)
                    WILDCARD_ENTRY(PARTIAL)
                    FQ_OWNING_CP_NAME(USIBMRA.RAK      )
                    LOCAL_NODE_NN_SERVER(YES);

START_ATTACH_MANAGER;
```

Figure 32 (Part 2 of 2). Network Node Used to Connect an APPN Network to a Subarea Network

7.19 Connection with a Host

To be able to establish a conversation between an LU 6.2 LU in the APPN network and an LU 6.2 LU in a host, both LUs must be known by VTAM*.

The definition of the LU in the host is made in the network node that connects the APPN network to the subarea network. It is the same definition as for an LU that would be in another part of the APPN network that could only be reached through the subarea network: the LU is seen as being located in a LEN node. So, see section 7.18, "Connection through a Subarea Network" on page 92 where the definition is explained (all the PLUs defined in this section could belong to the host).

Example of .NDF File

In this example we define two PLUs located in two different networks (different NETIDs).

The Configuration Management window was used to build the .NDF file:

1. Local Node Characteristics
2. Connection to subarea (LEN)
   - Definition of the partner LUs in the hosts (there are partner LUs in different hosts)
3. Advanced SNA capabilities, we select:
   - Partner LUs (to change the NETID of the PLU in the other host)
   - Modes
   - CPI Communications Side Information.

Here is the .NDF file.

```
DEFINE_LOCAL_CP  FQ_CP_NAME(USIBMRA.HENRILU1 )
            DESCRIPTION(Network Node connected to the Host)
            CP_ALIAS(HENRILU1)
            NAU_ADDRESS(INDEPENDENT_LU)
            NODE_TYPE(NN)
            NODE_ID(X'22221')
            HOST_FP_SUPPORT(NO);
```

Figure 33 (Part 1 of 3). Network Node where Two PLUs Are Defined in Two Different Networks (SNI)

```
DEFINE_LOGICAL_LINK  LINK_NAME(TOHOST  )
                   DESCRIPTION(Link to the Subarea)
                   FQ_ADJACENT_CP_NAME(USIBMRA.HOST )
                   ADJACENT_NODE_TYPE(LEN)
                   DLC_NAME(IBMTRNET)
                   ADAPTER_NUMBER(0)
                   DESTINATION_ADDRESS(X'400001240000')
                   CP_CP_SESSION_SUPPORT(NO)
                   ACTIVATE_AT_STARTUP(NO)
                   LIMITED_RESOURCE(USE_ADAPTER_DEFINITION)
                   LINK_STATION_ROLE(USE_ADAPTER_DEFINITION)
                   SOLICIT_SSCP_SESSION(NO)
                   EFFECTIVE_CAPACITY(USE_ADAPTER_DEFINITION)
                   COST_PER_CONNECT_TIME(USE_ADAPTER_DEFINITION)
                   COST_PER_BYTE(USE_ADAPTER_DEFINITION)
                   SECURITY(USE_ADAPTER_DEFINITION)
                   PROPAGATION_DELAY(USE_ADAPTER_DEFINITION)
                   USER_DEFINED_1(USE_ADAPTER_DEFINITION)
                   USER_DEFINED_2(USE_ADAPTER_DEFINITION)
                   USER_DEFINED_3(USE_ADAPTER_DEFINITION);

DEFINE_PARTNER_LU  FQ_PARTNER_LU_NAME(USIBMRA.CICSLOC  )
                 DESCRIPTION(CICS local)
                 PARTNER_LU_ALIAS(CICS31RA)
                 MAX_MC_LL_SEND_SIZE(32767)
                 CONV_SECURITY_VERIFICATION(NO)
                 PARALLEL_SESSION_SUPPORT(YES);

DEFINE_PARTNER_LU  FQ_PARTNER_LU_NAME(USIBMRM.CICSREM  )
                 DESCRIPTION(CICS in another network)
                 PARTNER_LU_ALIAS(CICSDEMO)
                 MAX_MC_LL_SEND_SIZE(32767)
                 CONV_SECURITY_VERIFICATION(NO)
                 PARALLEL_SESSION_SUPPORT(YES);

DEFINE_PARTNER_LU_LOCATION  FQ_PARTNER_LU_NAME(USIBMRA.CICSLOC  )
                         DESCRIPTION(CICS local)
                         WILDCARD_ENTRY(NO)
                         FQ_OWNING_CP_NAME(USIBMRA.HOST )
                         LOCAL_NODE_NN_SERVER(YES);

DEFINE_PARTNER_LU_LOCATION  FQ_PARTNER_LU_NAME(USIBMRM.CICSREM  )
                         DESCRIPTION(CICS in another network)
                         WILDCARD_ENTRY(NO)
                         FQ_OWNING_CP_NAME(USIBMRA.HOST )
                         LOCAL_NODE_NN_SERVER(YES);
```

Figure 33 (Part 2 of 3). Network Node where Two PLUs Are Defined in Two Different Networks (SNI)

```
DEFINE_MODE  MODE_NAME(MODE1   )
         DESCRIPTION(Created with PM)
         COS_NAME(#CONNECT)
         DEFAULT_RU_SIZE(NO)
         MAX_RU_SIZE_UPPER_BOUND(1920)
         RECEIVE_PACING_WINDOW(8)
         MAX_NEGOTIABLE_SESSION_LIMIT(32767)
         PLU_MODE_SESSION_LIMIT(8)
         MIN_CONWINNERS_SOURCE(4);

DEFINE_CPIC_SIDE_INFO  SYMBOLIC_DESTINATION_NAME(CICS31  )
                DESCRIPTION(CPIC for CICS local)
                PARTNER_LU_ALIAS(CICS31RA        )
                MODE_NAME(MODE1   )
                TP_NAME(ACA1);

DEFINE_CPIC_SIDE_INFO  SYMBOLIC_DESTINATION_NAME(CICS    )
                DESCRIPTION(CPIC for CICS in another network)
                PARTNER_LU_ALIAS(CICSDEMO        )
                MODE_NAME(MODE1   )
                TP_NAME(ACA1);
```

Figure 33 (Part 3 of 3). Network Node where Two PLUs Are Defined in Two Different Networks (SNI)

7.20 Connection with a Primary Host

A primary host is a host that contains a focal point, such as NetView, to monitor the network. Only one primary host may be defined.

The primary host may be used to connect two parts of the APPN network. The primary host also may contain LU 6.2 LUs.

In both cases the connection of a network node to the host is the same as explained in section 7.18, "Connection through a Subarea Network" on page 92 and section 7.19, "Connection with a Host" on page 96 except that you must select `Primary host` instead of `LEN`.

Example of .NDF File

Here we show a network node with a link to a primary host. The Configuration Management window was used to build the .NDF file:

```
DEFINE_LOCAL_CP  FQ_CP_NAME(USIBMRA.HENRILU1 )
                 DESCRIPTION(Network Node connected to a Primary Host)
                 CP_ALIAS(HENRILU1)
                 NAU_ADDRESS(INDEPENDENT_LU)
                 NODE_TYPE(NN)
                 NODE_ID(X'22221')
                 HOST_FP_SUPPORT(YES)
                 HOST_FP_LINK_NAME(PRIMHOST);

 DEFINE_LOGICAL_LINK  LINK_NAME(PRIMHOST)
                      DESCRIPTION(Link to the Primary Host)
                      FQ_ADJACENT_CP_NAME(USIBMRA.ANYNAME  )
                      ADJACENT_NODE_TYPE(LEN)
                      DLC_NAME(IBMTRNET)
                      ADAPTER_NUMBER(0)
                      DESTINATION_ADDRESS(X'400001240000')
                      CP_CP_SESSION_SUPPORT(NO)
                      ACTIVATE_AT_STARTUP(YES)
                      LIMITED_RESOURCE(USE_ADAPTER_DEFINITION)
                      LINK_STATION_ROLE(USE_ADAPTER_DEFINITION)
                      SOLICIT_SSCP_SESSION(YES)
                      EFFECTIVE_CAPACITY(USE_ADAPTER_DEFINITION)
                      COST_PER_CONNECT_TIME(USE_ADAPTER_DEFINITION)
                      COST_PER_BYTE(USE_ADAPTER_DEFINITION)
                      SECURITY(USE_ADAPTER_DEFINITION)
                      PROPAGATION_DELAY(USE_ADAPTER_DEFINITION)
                      USER_DEFINED_1(USE_ADAPTER_DEFINITION)
                      USER_DEFINED_2(USE_ADAPTER_DEFINITION)
                      USER_DEFINED_3(USE_ADAPTER_DEFINITION);

START_ATTACH_MANAGER;
```

Figure 34. Network Node Connected to a Primary Host

7.21 VTAM/NCP Information

This section contains information about the following:

- Modes used in VTAM and Networking Services/2
- Classes of services in VTAM and Networking Services/2
- PUs
- LU 6.2 LUs
- Other types of LUs.

At the end of this section you will find a sample logon mode table and a sample VTAM list that were used for the configuration shown in Figure 31 on page 92.

Levels of VTAM and NCP That Support APPN

To use a subarea network with an APPN network you must have at least the following:

- VTAM V3R2
- SSP V3R4M1
- NCP V4R3M1.

The following table shows the PTFs that are needed to support different NETIDs.

Table 1. ACF/VTAM Support for Different NETIDS*

Release		**REL**	**APAR**	**PTF**
VTAM 3.2	MVS/XA	205	OY26312	UY90564
		215	OY26327	UY90565
	MVS/370	204	OY29600	UY90566
		214	OY29603	UY90567
	VM/SP 9370	321	VM40123	UV90556
	VSE	G70	DY39165	UD90340
VTAM 3.3	MVS/ESA*	301	OY30487	UY90599
	MVS/XA*	303	OY30488	UY90600
NCP 5.3		302	IR88927	UR90167
NCP 5.2.1		212	IR90529	UR90228
NCP 4.3.1		310	IR90530	UR90229
SSP 3.5		502	IR88946	UR90170
SSP 3.4.1		412	IR90558	UR32174

Modes

The IBM-supplied modes of Networking Services/2 are:

- "BLANK" (This is the series X'4040404040404040' and not X'C2B3C1D5D2404040'. This is different from the AS/400.)
- #BATCH
- #BATCHSC
- #INTER
- #INTERSC.

You may modify the definitions of these modes in your node.

The modes CPSVCMG and SNASVCMG are architected modes and cannot be modified.

If the IBM-supplied modes of Networking Services/2 are not already defined in your VTAM logon mode tables, you may add them or create a special logon mode table. We have built such a table, MODAPPN, with the IBM-supplied modes for APPN and a mode we intend to use in our TPs: MODE1 (see Figure 35 on page 103).

Unless you specify another mode, the default mode of Networking Services/2 is the blank mode.

Class of Service

When a session goes through both an APPN network and a subarea network, it uses two classes of service (COS):

1. In the APPN network the session uses the COS defined for the mode used by the transaction program. This definition is in the active configuration of the workstation. This COS is used to route the session in the APPN network.

   If you use the default blank mode, the associated COS is #CONNECT.

2. In the subarea network the name of the COS may be written in the logon mode table, in the entry for the mode name used by the session. This COS name is used by VTAM to route the session through the subarea network.

   If you use the default blank mode or if you do not define any COS in an entry of your logon mode table, the COS defaults to the blank entry in the ISTSDCOS table.

In both cases, each network uses the mode name to find the COS name. But the two COS names are not necessarily the same.

PUs

A network node that connects to the subarea network must be defined to VTAM with a PU macro. The name you give to this PU in the VTAM list is not correlated with any name defined in Networking Services/2.

You should not give a PU the name of the CP; you would not be allowed to define the CP as an LU, because the names must be unique in VTAM, whether they are PU or LU names.

The PU macro must contain XID=YES to use an XID exchange during activation of the PU. This parameter is coded in the NCP major node. It must not be in the PU statement of a switched major node.

For switched SNA devices you may use a new parameter in the PU macro: CPNAME=cccccccc. It specifies the CP name of the network node connected to the subarea. Either CPNAME or IDBLK and IDNUM must be specified on a switched PU definition statement. Both may be specified. The network node provides its CP name to VTAM in the XID exchange during the connection sequence. VTAM uses the CP name to locate the corresponding PU macro. If there is no PU macro with the corresponding CP name, VTAM uses IDNUM and IDBLK to locate the PU macro. Both ways of coding the PU macro are shown in Figure 36 on page 104.

LU 6.2

Independent LUs are defined to VTAM by coding LOCADDR=0. There can be as many LUs defined with LOCADDR=0 as you want.

When you define the LUs of one of the parts of the APPN network to VTAM, you must define them as being in the network node that connects this part of the APPN network to the subarea network.

Behind the PU macro of this network node, define each LU that you want to reach from the other part of the APPN network. Don't forget that control points are LUs. Especially do not forget to define the CP of this network node behind the PU macro if you intend to establish sessions with it through the subarea network.

An LU that is not defined in VTAM cannot be used as the destination for a session with another LU if this session must go through the subarea network. There is no effective way to get around it (such as the wildcards of APPN); VTAM must know the name of each destination LU. Without VTAM V3R4 you have to define every LU that will use the subarea.

Since an APPN network is intended to change easily, you should define the LUs of the APPN network in a special major node whenever it is possible. You may also define in VTAM, LUs that do not exist yet. By doing so you will avoid stopping and restarting VTAM as frequently.

Other LUs

If the network node uses its connection to the subarea network for 3270 emulation, the LU type 2 LUs of the 3270 emulation are defined in the same PU macro as the LU type 6.2 LUs of the APPN network. The link will also be used for the connection between the 3270 emulation and the host.

In this case, the verification program APPNV will force the parameter SOLICIT_SSCP_SESSION to YES. This happens whatever the value of this parameter is in the .NDF file. You can verify the status of this parameter by selecting `APPC -> Link Definition` in the Display window. What is displayed is NOT what you have defined, but how your link is currently defined in the running configuration. However, you don't have to worry about this change; it has no impact on the use of your APPN network.

3270 emulation downstream from the network node is still accomplished the same way as without Networking Services/2. The definitions are still entered through the Communications Manager screens. That is because 3270 emulation does not use LU 6.2. The LUs of this node and all the LUs downstream from the network node are defined behind the PU macro for the network node. This includes:

- The LU 6.2 LUs in this piece of the APPN network
- The other LUs for 3270 emulation.

When you install Networking Services/2 in a workstation that has 3270 emulation, you do not need to change the earlier VTAM definition, but only have to add the definitions for the LU 6.2 LUs into the PU macro of the network node that connects the APPN network to the subarea.

Logon Mode Table (Example)

Here is the sample logon mode table we used:

```
MODAPPN  MODETAB
*-------------------------------------------------------------------*
* GENERATED IN ITSC RALEIGH                                         *
*-------------------------------------------------------------------*
*   LOGMODE TABLE ENTRY FOR OS/2       (31/01/91)                   *
*********************************************************************
BLANK    MODEENT LOGMODE=BLANK
#BATCH   MODEENT LOGMODE=#BATCH
#BATCHSC MODEENT LOGMODE=#BATCH
#INTER   MODEENT LOGMODE=#INTER
#INTERSC MODEENT LOGMODE=#INTER
CPSVCMG  MODEENT LOGMODE=CPSVCMG
SNASVCMG MODEENT LOGMODE=SNASVCMG
MODE1    MODEENT LOGMODE=MODE1
*********************************************************************
         MODEEND
         END
```

Figure 35. MODETAB Used for LU 6.2 LUs

VTAM List (Example)

Here is the VTAM major node definition that we used:

```
*********************************************************************
*         VTAM SWITCHED MAJOR NODE FOR TRLAN-PS/2                   *
*********************************************************************
SWKNNTR VBUILD TYPE=SWNET,             REQUIRED                       X
               MAXNO=7,                REQUIRED                       X
               MAXGRP=5
**
RAKUNN01 PU    ADDR=13,                COULD BE ANYTHING (NOT USED)   X
               IDBLK=05D,              MATCH ON PS/2 FOR APPC STATION X
               IDNUM=22222,            SEND_XID PARAMETER             X
               DISCNT=NO,                                             X
               MAXOUT=1,
               MAXPATH=1,
               PUTYPE=2,
               VPACING=0
**
RAKENN01 PATH  GRPNM=EG24L00,                                         X
               DIALNO=400000022222,                                   X
               GID=1,PID=1
**
RALYOS2A LU    LOCADDR=0,MODETAB=MODAPPN          FOR THE PS/2 LU6.2
RAKSNN12 LU    LOCADDR=2,                         FOR THE PS/2 EM LUA X
               DLOGMOD=M2SDLCQ,MODETAB=AMODETAB,                      X
               USSTAB=US327X,ISTATUS=ACTIVE
RAKSNN13 LU    LOCADDR=3,                         FOR THE PS/2 EM LUB X
               DLOGMOD=M2SDLCQ,MODETAB=AMODETAB,                      X
               USSTAB=US327X,ISTATUS=ACTIVE
**
HENRI    PU    ADDR=13,                COULD BE ANYTHING (NOT USED)   X
               CPNAME=HENRILU1,                                       X
               DISCNT=NO,                                             X
               MAXOUT=1,
               MAXPATH=1,
               PUTYPE=2,
               VPACING=0
**
RAKENN02 PATH  GRPNM=EG24L00,                                         X
               DIALNO=400000022221,                                   X
               GID=1,PID=1
**
HENRILU1 LU    LOCADDR=0,MODETAB=MODAPPN          FOR THE PS/2 LU6.2
CLAUDLU1 LU    LOCADDR=0,MODETAB=MODAPPN          FOR THE PS/2 LU6.2
CLAUDLU2 LU    LOCADDR=0,MODETAB=MODAPPN          FOR THE PS/2 LU6.2
*
HENRLU12 LU    LOCADDR=2,                         FOR THE PS/2 EM LUA X
               DLOGMOD=M2SDLCQ,MODETAB=AMODETAB,                      X
               USSTAB=US327X,ISTATUS=ACTIVE
HENRLU13 LU    LOCADDR=3,                         FOR THE PS/2 EM LUB X
               DLOGMOD=M2SDLCQ,MODETAB=AMODETAB,                      X
               USSTAB=US327X,ISTATUS=ACTIVE
HENRLU14 LU    LOCADDR=4,                         FOR THE PS/2 EM LUC X
               DLOGMOD=M2SDLCQ,MODETAB=AMODETAB,                      X
               USSTAB=US327X,ISTATUS=ACTIVE
```

Figure 36. VTAM Switched Major Node

7.22 Building a Sample APPN Network

Using APPN to Network LAN Workstations

For this example, we have chosen a "LAN connected to one or more subareas" scenario. In this scenario, every node on the sample piece of the APPN network is interconnected with a LAN. The subarea backbone is used to reach partners that are not on the LAN.

Every node on the LAN is capable of having a connection with every other node on the LAN, but no one wants the administration cost of defining every node to every other node. That is why we included a connection network definition in this scenario. When a network node finds a partner LU during a search, it simply returns the LAN address of the partner LU to the originator. The originator dynamically forms a logical connection with the specified address. No intermediate routing is required.

In the examples below, we have used lowercase letters to represent variables. You should assume that these variables have a global scope. In other words, once a value is assigned to a variable, it must have the same value in every step where the variable appears.

Make Some Simplifying Assumptions

- Assume that, from some central location, you will build ASCII configuration files and distribute them to the LAN workstations. Each workstation operator will run APPNV to build the required configuration file.
- Assume that you have already developed a naming convention for the network ID and LU names. (Remember, CP names are also LU names.)
- To simplify this discussion, we will also assume that there is no security.

Choose a Convention for Network Nodes

The best conventions are those that place network nodes where administration can be done easily. For example, make the manager's workstation a network node and make every other department workstation an end node. When a workstation enters or leaves the department, the manager makes a small change to his or her ASCII file. (Remember, you can always use APPNV /E to make incremental additions.) No one else is affected. For the following steps, we will assume that your convention has these properties.

- Each end node is assigned to a network node.
- Each LEN node is assigned to a network node. Remember, a subarea (sometimes called a composite end node) is treated as a LEN node.
- For each subarea connected to the APPN network, there is one and only one connection to a network node. In addition, one subarea has been identified as the primary subarea (the subarea that contains the focal point). If you only have one subarea connection, obviously that would be the primary subarea. If your network is connected to more than one subarea, the primary subarea is normally the one that would require the most configuration if treated as a LEN node.

Defining a Network Node Configuration

1. Define the control point:

```
DEFINE_LOCAL_CP
   FQ_CP_NAME(aaaaaaaa.bbbbbbbb)
   CP_ALIAS(cccccccc)
   NODE_TYPE(NN)
   NODE_ID(X'ddddd');

   where aaaaaaaa is the network ID (must be the same for all
                  control points and LUs in this APPN network)
         bbbbbbbb is the control point (LU) name
         cccccccc is a local alias for LU name (normally it is
                  a bad idea to choose the node's user name as
                  an LU alias)
         ddddd    is the node ID defined in VTAM for your 3270
                  emulation connections or 00000 if you
                  don't use 3270 emulation to VTAM
```

2. Define the connection network. This allows your workstation to dynamically link to any other node on the same connection network. With this feature, no intermediate routing is used for sessions between workstations on this LAN.

```
DEFINE_CONNECTION_NETWORK
   FQ_CN_NAME(aaaaaaaa.eeeeeeee)
   ADAPTER_INFO(dlc_name(ffffffff),adapter_number(g));

   where aaaaaaaa is the network ID
         eeeeeeee is the connection network name (must be the same
                  for all nodes on the LAN in this APPN network)
         ffffffff is name of the LAN DLC (for example, IBMTRNET)
         g        is the adapter number (for example, 0)
```

3. Define a logical link to a sufficient number of network nodes to support fault tolerance. There is no need for every network node to be connected to every other network node. For a large number of network nodes, the topology burden would be significant and pretty much useless on a LAN connection network. If you want to tolerate link failures, bridge failures, or node failures, there must be a "path" of CP-CP sessions from each network node to all other network nodes when the failure occurs. A common technique is to connect the network nodes in a ring. In this case, each network node needs at least two connections plus additional connections for fault-tolerance.

```
DEFINE_LOGICAL_LINK
   LINK_NAME(hhhhhhhh)
   DLC_NAME(ffffffff)
   ADAPTER_NUMBER(g)
   ADJACENT_NODE_TYPE(NN)
   ACTIVATE_AT_STARTUP(YES)
   CP_CP_SESSION_SUPPORT(YES)
   DESTINATION_ADDRESS(X'iiiiiiiiiii');

   where ffffffff is name of the LAN DLC (for example, IBMTRNET)
         g        is the adapter number (for example, 0)
         hhhhhhhh is any link name unique in the node (for
                  example, the partner's CP name)
         iiiiiiiiiii is the token-ring MAC address of the network
                  node
```

4. Define a logical link to every end node assigned to this network node. This is not absolutely required, but it is a good convention. Even though a

network node is normally up all the time, there will be cases when the end node comes up and the network node is not up. In this case, these definitions will force the network node to link to its end nodes when it comes back online.

```
DEFINE_LOGICAL_LINK
   LINK_NAME(jjjjjjjj)
   DLC_NAME(ffffffff)
   ADAPTER_NUMBER(g)
   ADJACENT_NODE_TYPE(LEARN)
   ACTIVATE_AT_STARTUP(YES)
   CP_CP_SESSION_SUPPORT(YES)
   DESTINATION_ADDRESS(X'kkkkkkkkkkkk');

   where ffffffff is name of the LAN DLC (for example, IBMTRNET)
         g        is the adapter number (for example, 0)
         jjjjjjjj is any link name unique in the node (for
                  example, the partner's CP name)
         kkkkkkkkkkkk is the token-ring MAC address of the end
                  node
```

5. For every LEN node (that is, any node that does not support CP-CP sessions) assigned to this network node, define a logical link. Then define a partner LU location for each LU in that node. (This is how you support OS/2 Version 1.2 nodes that have not migrated to Networking Services/2.)

```
DEFINE_LOGICAL_LINK
   LINK_NAME(llllllll)
   DLC_NAME(ffffffff)
   ADAPTER_NUMBER(g)
   ADJACENT_NODE_TYPE(LEN)
   ACTIVATE_AT_STARTUP(YES)
   CP_CP_SESSION_SUPPORT(NO)
   DESTINATION_ADDRESS(X'mmmmmmmmmmmm')
   FQ_ADJACENT_CP_NAME(nnnnnnnn.oooooooo);

   where ffffffff is name of the LAN DLC (for example, IBMTRNET)
         g        is the adapter number (for example, 0)
         llllllll is any link name unique in the node (for
                  example, the partner's CP name)
         mmmmmmmmmmmm is the token ring MAC address of the LEN
                  node
         nnnnnnnn is the network ID of the LEN node (if the LEN
                  node is part of your network, then set nnnnnnnn
                  equal to aaaaaaaa)
         oooooooo is the CP name assigned to the LEN node

(Note: Repeat this definition for every LU in the LEN node)

DEFINE_PARTNER_LU_LOCATION
   FQ_OWNING_CP_NAME(nnnnnnnn.oooooooo)
   FQ_PARTNER_LU_NAME(nnnnnnnn.pppppppp)
   LOCAL_NODE_NN_SERVER(YES);
   where nnnnnnnn is the network ID of the LEN node (if the LEN
                  node is part of your network, then set nnnnnnnn
                  equal to aaaaaaaa)
         oooooooo is the CP name assigned to the LEN connection
         pppppppp is the name of the LU in the LEN node
```

6. On one **and only one** network node, define a logical link and a wildcard partner LU location to the primary subarea. With this convention, the network will assume that any LU not found in the APPN network will be in

the subarea network. (The alternative is to define all the subarea LUs in the network node using a DEFINE_PARTNER_LU_LOCATION verb for each LU. (See the LEN node definitions above.)

```
DEFINE_LOGICAL_LINK
   LINK_NAME(qqqqqqqq)
   DLC_NAME(ffffffff)
   ADAPTER_NUMBER(g)
   ACTIVATE_AT_STARTUP(YES)
   CP_CP_SESSION_SUPPORT(NO)
   DESTINATION_ADDRESS(X'rrrrrrrrrrrr')
   FQ_ADJACENT_CP_NAME(ssssssss.tttttttt);

   where ffffffff is name of the LAN DLC (for example, IBMTRNET)
         g        is the adapter number (for example, 0)
         qqqqqqqq is any link name unique in the node (for
                  example, the partner's CP name)
         rrrrrrrrrrrr is the token ring MAC address of the subarea
         ssssssss is the network ID of the subarea node (if the
                  subarea node is part of your network, then set
                  ssssssss equal to aaaaaaaa)
         tttttttt is the CP name assigned to the subarea connection

DEFINE_PARTNER_LU_LOCATION
   FQ_OWNING_CP_NAME(ssssssss.tttttttt)
   WILDCARD_ENTRY(FULL)
   LOCAL_NODE_NN_SERVER(YES);

   where ssssssss is the network ID of the subarea node (if the
                  subarea node is part of your network, then set
                  ssssssss equal to aaaaaaaa)
         tttttttt is the CP name assigned to the subarea connection
```

7. Define the things required by applications that will run in the network node.
   - If the applications accept conversations started in partner logical units, you must either include DEFINE_TP verbs or specify a directory for inbound attaches on a DEFINE_DEFAULTS verb.
   - If the applications allocate conversations and use the ALIAS parameter instead of the FQ_PARTNER_LU_NAME parameter, you must include DEFINE_PARTNER_LU verbs.
   - If your applications use CPI-C and do not build their side information dynamically, you must include DEFINE_CPIC_SIDE_INFO verbs.
   - If your applications does not use the default or predefined modes, you must include DEFINE_MODE verbs.
   - If your applications require the sessions to be preactivated, you must include CNOS verbs.
8. Start the attach manager.

```
START_ATTACH_MANAGER;
```

Defining an End Node Configuration

1. Define the control point.

```
DEFINE_LOCAL_CP
   FQ_CP_NAME(aaaaaaaa.uuuuuuuu)
   NODE_TYPE(EN)
   CP_ALIAS(vvvvvvvv)
   NODE_ID(X'wwwww');

   where aaaaaaaa is the network ID
         uuuuuuuu is the control point (LU) name
         vvvvvvvv is a local alias for LU name (not the user)
         wwwww    is the node ID defined in VTAM for your 3270
                  emulation connections or 00000 if you
                  don't use 3270 emulation to VTAM
```

2. Define the connection network. This allows your workstation to have a session with any other node on the LAN without going through an intermediate node.

```
DEFINE_CONNECTION_NETWORK
   FQ_CN_NAME(aaaaaaaa.eeeeeeee)
   ADAPTER_INFO(dlc_name(ffffffff),adapter_number(g));

   where aaaaaaaa is the network ID
         eeeeeeee is the connection network name
         ffffffff is name of the LAN DLC (for example, IBMTRNET)
         g        is the adapter number (for example, 0)
```

3. Define a logical link to this end node's network node server. Through this connection, the end node will be able to locate every other LU in the network.

```
DEFINE_LOGICAL_LINK
   LINK_NAME(xxxxxxxx)
   DLC_NAME(ffffffff)
   ADAPTER_NUMBER(y)
   ADJACENT_NODE_TYPE(NN)
   ACTIVATE_AT_STARTUP(YES)
   CP_CP_SESSION_SUPPORT(YES)
   PREFERRED_NN_SERVER(YES)
   DESTINATION_ADDRESS(X'zzzzzzzzzzzz');

   where ffffffff is name of the LAN DLC (for example, IBMTRNET)
         y        is the adapter number (for example, 0)
         xxxxxxxx is any link name unique in the node (for example the
                  partner's CP name)
         zzzzzzzzzzzz is the token-ring MAC address of the network
                  node
```

4. Define the things required by applications that will run in the end node.

   - If the applications accept conversations started in partner logical units, you must either include DEFINE_TP verbs or specify a directory for inbound attaches on a DEFINE_DEFAULTS verb.
   - If the applications allocate conversations and use the ALIAS parameter instead of the FQ_PARTNER_LU_NAME parameter, you must include DEFINE_PARTNER_LU verbs.
   - If your applications use CPI-C and do not build their side information dynamically, you must include DEFINE_CPIC_SIDE_INFO verbs.
   - If your applications does not use the default or predefined modes, you must include DEFINE_MODE verbs.
   - If your applications require the sessions to be preactivated, you must include CNOS verbs.

5. Start the attach manager.

```
START_ATTACH_MANAGER;
```

Chapter 8. Defaults Supplied by Networking Services/2

The Networking Services/2 minimum configuration requirements for the node definitions (.NDF) file is the node name. This is because Networking Services/2 has many definitions and functions already built-in for you, to make your node definition as simple as possible. By using these supplied features, you can simplify the configuration process immensely.

At the end of this chapter you can find the defaults in effect if you don't use the **DEFINE_DEFAULTS** verb.

For additional information see *Networking Services/2 Installation and Network Administrator Guide*

8.1 The Control Point LU

When you configure your node name (using **DEFINE_LOCAL_CP**), you are also naming an LU in your node. This LU is known as the control point LU (CP-LU). You can specify an NAU address for your LU if it also needs to act as a dependent LU. You may also specify that the CP-LU should enforce LU-LU session security. You can choose to run all of your TPs on this LU, thereby eliminating the need to define multiple local LUs. The CP-LU will control the CP-CP sessions with all other APPN nodes.

8.2 IBM Supplied Class of Service (COS) Definitions

The class of service (COS) that is used for a session depends upon what mode name is being used to establish the session. Networking Services/2 supplies five built-in class of service (COS) definitions to which a user mode may refer. You should rarely (if ever) have to build your own classes of service. The class of service (COS) definitions Networking Services/2 supplies for you are named:

1. #BATCH
2. #BATCHSC
3. #CONNECT
4. #INTER
5. #INTERSC.

These names imply certain capabilities in the definitions. #BATCH and # INTER denote, respectively, definitions suitable for batch and interactive capabilities. The SC suffix means the definitions include security. #CONNECT implies general connection capability.

Use the following guidelines for choosing a class of service:

- Use #BATCHSC and #INTERSC only if you want to choose a secure logical link. The only secure logical links that Networking Services/2 supplies for you are through an X.25 network (if you have X.25 configured). Other links may be designated as secure only if you change the default value (using the **DEFINE_LOGICAL_LINK** verb).
- Use #BATCH and #INTER if some node along the route will regulate traffic based on the transmission priority for the COS.

- Use #CONNECT if there is nothing you need to regulate, or you just do not know what COS to use.

  Networking Services/2 will choose the optimum route of all available logical links to route traffic using the COS you choose.

8.3 IBM Supplied Modes

The mode that a TP uses to allocate a session should be based on the associated COS name, as well as other characteristics such as RU size and receive pacing window. Networking Services/2 supplies five built-in modes that you may use. These modes will choose an RU size tuned to the logical link computed for the route and a receive pacing window of 16. If the partner is an APPN node, adaptive pacing will be used which starts with a window size of one and changes dynamically. With these definitions you will rarely have to build your own mode. The modes Networking Services/2 supplies for your use are named:

1. X'4040404040404040' (the "blank" mode name - EBCDIC blanks)
2. #BATCH
3. #INTER
4. #BATCHSC
5. #INTERSC.

These mode definitions that Networking Services/2 provides specify the matching COS name, except for the blank mode name, which specifies the COS name of #CONNECT. This will help you choose your mode accordingly.

Some reasons you may have to define your own mode are:

- Your partner only supports single sessions.
- Your TP is running on a dependent LU.
- The supplied receive pacing window is inappropriate and adaptive pacing is not used.
- Your TP uses a different mode name than what is supplied and the implicit mode capability is not used.

8.4 Implicit Modes

Networking Services/2 also supports implicit modes for both inbound and outbound requests. This means you can configure your node such that no mode definitions are required at all (except for the five supplied for you). If you define a default mode for Networking Services/2, you can specify any mode name on outbound session requests and accept any mode name on inbound requests. Networking Services/2 will then build the mode dynamically using parameters specified for the default mode. Implicit mode parameters are obtained from the default mode name specified in the **DEFINE_DEFAULTS** verb.

You may need to define a mode when:

- The mode name used has parameters different than the default mode parameters
- You have not specified a default mode name on the **DEFINE_DEFAULTS** verb.

8.5 Implicit Logical Links

Most Networking Services/2 node definitions will include verbs which define connectivity to adjacent nodes. There are, however, some situations in which an inbound connection attempt is made by an undefined adjacent node. This will typically happen as a result of one of the following scenarios:

1. The partner is establishing the logical link using the connection network facility
2. The partner has you defined as an adjacent node but you did not define your partner. This may occur when you have been defined to service requests for many adjacent nodes. However, if you are providing networking services for this node, by means of CP-CP sessions, both nodes should have connections to each other defined.

When this occurs, Networking Services/2 will build an implicit logical link definition for you. The implicit link name will start with an EBCDIC @ (X'7C') character, which makes implicit links easy to identify.

8.6 Implicit Partner LUs

Networking Services/2 supports implicit partners for both inbound and outbound requests. This means you can define your node such that no partner LU definitions are required at all. You can specify the fully-qualified partner LU name on outbound session requests and configure Networking Services/2 to accept inbound requests and build the partner LU dynamically. The implicit partner LU alias name will start with an ASCII @ (X'40') character, which makes implicit partner LUs easy to identify.

There may be good reasons to define partner LUs. Some of these are:

- You want to refer to your partner LU with an alias name.
- Your partner LU only supports single sessions, such as a pre-LEN subarea LU (subarea that only supports dependent LUs).
- Your partner LU sends verified conversation security.
- You have configured Networking Services/2 to accept BINDS **only** from the set of defined partner LUs (see the **DEFINE_DEFAULTS** verb).

8.7 Default TPs

Networking Services/2 also provides the capability to start programs as a result of inbound allocation requests, even though no TP definitions exist for the programs. To use this capability the program filename must match the inbound TP name. This means you can configure your node such that no TP definitions are required at all. When you enable the default TP capability for Networking Services/2, you can specify the following information about the TP:

- Directory for inbound attaches - this is the directory where the TP program resides. You can also specify that the current OS/2 path be used to find the program by specifying **DIRECTORY_FOR_INBOUND_ATTACHES(*)** in the **DEFINE_DEFAULTS** verb.
- Default TP operation - this lets you specify how the TP will be started:
  - Queued, attach manager started

- Queued, operator started
- Queued, operator preloaded
- Non-queued, attach manager started.

- Default TP program type - this lets you specify what type of screen group the TP will use:
  - Presentation Manager
  - VIO-windowable
  - Full-screen
  - Background.
- Default TP conversation security required - this lets you specify whether the default TPs require conversation security.

The format and parameters for the DEFINE_DEFAULTS verb can be found in Appendix A, "File APPNV.CTL" on page 191. More information on TPs can be found in *ns2arp.*.

You may need to configure explicit TP definitions when:

- The TP has different properties than the specified default values.
- The TP program filename does not match the TP name.
- You have not enabled the default TP capability.

How Default TP Names Match the Filespecs of the TP Programs:

Care should be taken in matching default TP names and the filespecs of the TP programs. The APPC attach manager uses the following algorithm to generate a filespec from the TP name carried in an inbound allocation request for a default TP:

> Scan the first nine characters of the TP name for an EBCDIC period (X'4B') or blank (X'40').
> If a period is found:
>> Use all the characters up to the period (a maximum of eight characters) plus up to three characters following the period until a bland is found, to form a filespec.
>
> Else if a blank is found:
>> Use all the characters up to the blank (a maximum of eight characters) and append '.EXE'.
>
> Else (if neither a period nor a blank is found):
>> Use the first eight characters and append '.EXE'.

The following list shows some examples of inbound TP names and the corresponding program filespecs generated by the attach manager for default TPs:

Inbound TP name	Generated program filespec
Program	Program.EXE
Program.	Program.
program.exe	program.exe
program.pjs	program.pjs
LongTPName.JFW	LongTPNa.EXE

Note: Default TP names are case sensitive, just like configured TP names.

8.8 Implicit CNOS

When partner LUs and modes are configured in Communications Manager without Networking Services/2 installed, the CNOS verb is built from the initial session limits profile and is issued when the Communications Manager is started. With Networking Services/2 installed, an implicit CNOS verb is issued any time there is a session request which requires initializing the session limits with a partner LU. With this facility, CNOS does not have to be configured, the TP does not have to explicitly issue a CNOS verb before allocating a conversation, nor does CNOS have to occur before the TP is actually ready to be executed. The CNOS verb can be issued to defined partner LUs when Networking Services/2 is started by including a CNOS verb in the .NDF file for that partner. When a .CFG file with defined partner LUs is migrated (at installation time or with APPNMIG) CNOS verbs are built and included in the .NDF file for each defined partner LU.

8.9 Default for the DEFINE_DEFAULTS Verb

If you don't use the **DEFINE_DEFAULTS** verb in your .NDF file, the following are implicitly used:

DEFAULT_TP_OPERATION(QUEUED_OPERATOR_STARTED)
DEFAULT_TP_PROGRAM_TYPE(BACKGROUND)
DEFAULT_TP_CONV-SECURITY-RQD(NO)
DEFAULT_LOCAL_LU_NAME(local CP)
IMPLICIT_INBOUND_PLU_SUPPORT(YES)
MAX_HELD_ALERTS(0)
MAX_MC_LL_SEND_SIZE(0)
DEFAULT_MODE_NAME(blank)

If you use the **DEFINE_DEFAULTS** verb in your .NDF file, without any parameters defined, the following are implicitly used:

DEFAULT_TP_OPERATION(NONQUEUED_AM_STARTED)
DEFAULT_TP_PROGRAM_TYPE(BACKGROUND)
DEFAULT_TP_CONV-SECURITY-RQD(NO)
DEFAULT_LOCAL_LU-ALIAS(the local CP becomes the default LU)
IMPLICIT_INBOUND_PLU_SUPPORT(YES)
MAX_HELD_ALERTS(10)
MAX_MC_LL_SEND_SIZE(32767)
DEFAULT_MODE_NAME(blank)

Be aware that in both cases there is no default value for:

DIRECTORY_FOR_INBOUND_ATTACHES

When you migrate, a **DEFINE_DEFAULTS** verb is put in your .NDF file (see Figure 17 on page 62 in section 7.1, "End Node Obtained by Migrating an APPC-Configured .CFG File" on page 57).

If you directly build the .NDF file, it is strongly recommended that you initially define the defaults from the Configuration Management window to avoid confusion over how the defaults will be set. To do so, select: `Configure -> Advanced SNA... ->Transaction Program Defaults`.

Chapter 9. Network Design Evolution

This chapter describes how to make your current network take the maximum advantages of Networking Services/2 installation.

Once Networking Services/2 is installed you have APPN available on your machines. Here are recommendations that you should consider before going further.

9.1 How to Benefit from APPN

Any APPC application that ran without Networking Services/2 will still run with it installed on the node.

Once you have migrated your node to use Networking Services/2, delete all the DEFINE_PARTNER_LU_LOCATION verbs issued for the partner LUs that are in an end node or a network node: with APPN the partner LUs are dynamically found in the network.

If you want to change your application or create new ones, you should take into consideration the following:

- Keep in mind that the resources you use within APPN are the LUs, not the transaction programs.
- Your control point is an LU. This LU is your local default LU unless you have specified another one during configuration (either under Communications Manager before you used the migration facility, or in your .NDF file if you built it directly). Whenever possible keep this LU as the local default.
- If you have no reason for using another LU, do not define any other LUs and use only your control point LU: with modern implementations, parallel sessions and multiple links per node, there is no need for multiple local logical units.
- The most prevalent requirement for multiple LUs comes from an application that needs simultaneous conversations to applications in a subarea that only supports dependent LUs (single session LUs). But even in this case, a clever design can permit the application to run on a single LU.
- So the best design for a node (LEN, end node or network node) is to have only one local LU (the LU-CP) defined as default LU.
- Since you have a local default LU, use it as often as possible. It will allow your transaction programs to be more easily carried from one node to another, no matter what the local default LU is. For example, the sample APPN program APPCTELL.EXE could not work on every node if it did not use the local default LU.

9.2 Connection Networks

The connection network is intended to spare a lot of routing overhead when you have network nodes and end nodes on a token-ring LAN.

Concept

Without APPN, an LU had to know the address on the token-ring LAN (MAC address) of each of its partner LUs. With the APPN directory and connection networks these addresses can be retrieved from the network node server dynamically.

The concept of connection network makes possible a direct session between any two nodes located on the same token-ring LAN with only a single definition for the connection network on each node. When an LU wants to establish a session with another LU, it uses the APPN directory services to locate the other LU. When the LU is in another node an end node's directory service will ask its network node server to locate the LU. The network node does a distributed search and locates the LU. Included in the results from the search are the connections from the node containing the LU into the APPN network (including the connection network and its MAC address). The network node server calculates the best route for the session (the connection network) and passes the route (including the destination MAC address) back to the LU wanting to initiate the session. The first node can then dynamically create a link to the second node (this link will always be deleted at the end of the session). Thus the session will not be routed through any intermediate node.

You must only be sure that the same connection network name is assigned to each node of the token-ring LAN that wants to use this service. Only end nodes and network nodes may use connection networks. Links to LEN nodes must still be defined.

Why are connection networks so important? The answer is simple: if you have APPN installed on a token-ring LAN without any connection network, then only the links you have defined will be used. If you have not defined links between any two end nodes then the network nodes will have to do intermediate routing for the end nodes attached to them. It means that the data exchanged between two end nodes on a common token-ring LAN will still be routed through network nodes.

By using a connection network you avoid this heavy routing overhead on your network nodes.

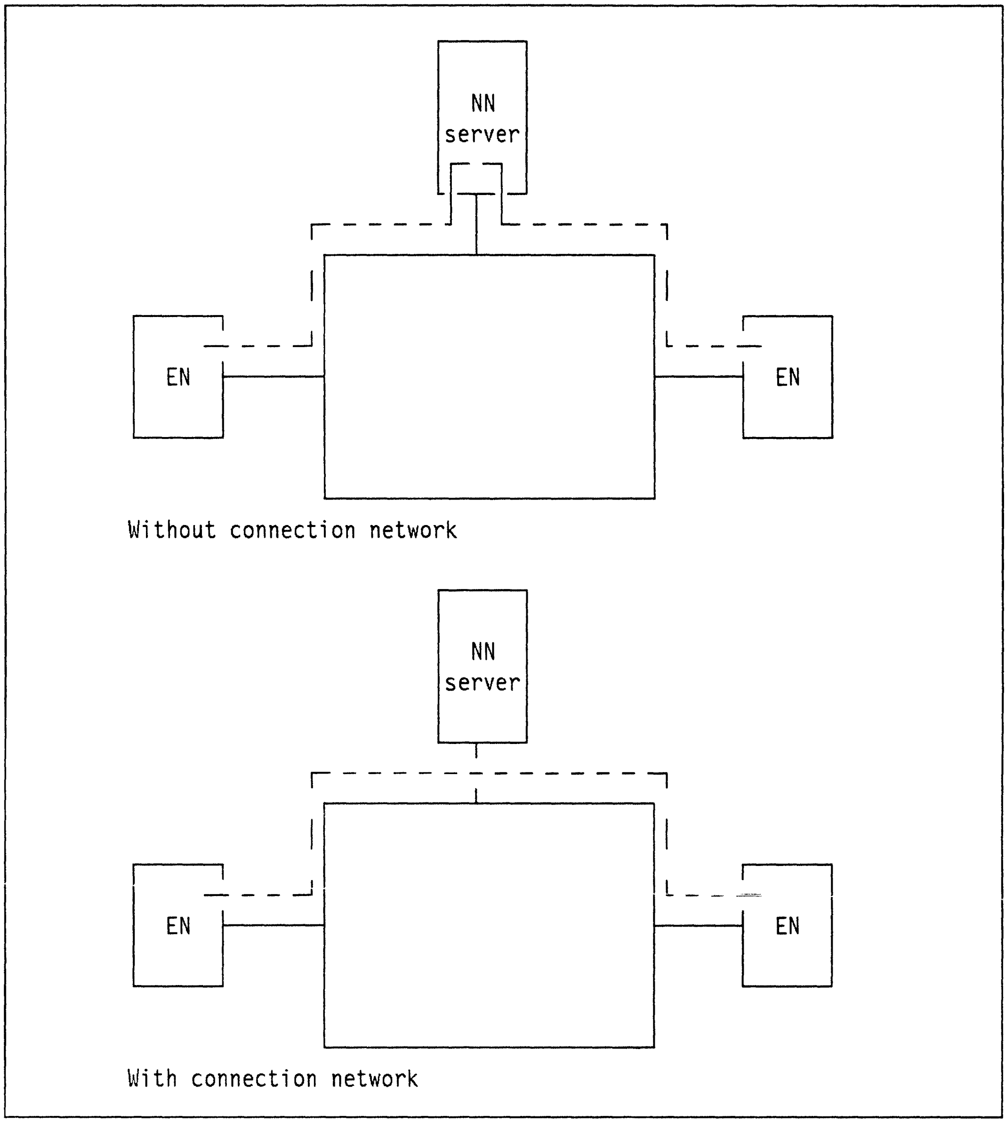


Figure 37. Connection Networks

Configuration

To define a connection network you must consider the following:

End Node Configuration

You should use the following verbs for each end node definition:

- DEFINE_LOCAL_CP
- DEFINE_CONNECTION_NETWORK
- DEFINE_LOGICAL_LINK (with the network node server)
- DEFINE_DEFAULTS (enable your defaults)
- START_ATTACH_MANAGER.

Network Node Configuration

You should use the following verbs for the network node server definition:

- DEFINE_LOCAL_CP
- DEFINE_CONNECTION_NETWORK
- DEFINE_DEFAULTS enable your defaults
- DEFINE_LOGICAL_LINK (with any "adjacent" network nodes).
- Include the following for each served end node:
  - DEFINE_LOGICAL_LINK
- START_ATTACH_MANAGER.

Utilization

Each connection network name must be unique within the LU names of the APPN network.

Communications Manager allows only 64 link stations per token-ring adapter. Therefore no more than 128 end nodes can be attached to the same network node on a token-ring LAN (with two adapters in the workstation).

If you want to have more workstations on your token-ring LAN, or if you don't want to attach so many end nodes to a network node, you must define multiple network node servers on the token-ring LAN and then connect the network nodes together. All these network nodes may belong to the same or to different connection networks.

You may have one node with two adapters on the same connection network.

```
DEFINE_CONNECTION_NETWORK  FQ_CN_NAME(NET.CONNET)
                 ADAPTER_INFO( DLC_NAME(IBMTRNET)
                               ADAPTER_NUMBER(0))
                 ADAPTER_INFO( DLC_NAME(IBMTRNET)
                               ADAPTER_NUMBER(1));
```

Figure 38. Node with Two Adapters on the Same Connection Network

However, you must be careful. In a valid connection network all adapters must be able to access all other adapters on the same connection network. Thus, in the preceding figure both adapters must be on the same token-ring LAN.

You can also have one node with two adapters defined on two different connection networks. These connection networks may be on the same token-ring LAN or on two different token-ring LANs.

```
DEFINE_CONNECTION_NETWORK  FQ_CN_NAME(NET.CONNET0)
                 ADAPTER_INFO( DLC_NAME(IBMTRNET)
                               ADAPTER_NUMBER(0));

DEFINE_CONNECTION_NETWORK  FQ_CN_NAME(NET.CONNET1)
                 ADAPTER_INFO( DLC_NAME(IBMTRNET)
                               ADAPTER_NUMBER(1));
```

Figure 39. Node with Two Adapters on Different Connection Networks

There is no requirement for an end node and its network node server to both be on the same connection network. An end node and its network node server may belong to different connection networks or the end node can be connected to its serving network node by a different link type (for example, SDLC).

Defining multiple connection networks on the same token-ring LAN is a way of partitioning your token-ring LAN.

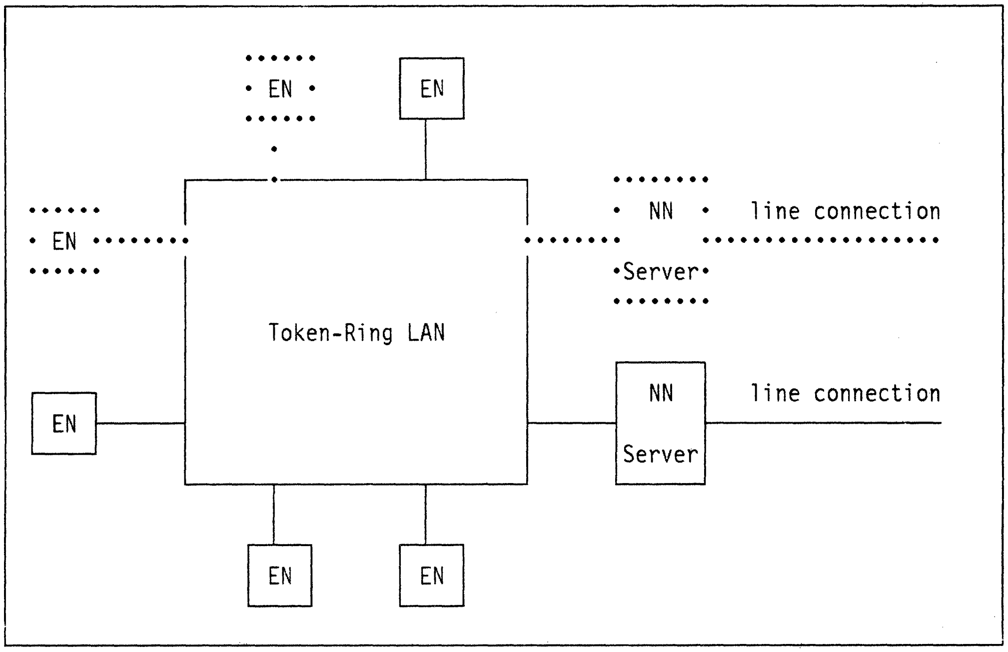


Figure 40. Partitioning a Token-Ring LAN

Connection network links are automatically defined as limited resources. Even if you specify free unused link=NO in the token-ring DLC adapter profile of the SNA feature profile of Communications Manager, this default will be overwritten when the logical link is defined by Networking Services/2. See sections 7.15, "Connection Network" on page 87 and 7.16, "Network Node Acting as a Router between Two Token-Ring LANs" on page 88 for examples of connection networks being defined.

9.3 How to Define Links between End Nodes and a Network Node Server

Networking Services/2 allows the situation in which you only define the links between an end node and its network node server in the end node. The network node learns about the end node when the end node is powered on. The end node dynamically create a logical link to the server and all goes well.

So it would seem you don't have to define the end nodes to their server which in fact would be much less work. However, it is strongly recommended that you do define the end nodes to their network node server if you don't want to encounter problems.

To understand why a network node should define the links to all the end nodes it serves, consider this scenario.

1. The network node does not have the recommended link definitions to the end node.

2. The network node is activated.
3. The first three end nodes are activated. Their link definitions cause them to automatically connect to their network node. The network node provides them with the standard APPN services: search for LU locations, compute optimal routes, and provide intermediate routing when necessary.
4. The network node is deactivated for maintenance. The first three end nodes lose their network node connection. Existing sessions that are not routed through the network node are not affected, but there is no APPN service for new sessions.
5. The second three end nodes are activated. Since the network node is not active, they cannot link to it and they cannot get any APPN services for starting new sessions.
6. The network node is reactivated. Since it does not contain the link definitions for its end nodes, it does not try to link to them automatically. And since the end nodes are already active, they will not make another attempt to link with the network node. So, even though the network node is active, none of the end nodes will be able to get APPN services from it. Manual intervention is required to reconnect the end nodes to the network node.

Now consider the same scenario when the network node has the recommended link definitions. When the network node is reactivated in step 6, it will automatically link to each of its end nodes, and the end nodes will have access to the APPN services. NO manual intervention is required.

9.4 Routing between Token-Ring LANs

Since the same network node may belong to two different token-ring LANs, it provides an easy way to get a route between two token-ring LANs.

If you intend to have connection networks on each token-ring LAN, the connection network names must be different except if there is a bridge between the token-ring LANs.

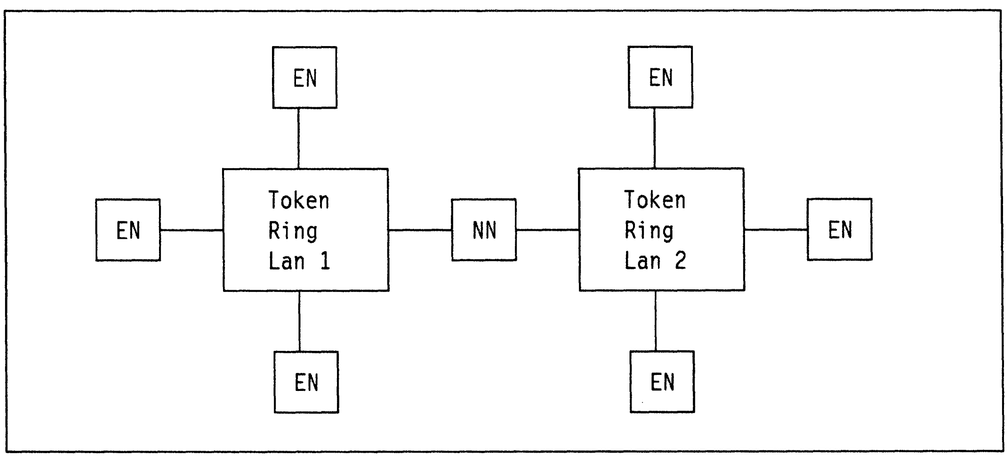


Figure 41. Routing between Token-Ring LANs

Networking Services/2 supports routing between DLCs for LU 6.2 applications only. See section 7.16, "Network Node Acting as a Router between Two Token-Ring LANs" on page 88 for an example of this.

Chapter 10. Management Services

Networking Services/2's management services capability is an implementation of the SNA management services architecture. Details about this architecture are found in the *IBM Systems Network Architecture Management Services Reference*. An overview of some of the concepts will be presented along with Networking Services/2's implementation and the significance of this in today's networks. Also, see Chapter 11, "AS/400 Considerations" for some network management considerations when an AS/400 is included in the network.

10.1 Management Services Architecture Level

The management services architecture has been evolving with time. Therefore, products have implemented different levels of the architecture. The levels of the architecture we are concerned with are:

MDS-level

An SNA product that can send and receive Multiple Domain Support Message Units (MDS_MUs) between a focal point (FP) and an entry point (EP). The MSD_MUs may flow on an LU-to-LU session using the SNASVCMG mode or (between an end node and its network node server) on a CP-to-CP session. This is the most recent level of the architecture. NetView Version 2 Release 2 will implement this level as a focal point.

Networking Services/2 has implemented this level as an entry point.

migration-level

An SNA product that can send and receive Control Point Management Services Units (CP_MSUs) but not MDS_MUs. As a focal point it only supports the Alert MS category. OS/400 Release 3 Modification Level 0 has implemented this level of the management services architecture as both a focal point and an entry point.

Networking Services/2 does support transforming Alert MDS_MUs into CP_MSUs and forwarding them to a migration-level focal point (an AS/400).

NMVT-level

An SNA product that can send and receive NMVTs, but not MDS_MUs or CP_MSUs. These NMVTs will flow on the SSCP-to-PU session. Among the products to implement this level are NetView Version 2 Release 1 (and earlier) and OS/2 Extended Edition without Networking Services/2 installed.

Networking Services/2 does support transforming from MDS_MUs and CP_MSUs to NMVTs and back when the focal point is in a host and the NMVTs flow on an SSCP-to-PU session. Also, the transformation takes place when a management services application (such as LAN Manager) wants to send an Alert NMVT and the focal point is a migration-level focal point (AS/400) or an MDS-level focal point (NetView Version 2 Release 2). For more information on how the transformations are done see the *IBM SAA Networking Services/2 Installation and Networking Administrator Guide.*

10.2 Focal Point, Service Point, and Entry Point Relationships

We have been using the terms focal point and entry point without having defined what they are. Here is a brief description:

Focal Point (FP)
A focal point is a central point of control for managing a network. It can request data from service points and entry points relating to the operation of a network. It can also receive unsolicited data from the nodes it manages. NetView and AS/400 have implemented the focal point capability.

Entry Point (EP)
An entry point captures local management services data and sends it to a focal point for processing, either upon request or unsolicited. Networking Services/2 provides the entry point function.

Service Point (SP)
A service point is support for requesting and capturing data from devices that, by themselves, cannot serve as an entry point. Except that it collects non-local data, a service point functions like an entry point in its relationship to a focal point. The IBM NetView/PC and IBM LAN Manager program products provide service point function. Networking Services/2 provides programming support for these and other management services applications.

A relationship is established between a focal point and an entry point for a given management services category (such as Alerts) by exchanging MS Capabilities messages. The collection of entry point nodes that have an explicit or default focal point-to-entry point relationship with the same focal point for an MS category make up the focal point's sphere of control, or SOC, for that category. Each of these entry point nodes is called a SOC node. Networking Services/2, as a network node or end node, can be a SOC node for the Alert MS category.

The following are the types of focal point-to-entry point relationships possible:

Explicit
This relationship is established when an operator at a focal point assigns an entry point node to the focal point's SOC. The focal point initiates the exchange of MS Capabilities to establish the explicit focal point-to-entry point relationship. The entry point node can be a network node or an end node.

The relationship between the Networking Services/2 network node entry point and the AS/400 focal point in "Alert Processing on PS/2, AS/400 and NetView" on page 154 is an explicit focal point-to-entry point relationship.

Implicit (Primary)
This relationship is established when an operator at an entry point assigns that node to the focal point's SOC. The entry point initiates the exchange of MS Capabilities to establish the implicit (primary) focal point-to-entry point relationship. The entry point node can be a network node or an end node.

Networking Services/2 does not support this. There is no way to request NS/2 to initiate the MS Capabilities exchange. NS/2 will only initiate the MS Capabilities exchange when it loses its explicit or implicit (primary) focal point, and a backup focal point has been defined.

Implicit (Backup)

This relationship is established when the entry point acquires a backup focal point after an explicit or implicit primary focal point becomes unavailable. The entry point initiates the MS Capabilities exchange. A backup can only have been specified when both the entry point and the focal point are at the MDS-level.

Default

This relationship is established when a focal point acquires the entry point automatically without network operator definition (for example, an AS/400 can be defined as a default focal point and will initiate the MS Capabilities exchange with a network node when it is added to the topology database in the AS/400). The focal point initiates the MS Capabilities exchange.

Domain

This relationship is established when a network node server informs the entry point that is an end node in the network node's domain of the focal point. The network node sends the MS Capabilities to the end node to establish the domain relationship.

Networking Services/2 supports this relationship for all three levels of focal point.

Host

This relationship is used when the entry point node can have an SSCP-to-PU session and this session is used to transport NMVTs to the management services application in the host.

Networking Services/2 supports being an entry point in a host relationship when it is boundary-attached to the subarea network. You should specify YES for the host-FP-support configuration option.

10.3 Focal Point-to-Entry Point Relationship Hierarchy

There is a possibility for more than one focal point being available to an entry point for a particular management services category. For example, Networking Services/2 might be configured to have a host focal point using the SSCP-to-PU session. At a later time an AS/400 focal point might send the Networking Services/2 an MS Capabilities offering to be the Alert focal point. This *explicit* focal point would take precedence over the *host* focal point.

The hierarchy for focal points is:

1. An *explicit* focal point replaces any active focal point-to-entry point relationship.
2. A *default* focal point replaces a *host* focal point-to-entry point relationship, but not an *explicit* or *implicit (backup)* relationship.
3. A *domain* focal point replaces a *host* focal point-to-entry point relationship, but not an *explicit* or *implicit (backup)* relationship.
4. A *host* focal point does not replace any other relationship. It can only be started when Networking Services/2 is started, and remains active only until an *explicit*, *default*, or *domain* focal point-to-entry point relationship (if any) is established. If one of these other relationships is started and then that focal point becomes unavailable, Networking Services/2 cannot go back to using the *host* focal point-to-entry point relationship unless Networking Services/2 is stopped and restarted.

10.4 Management Services for a Sample Network

To understand some of the implications of what is and is not supported for network management, let us look at a sample network and see how we might want to manage Alerts from this network. Let us assume that in Figure 42 we want all alerts to be sent to a NetView operator in the host.

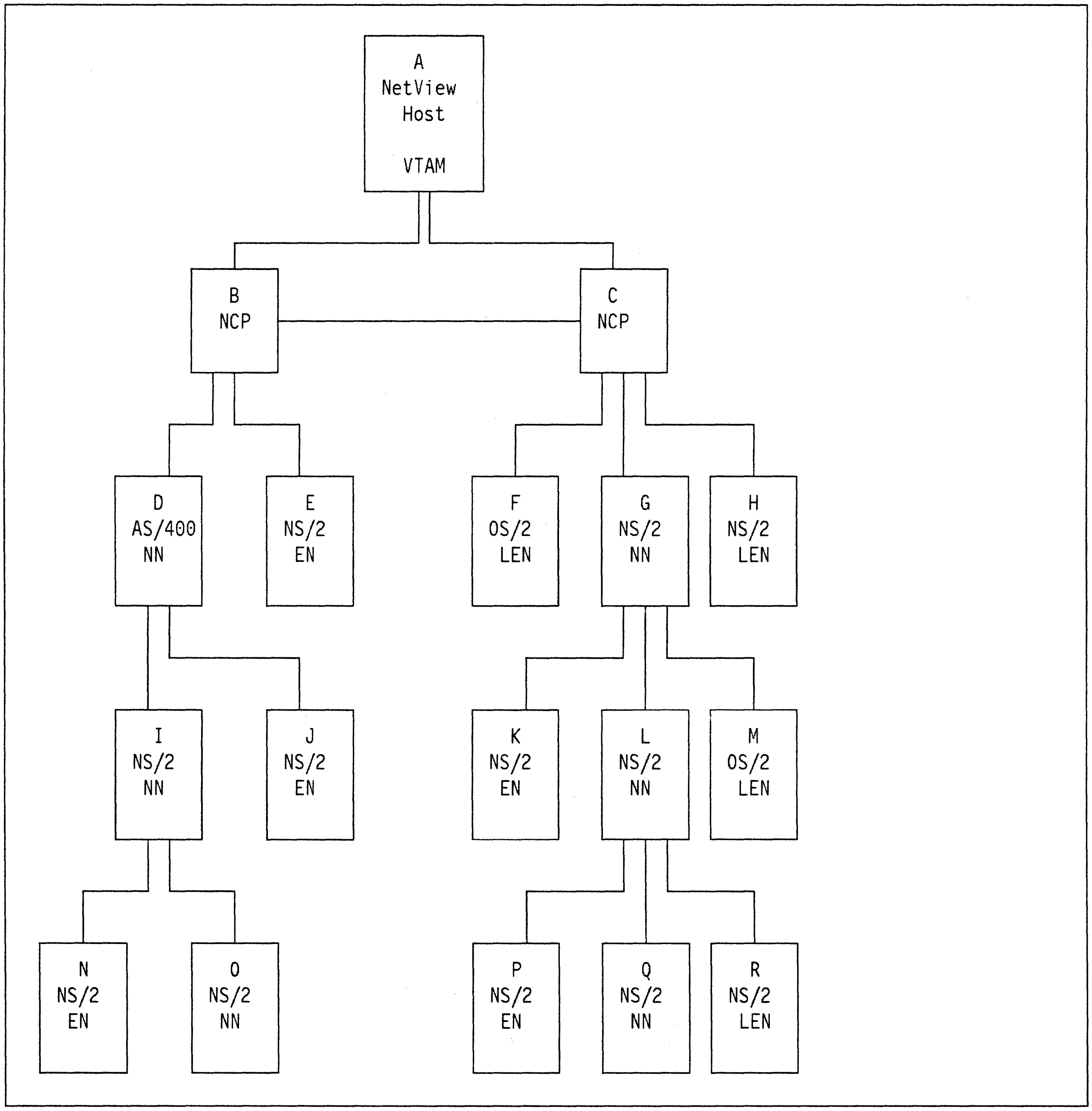


Figure 42. Sample Network for Management Considerations

Your options for how Alerts can get to the NetView operator vary depending on where you are in the network.

Boundary-Attached End Nodes and LEN Nodes (Nodes E, F, and H)

This section discusses the options for nodes E, F, and H. OS/2 LEN nodes (node F) and NS/2 end nodes (node E) or LEN nodes (node H) can be configured to request SSCP-PU session activation. There is really no difference between the NS/2 end node (node E) and the NS/2 LEN node in this figure because our definition of an NS/2 LEN node is an end node without CP-to-CP sessions and neither node will have CP-to-CP sessions with a network node.

When configuring NS/2 nodes (end nodes or network nodes) that are boundary attached to the subarea and are to use the SSCP-to-PU session for network management, you need to specify the following in the .NDF file:

1. HOST_FP_SUPPORT(YES) on the DEFINE_LOCAL_CP verb
2. HOST_FP_LINK_NAME(link-name for link to host) in the DEFINE_LOCAL_CP verb
3. SOLICIT_SSCP_SESSION(YES) on the DEFINE_LOGICAL_LINK verb for the link to the host.

For an example of this for a network node see section 7.20, "Connection with a Primary Host" on page 98. It is the same for an end node except that it would be NODE_TYPE(EN) on the DEFIND_LOCAL_CP verb. If you are token-ring LAN-attached, your C&SM LAN ID will be displayed as your RESOURCE ID in NetView, so you want to make it something meaningful. This is *host* focal point support. *Host* focal point support is the only way the OS/2 LEN node (node F) can receive network management support.

If you have an AS/400 somewhere in your APPN network (node D) and the CPs for nodes E and H are defined to VTAM, you can add nodes E and H to the AS/400's SOC and the AS/400 will initiate a focal point-to-entry point relationship with nodes E and H and take over focal point services for these nodes. The AS/400 can also be set up to route alerts that it receives up to NetView in host A on the AS/400's SSCP-to-PU session. Nodes E and H have to be explicitly added to the AS/400's SOC before this relationship will be established.

For more information on how to add and remove entries to the AS/400's SOC see "Alert Processing on PS/2, AS/400 and NetView" on page 154.

Boundary-Attached Network Nodes and End Nodes in Their Domain (Nodes G and K)

This section discusses the options for nodes G and K. An NS/2 network node can be configured to request SSCP-to-PU session activation. When configuring NS/2 network nodes that are boundary-attached to the subarea and are to use the SSCP-to-PU session for network management, you need to specify the following in the .NDF file:

1. HOST_FP_SUPPORT(YES) on the DEFINE_LOCAL_CP verb
2. HOST_FP_LINK_NAME(link-name for link to host) in the DEFINE_LOCAL_CP verb
3. SOLICIT_SSCP_SESSION(YES) on the DEFINE_LOGICAL_LINK verb for the link to the host.

For an example of this for a network node see section 7.20, "Connection with a Primary Host" on page 98. If you are token-ring LAN-attached, your C&SM LAN

ID will be displayed as your RESOURCE ID in NetView, so you want to make it something meaningful.

An NS/2 network node (node G) will initiate the MS Capabilities exchange with end nodes in its domain (node K) for focal point support. This allows the end node to send alerts on the CP-to-CP session to its serving network node. The serving network node will then send the alert on to the focal point (in this case on the SSCP-to-PU session to host A). This is *domain* focal point support.

If you have an AS/400 somewhere in your APPN network (node D) and the CP for node G is defined to VTAM, you can add node G to the AS/400's SOC and the AS/400 will initiate a focal point-to-entry point relationship with node G and take over focal point services for this node. Node G will then do a new MS Capabilities exchange with end node K. Node G will now have an *explicit* focal point relationship with the AS/400 and node K will still have a *domain* focal point relationship, but now the AS/400 will be the focal point. The AS/400 can also be set up to route alerts that it receives up to NetView in host A on the AS/400's SSCP-to-PU session. Node G has to be explicitly added to the AS/400's SOC before this relationship will be established.

If the CP for node K is defined to VTAM, you can also add node K to the AS/400's SOC. This would cause the AS/400 to initiate an MS Capabilities exchange directly with end node K causing an *explicit* focal point-to-entry point relationship to be established between the AS/400 and end node K.

For more information on how to add and remove entries to the AS/400's SOC see "Alert Processing on PS/2, AS/400 and NetView" on page 154.

LEN Nodes That Are Not Boundary-Attached (Nodes M and R)

This section discusses the options for nodes M and R.

There is currently no way for LEN nodes to send alerts to the host if they are not boundary-attached to the subarea.

NS/2 End Node Attached to an AS/400 (Node J)

This section discusses the options for node J.

An end node attached to an AS/400 network node is part of the domain of the AS/400. The AS/400 will initiate the MS Capabilities exchange with the end node (node J) establishing a *domain* focal point-to-entry point relationship.

Network Nodes That Are Not Boundary-Attached with AS/400 (Nodes I and O)

This section discusses the options for nodes I and O.

Network nodes that are not boundary-attached to the subarea network do not have an SSCP-to-PU session and therefore cannot send network management information to the host by that session. If, however, the network node that attaches this group of nodes to the subarea is an AS/400 (node D) the AS/400 can function as the focal point for the network nodes and forward the alerts to the host.

If the AS/400 is defined to be a *default* focal point, then when the NS/2 network node (node I or node O) is added to the network, then the AS/400 network node will find out via the topology database update (TDU). The TDU will cause the

AS/400 to initiate an MS Capabilities exchange with the newly added network node and establish a *default* focal point-to-entry point relationship. The NS/2 network node would then initiate an MS Capabilities exchange with end nodes in its domain (end node N is in network node I's domain) establishing a *domain* focal point-to-entry point relationship.

If a *default* focal point is not defined, then you will have to explicitly add the NS/2 network nodes to the AS/400's SOC. Even if a *default* focal point does exist, you can still explicitly add the NS/2 network nodes (nodes I and O) and the NS/2 end node (node N) to the AS/400's SOC.

For more information on how to add and remove entries to the AS/400's SOC see "Alert Processing on PS/2, AS/400 and NetView" on page 154.

Network Nodes That Are Not Boundary-Attached without AS/400 (Nodes L and Q)

This section discusses the options for nodes L and Q.

Network nodes that are not boundary-attached to the subarea network do not have an SSCP-to-PU session and therefore cannot send network management information to the host by that session. If, however, there is an AS/400 network node (node D) in the APPN network acting as a focal point, and the CPs for the NS/2 network nodes (nodes L and Q) are defined to VTAM, then the AS/400 can establish *explicit* focal point-to-entry point relationships with the network nodes and the AS/400 can forward the alerts to the host.

If the AS/400 is not in the same group of nodes (you have to traverse the subarea network to get to it) then it cannot be defined as a *default* focal point, and you would have to explicitly add the NS/2 network nodes to the AS/400's SOC, causing the AS/400 to initiate an MS Capabilities exchange, thus establishing an *explicit* focal point-to-entry point relationship. The NS/2 network node would then initiate an MS Capabilities exchange with end nodes in its domain (end node P is in network node L's domain) establishing a *domain* focal point-to-entry point relationship.

You could also explicitly add the NS/2 end node to the AS/400's SOC initiating a new MS Capabilities exchange between the AS/400 and the NS/2 end node (node P) establishing an *explicit* focal point-to-entry point relationship.

For more information on how to add and remove entries to the AS/400's SOC see "Alert Processing on PS/2, AS/400 and NetView" on page 154.

10.5 Automating the Entry of Nodes to the AS/400's SOC

When a network node is in the same part of an APPN network as an AS/400 node (no subarea links in between) the AS/400 can be set up to automatically establish a *default* focal point-to-entry point relationship. If, however, the AS/400 is in another part of the network (subarea links in between), then the AS/400 will not know when these nodes join the network. This means that when the network node powers up, a network operator command has to be executed on the AS/400 to add the node to the AS/400's SOC.

The commands for adding or removing a node from the AS/400's SOC can be issued from an APPC transaction program. If the startup.cmd file of an NS/2 network node started a transaction program that established a conversation with a transaction program on the AS/400, informing the AS/400 that it desired to be added the the AS/400's SOC, then the NS/2 network node would be added to the AS/400's SOC every time NS/2 was started.

Chapter 11. AS/400 Considerations

This chapter assists the customer in using APPN in both the OS/2 environment and in the AS/400 environment to increase connectivity, reduce system definition, ease network operation, and simplify network design. The connection between Networking Services/2 and the AS/400 is looked at as well as considerations for 5250 emulation and AS/400 PC Support.

This chapter will start with some general considerations and then there will be some examples of configuring Networking Services/2 for connection to the AS/400 and configuring the AS/400 on the other side.

11.1 General AS/400 Considerations

PC Support and OS/400 Driver Levels

The AS/400 PC Support (both OS/2 and DOS) used for testing was Release 3.0.

OS/400 was at Version 1, Release 3, Modification level 0. In addition, we had installed CUMulative PTF package TC91025, which was made available January 25th, 1991.

PC Support and OS/400 Fix Reports

Rel 3.0 PC Support INSTALL.EXE Trap '000D'x

When we attempted to install the OS/2 version of PC Support onto one of our PS/2s*, we received a TRAP '000D'x error:

```
SYS1943: A program caused a protection violation.

TRAP 000D
```

This was caused by the OS/2 INSTALL.EXE program attempting to modify the CONFIG.SYS file which had very long (over 122 characters) PATH or LIBPATH statements. A fix has been provided for this problem: LF70605, which **is** part of the CUM PTF package TC91025.

To make a new OS/2 install disk (for single byte systems):

1. Make sure LF70605 is installed on your AS/400.
2. Insert a blank, formatted diskette into the A: drive of a PS/2 that has PC Support running to the AS/400.
3. Type "I:\COPYPCS A:".
4. Use this new disk to install PC Support.

Rel 3.0 OS/400 Connection Network Routing PTF

Before you attempt to use the AS/400 as a network node in a network that has a connection network you should load PTF MF02095 onto the AS/400. MF02095 corrects a problem with the AS/400 determining routes through connection networks.

MF02095 is **not** part of CUM PTF package TC91025.

OS/2 5250 WSF Must Have a PLU Defined in Communications Manager

An oddity that is not discussed in the AS/400 configuration scenarios has to do with the OS/2 5250 WSF session profile. One of the parameters in the 5250 WSF profile is the APPC partner LU alias. The APPC partner LU alias (as specified in the 5250 WSF session profile) must match the DEFINE_PARTNER_LU PARTNER_LU_ALIAS verb in the .NDF file. This should make sense because it is in the .NDF file that Networking Services/2 finds out how to map the PARTNER_LU_ALIAS into the FQ_PARTNER_LU_NAME.

So, taking the scenario from section 11.3, "NS/2 Network Node Connection to AS/400 Network Node - with PC Support" on page 140 as an example, we have this relationship for the partner LU alias of *AS400*:

```
5250 WSF Profile:
  APPC Partner LU Alias. . . . AS400

DEFINE_PARTNER_LU  FQ_PARTNER_LU_NAME(USIBMRA.bbb)        used to
                   PARTNER_LU_ALIAS(AS400)                establish session
                                                          with remote host.
```

Figure 43. Mapping of PLU Alias to a Fully-Qualified LU Name

The setup above works fine in all of the AS/400 scenarios.

The problem arises from the fact that in order for your Communications Manager configuration file to properly verify, you must also have a "dummy" partner LU alias defined in Communications Manager's partner logical unit profile. This "dummy" partner LU alias name is not used, except during the verification of the Communications Manager configuration file.

If you have migrated your configuration from a working Communications Manager configuration file, you should not have to worry about this, just as we did not have to in any of the AS/400 scenarios.

But, if you are not migrating, or are adding new 5250 WSF session profiles in Communications Manager, then you must create a new partner logical unit profile with a partner LU alias to match.

So, now our mapping of the partner LU alias in the 5250 WSF profile to the fully-qualified LU Name is more like this:

```
5250 WSF Profile:
  APPC Partner LU Alias. . . : AS400

Partner LU Profile:('Dummy' entry)
  Partner LU (PLU) Alias. . .: AS400

DEFINE_PARTNER_LU  FQ_PARTNER_LU_NAME(USIBMRA.bbb)        used to
                   PARTNER_LU_ALIAS(AS400)                establish session
                                                          with remote host.
```

Figure 44. Mapping of PLU Alias to a Fully-Qualified LU Name - with "Dummy" Alias

Furthermore, the partner LU profile is associated with the LU profile, mode profile and the initial session limit profile. You will still have to enter and verify all of the above profiles in the Communications Manager configuration file. Again, the values defined in these profiles are not used.

You must also have duplicate definitions in the Networking Services/2 configuration file (.NDF) using the DEFINE_LOCAL_LU, DEFINE_PARTNER_LU and DEFINE_MODE verbs. This is because it is from these verbs that Networking Services/2 gets all of the information necessary to initialize itself.

In the AS/400 to Networking Services/2 scenarios, we avoided this complexity by assuming we had a working Communications Manager configuration file (.CFG) and then migrating to the node definition file (.NDF). After the migration, you can make changes to the .NDF file, as long as those changes do not alter the naming of LUs as was established in the Communications Manager.

11.2 Networking Services/2 End Node Token-Ring LAN-Attached to an AS/400 Network Node

This section will describe a very simple connection between a PS/2 running Networking Services/2 as an end node (EN) and an AS/400 running APPC/APPN as a network node (NN). This connection will be made across a token-ring LAN. In addition, we will establish the AS/400 as a network node Server via a CP-to-CP session between the PS/2 end node and the AS/400 network node. Please refer to Figure 45 for a diagram of this network.

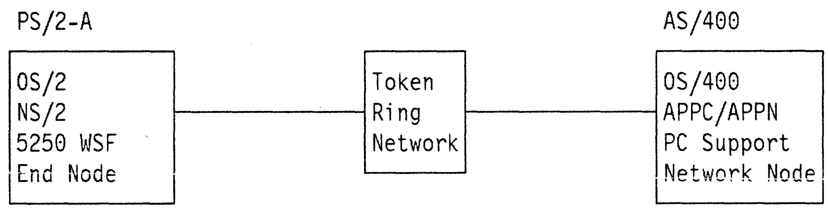


Figure 45. NS/2 End Node Token-Ring LAN-Attached to AS/400 Network Node

Most likely, the customer came into this scenario with the PS/2 running the APPC support provided by the Communications Manager of OS/2. This scenario will start with the PS/2 fully configured to communicate as a LEN node using 5250 WSF to emulate a workstation attached to the AS/400's PC Support. From this base (defined in "OS/2 LEN Support via Communications Manager to AS/400" on page 134), the PS/2 will install Networking Services/2 and migrate the Communications Manager configuration, to be a full end node in the APPN network (including CP-to-CP sessions with the AS/400 network node). Changes, of course, will have to be made on the AS/400 side too.

This section will outline the steps necessary to perform this migration. It will identify areas where extra attention should be placed to ensure a smooth migration. And finally, it will show the configurations on both the PS/2 and the AS/400 for the final APPN network.

Why would a customer want to do this migration? To see the full advantage, you must picture that the AS/400 is just the first network node in a large APPN network. The PS/2 with Networking Services/2 as an end node with CP-to-CP sessions with the AS/400 network node can make use of:

1. Improved performance of the Networking Services/2's implementation of APPC.
2. SAA's CPI-C programming interface available with Networking Services/2.

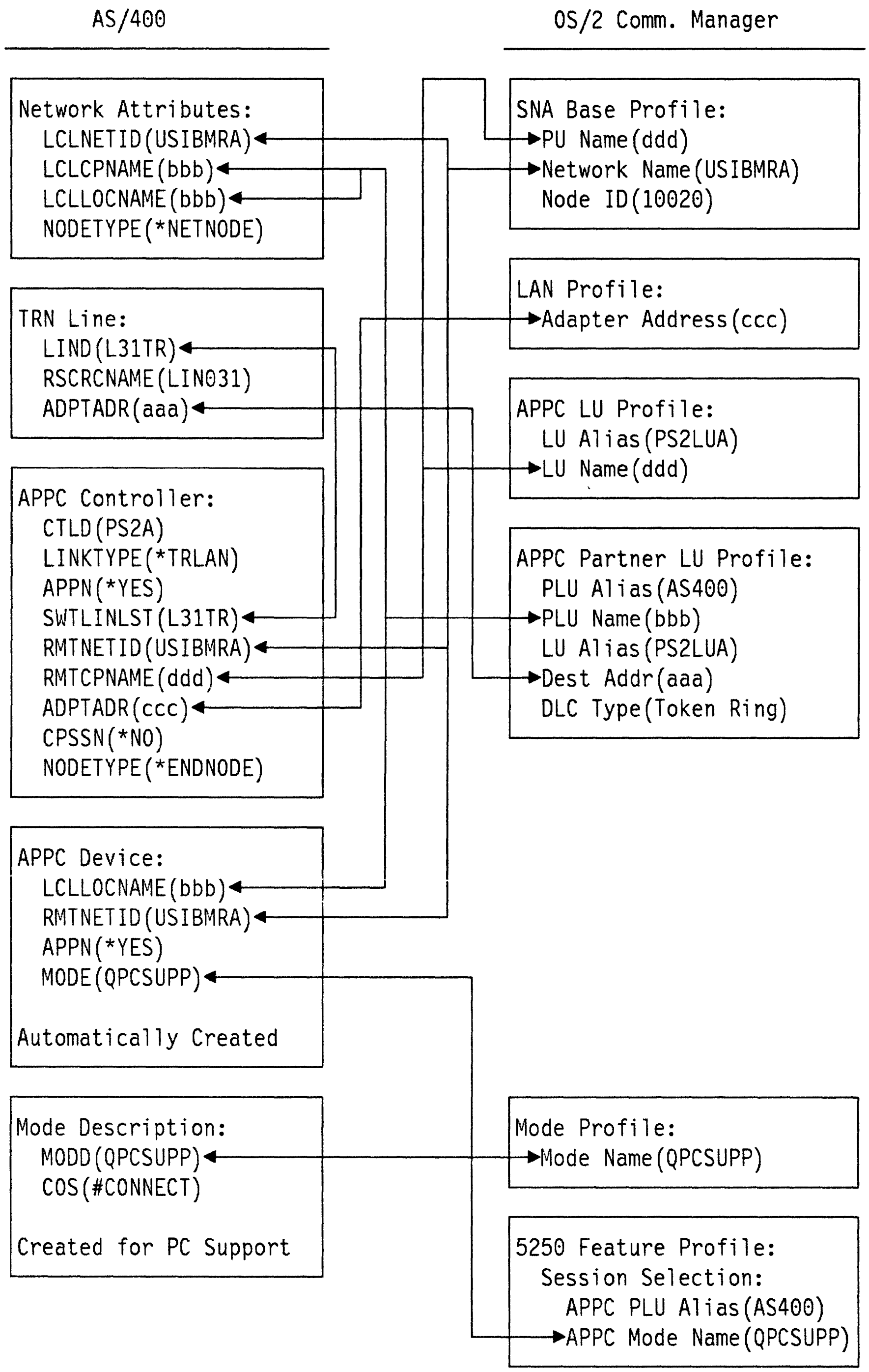
3. Automatic LU lookup and registration with the AS/400 network node (no more partner-LU configuration for a large and dynamic network).
4. The Management Services (MS) enhancements make it easier to work with a larger and more complex network.
5. As an end node, the PS/2 may make use of a Connection Network, using the AS/400 network node as a directory server.

OS/2 LEN Support via Communications Manager to AS/400

This scenario assumes that the user has already been running with OS/2's Communications Manager using the 5250 WSF emulation across a token-ring LAN. As a base of understanding, we have provided in Figure 46 on page 135 a matching parameter diagram. This diagram shows all of the important configuration parameters on both the AS/400 and the PS/2.

Note - Figure 46 on page 135 shows the configuration prior to the installation of Networking Services/2. Part of what this chapter will do is to identify which configuration parameters must change after the installation of Networking Services/2 is complete.

Also note - while 5250 WSF is providing emulation support to the AS/400, PC Support has not been loaded on the PS/2. Please see section 11.3, "NS/2 Network Node Connection to AS/400 Network Node - with PC Support" on page 140 for an example of PC Support on a DOS machine in the Networking Services/2 environment.




```
Where: aaa = AS/400 LAN adapter address     ccc = PS/2 LAN adapter address
       bbb = AS/400 system name             ddd = PS/2 system name
```

Figure 46. Base Configuration Matching Parameters between AS/400 and OS/2 Communications Manager (pre-Networking Services/2)

PS/2-A: Install Networking Services/2

The installation of Networking Services/2 went smoothly, and exactly as advertised.

The only two key steps were:

1. Install the APPC/APPN communication support and configuration programs. This is the base Networking Services/2 support. You do not need to install the sample programs and high-level language header files, because we will be using our own APPC application, namely 5250 WSF.

2. Choose to have the Networking Services/2 install code migrate your default Communications Manager file into a .CF2 file that is used by Networking Services/2. This migration will create, as an intermediate step, an ASCII file (for viewing and editing) with an extension of .NDF. It is this .NDF file that is shown in Figure 47 on page 137.

   Note - all of these files (.CFG, .NDF, and .CF2) will have the same filename - that of the default Communications Manager configuration file.

Shut down the PS/2 after the installation program has exited and all disk activity has completed. Re-boot.

PS/2-A: Review of the Migrated Configuration

After the Communications Manager configuration file (.CFG) has been migrated by the installation of Networking Services/2, a node definition file (.NDF) was created. It is this viewable and editable file that we will discuss in this section. Please see Figure 47 on page 137. Note - numbers inside of small boxes have been added to the figure as an aid for references.

After the PS/2 was re-booted, and before any changes were made to the Networking Services/2 or AS/400 configurations, Communications Manager was restarted and a 5250 WSF session was established to the AS/400. This was successful because Networking Services/2 migrated the PS/2 LEN node to be an end node without CP-to-CP sessions. In Figure 47, (1) shows that the DEFINE_LOCAL_CP is an end node and (4) defines that this end node does not have CP_CP_SESSION_SUPPORT with a network node.

Another good reason why the Networking Services/2 migration did not define CP-to-CP sessions, is that there was no way for it to know the CP name of the network node server. Look at (2a and 2b). The CP_NAME is CP000002, which Networking Services/2 generates without knowing what the real CP_NAME will be. These will be some of the places we must edit to establish CP-to-CP sessions with the AS/400 network node.

ITSC Technical Bulletin Evaluation

Technical Bulletin Title: ____

Technical Bulletin Form Number: ____________

This is an evaluation form to assess the quality of ITSC publications. Your feedback will help maintain the high quality of ITSC standards. Please fill out this questionnaire and send it to the address on the back of this page. No postage stamp is required if mailed in the U.S. Elsewhere, you may choose to have your IBM Marketing Representative forward your reply to the address listed on the reverse side of this form.

Date publication was ordered (MM/DD/YY) ____/____/____

Date publication was received (MM/DD/YY) ____/____/____

Please rate on a scale of 1 to 5 the subjects below.
(1 = very good, 2 = good, 3 = average, 4 = poor, 5 = very poor)

Technical Bulletin organization	___	Grammar/punctuation/spelling	___
Accuracy of the information	___	Ease of reading and understanding	___
Relevance of the information	___	Ease of finding information	___
Completeness of the information	___	Lack of redundant information	___
Value of illustrations	___		

Please answer the following questions:

a) Was the level of detail of the information adequate? Yes____ No____

b) Did you find information duplicated that was available in other IBM publications? Yes____ No____

If yes, please name the publication:

____

____

c) Was the bulletin published in time for your needs? Yes____ No____

d) Did this bulletin meet your needs? Yes____ No____

If no, please explain:

____

____

Comments/Suggestions:

Thank you for your feedback.

Your name, company name, and address (optional):

____

____

____

____

ITSC Technical Bulletin Evaluation Form

Fold and Tape — Please Do Not Staple — Fold and Tape

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY MAIL

FIRST CLASS PERMIT NO. 40 ARMONK, N.Y.

POSTAGE WILL BE PAID BY ADDRESSEE:
IBM International Technical Support Center
Department H52, Building 930
P.O. Box 950
Poughkeepsie, New York 12602
U.S.A.

ATTN: Quality Coordinator

Fold — Fold

IBM®

Node Definition File (.NDF)

```
DEFINE_LOCAL_CP  FQ_CP_NAME(USIBMRA.ddd )
                 DESCRIPTION(Created by the migration utility on 02-12-91 at 04:11p)
                 CP_ALIAS(PS2LUA  )
                 NAU_ADDRESS(INDEPENDENT_LU)
 1 ------------->NODE_TYPE(EN)
                 NODE_ID(X'10020')
                 HOST_FP_SUPPORT(NO);

DEFINE_LOGICAL_LINK  LINK_NAME(LINK0001)
                     DESCRIPTION(Created by the migration utility on 02-12-91)
 2a ---------------->FQ_ADJACENT_CP_NAME(USIBMRA.CP000002 )
                     ADJACENT_NODE_TYPE(LEN)<------------------------------- 3
                     DLC_NAME(IBMTRNET)
                     ADAPTER_NUMBER(0)
                     DESTINATION_ADDRESS(aaa)
 4 ----------------->CP_CP_SESSION_SUPPORT(NO)
                     ACTIVATE_AT_STARTUP(NO)<------------------------------- 5
                     LIMITED_RESOURCE(USE_ADAPTER_DEFINITION)
                     LINK_STATION_ROLE(USE_ADAPTER_DEFINITION)
                     SOLICIT_SSCP_SESSION(NO)
                     EFFECTIVE_CAPACITY(USE_ADAPTER_DEFINITION)
                     COST_PER_CONNECT_TIME(USE_ADAPTER_DEFINITION)
                     COST_PER_BYTE(USE_ADAPTER_DEFINITION)
                     SECURITY(USE_ADAPTER_DEFINITION)
                     PROPAGATION_DELAY(USE_ADAPTER_DEFINITION)
                     USER_DEFINED_1(USE_ADAPTER_DEFINITION)
                     USER_DEFINED_2(USE_ADAPTER_DEFINITION)
                     USER_DEFINED_3(USE_ADAPTER_DEFINITION);

DEFINE_PARTNER_LU  FQ_PARTNER_LU_NAME(USIBMRA.bbb )
                   DESCRIPTION(Created by the migration utility on 02-12-91)
                   PARTNER_LU_ALIAS(AS400)
                   MAX_MC_LL_SEND_SIZE(32767)
                   CONV_SECURITY_VERIFICATION(NO)
                   PARALLEL_SESSION_SUPPORT(YES);

DEFINE_PARTNER_LU_LOCATION  FQ_PARTNER_LU_NAME(USIBMRA.bbb )          <--
                            DESCRIPTION(Created by the migration utility on 02-12-91)  6
                            WILDCARD_ENTRY(NO)
 2b ----------------------->FQ_OWNING_CP_NAME(USIBMRA.CP000002 )
                            LOCAL_NODE_NN_SERVER(YES);                 <--

DEFINE_MODE  MODE_NAME(QPCSUPP )
             DESCRIPTION(Created by the migration utility on 02-12-91 at 04:11p)
             COS_NAME(#CONNECT)
             DEFAULT_RU_SIZE(NO)
             MAX_RU_SIZE_UPPER_BOUND(1920)
             RECEIVE_PACING_WINDOW(8)
             MAX_NEGOTIABLE_SESSION_LIMIT(32767)
             PLU_MODE_SESSION_LIMIT(8)
             MIN_CONWINNERS_SOURCE(4);

DEFINE_DEFAULTS  IMPLICIT_INBOUND_PLU_SUPPORT(YES)
                 DESCRIPTION(Created by the migration utility on 02-12-91 at 04:11p)
                 DEFAULT_MODE_NAME(BLANK)
                 DEFAULT_LOCAL_LU_ALIAS(PS2LUA  )
                 MAX_MC_LL_SEND_SIZE(32767)
                 DIRECTORY_FOR_INBOUND_ATTACHES(*)
                 DEFAULT_TP_OPERATION(NONQUEUED_AM_STARTED)
                 DEFAULT_TP_PROGRAM_TYPE(BACKGROUND)
                 DEFAULT_TP_CONV_SECURITY_RQD(NO)
                 MAX_HELD_ALERTS(10);

CNOS  LOCAL_LU_ALIAS(PS2LUA  )
      FQ_PARTNER_LU_NAME(USIBMRA.bbb )
      MODE_NAME(QPCSUPP )
      SET_NEGOTIABLE(NO)
      PLU_MODE_SESSION_LIMIT(8)
      MIN_CONWINNERS_SOURCE(4)
      MIN_CONWINNERS_TARGET(4)
      AUTO_ACTIVATE(0);
```

```
Where: aaa = AS/400 LAN adapter address    ccc = PS/2 LAN adapter address
       bbb = AS/400 system name            ddd = PS/2 system name
```

Figure 47. Node Definitions File (.NDF) after Installation and Migration

PS/2-A: Edit the .NDF File

You must edit the node definition file (.NDF) to define CP-to-CP sessions with the AS/400 network node. Follow these steps while referring to the numbers in Figure 47 on page 137:

1. Start an edit session of the .NDF file.
2. At (2a), change the CP_NAME from CP000002 to bbb (AS/400 CP name).
3. At (3), change the ADJACENT_NODE_TYPE from LEN to NN.
4. At (4), change the ACTIVATE_AT_STARTUP from NO to YES.
5. At (6), delete the entire DEFINE_PARTNER_LU_LOCATION definition for the network node server.
6. Save the changes to the .NDF file.

When you are done, the .NDF file should look like Figure 48 on page 139.

PS/2-A: Verify the Configuration

Use the Verify Configuration option of Networking Services/2. This will take the .NDF file as input, and create a new .CF2 configuration file which Networking Services/2 will use to communicate with the AS/400 network node.

AS/400: Configuration Changes

The configuration changes on the AS/400 are simple. Since the AS/400 was already a network node, and since it already had an APPC connection defined to PS/2-A, all that has to be done is upgrade this connection to include CP-to-CP sessions. This is done on the AS/400 by:

1. VRYCFG CFGOBJ(PS2A) CFGTYPE(*CTL) STATUS(*OFF)
2. CHGCTLAPPC CTLD(PS2A) CPSSN(*YES)
3. VRYCFG CFGOBJ(PS2A) CFGTYPE(*CTL) STATUS(*ON).

The important step above is number 2. It is this step that enables the AS/400 side of the CP-to-CP session to the PS/2 end node.

For the final mapping between the AS/400 network node and PS/2 end node configuration parameters, please see Figure 48 on page 139 (a parameter mapping diagram).

Final Configuration for Both PS/2-A and AS/400

Node Definition File (.NDF)

```
DEFINE_LOCAL_CP  FQ_CP_NAME(USIBMRA.ddd )
                 DESCRIPTION(Created by the migration utility on 02-12-91)
                 CP_ALIAS(PS2LUA  )
                 NAU_ADDRESS(INDEPENDENT_LU)
                 NODE_TYPE(EN)
                 NODE_ID(X'10020')
                 HOST_FP_SUPPORT(NO);

DEFINE_LOGICAL_LINK  LINK_NAME(LINK0001)
                     DESCRIPTION(Created by the migration utility)
|                    FQ_ADJACENT_CP_NAME(USIBMRA.bbb)
|                    ADJACENT_NODE_TYPE(NN)
                     DLC_NAME(IBMTRNET)
                     ADAPTER_NUMBER(0)
                     DESTINATION_ADDRESS(aaa)
|                    CP_CP_SESSION_SUPPORT(YES)
|                    ACTIVATE_AT_STARTUP(YES)
                     LIMITED_RESOURCE(USE_ADAPTER_DEFINITION)
                     LINK_STATION_ROLE(USE_ADAPTER_DEFINITION)
                     SOLICIT_SSCP_SESSION(NO)
                     EFFECTIVE_CAPACITY(USE_ADAPTER_DEFINITION)
                     COST_PER_CONNECT_TIME(USE_ADAPTER_DEFINITION)
                     COST_PER_BYTE(USE_ADAPTER_DEFINITION)
                     SECURITY(USE_ADAPTER_DEFINITION)
                     PROPAGATION_DELAY(USE_ADAPTER_DEFINITION)
                     USER_DEFINED_1(USE_ADAPTER_DEFINITION)
                     USER_DEFINED_2(USE_ADAPTER_DEFINITION)
                     USER_DEFINED_3(USE_ADAPTER_DEFINITION);

DEFINE_PARTNER_LU  FQ_PARTNER_LU_NAME(USIBMRA.bbb )
                   DESCRIPTION(Created by the migration utility)
                   PARTNER_LU_ALIAS(AS400)
                   MAX_MC_LL_SEND_SIZE(32767)
                   CONV_SECURITY_VERIFICATION(NO)
                   PARALLEL_SESSION_SUPPORT(YES);

DEFINE_MODE  MODE_NAME(QPCSUPP )
             DESCRIPTION(Created by the migration utility on 02-12-91)
             COS_NAME(#CONNECT)
             DEFAULT_RU_SIZE(NO)
             MAX_RU_SIZE_UPPER_BOUND(1920)
             RECEIVE_PACING_WINDOW(8)
             MAX_NEGOTIABLE_SESSION_LIMIT(32767)
             PLU_MODE_SESSION_LIMIT(8)
             MIN_CONWINNERS_SOURCE(4);

DEFINE_DEFAULTS  IMPLICIT_INBOUND_PLU_SUPPORT(YES)
                 DESCRIPTION(Created by the migration utility on 02-12-91)
                 DEFAULT_MODE_NAME(BLANK)
                 DEFAULT_LOCAL_LU_ALIAS(PS2LUA  )
                 MAX_MC_LL_SEND_SIZE(32767)
                 DIRECTORY_FOR_INBOUND_ATTACHES(*)
                 DEFAULT_TP_OPERATION(NONQUEUED_AM_STARTED)
                 DEFAULT_TP_PROGRAM_TYPE(BACKGROUND)
                 DEFAULT_TP_CONV_SECURITY_RQD(NO)
                 MAX_HELD_ALERTS(10);

CNOS  LOCAL_LU_ALIAS(PS2LUA  )
      FQ_PARTNER_LU_NAME(USIBMRA.bbb )
      MODE_NAME(QPCSUPP )
      SET_NEGOTIABLE(NO)
      PLU_MODE_SESSION_LIMIT(8)
      MIN_CONWINNERS_SOURCE(4)
      MIN_CONWINNERS_TARGET(4)
      AUTO_ACTIVATE(0);
```

AS/400

```
Network Attributes:
  LCLNETID(USIBMRA)
  LCLCPNAME(bbb)
  LCLLOCNAME(bbb)
  NODETYPE(*NETNODE)

TRN Line:
  LIND(L31TR)
  RSCRCNAME(LIN031)
  ADPTADR(aaa)

APPC Controller:
  CTLD(PS2A)
  LINKTYPE(*TRLAN)
  APPN(*YES)
  SWTLINLST(L31TR)
  RMTNETID(USIBMRA)
  RMTCPNAME(ddd)
  ADPTADR(ccc)
  CPSSN(*YES)
  NODETYPE(*ENDNODE)

APPC Device:
  LCLLOCNAME(bbb)
  RMTNETID(USIBMRA)
  APPN(*YES)
  MODE(QPCSUPP)

Automatically Created

Mode Description:
  MODD(QPCSUPP)
  COS(#CONNECT)

Created for PC Support
```

```
Where: aaa = AS/400 LAN adapter address    ccc = PS/2 LAN adapter address
       bbb = AS/400 system name            ddd = PS/2 system name
and  : |   = on the left margin, indicates this item was changed.
```

Figure 48. Final PS/2 .NDF and AS/400 Object Configuration Parameter Mapping

11.3 NS/2 Network Node Connection to AS/400 Network Node - with PC Support

This scenario will describe a much more complex network involving Networking Services/2 on the PS/2 and APPC/APPN on the AS/400. Depicted in Figure 49 is a common wide area network (WAN) problem. At one site, the customer has a token-ring LAN of PS/2s. At another remote site (possibly central to other PS/2 LANs) is the company's AS/400.

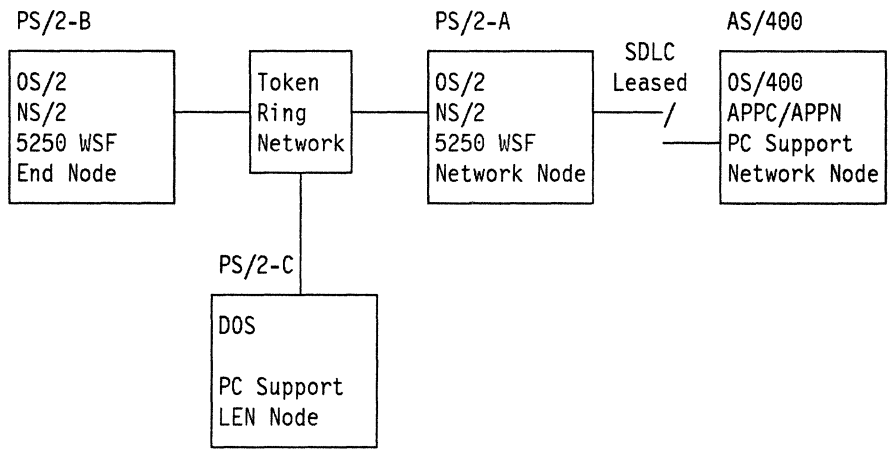


Figure 49. NS/2 NN Connection to AS/400 NN - with PC Support

In the past, this WAN problem was solved by LAN bridges. The problem with token-ring LAN bridges is that they are expensive, needing dedicated PS/2s on either end of the WANs to tie them together.

With Networking Services/2, one of the PS/2s on the token-ring LAN may be configured to be a network node, allowing it to route intermediate node session data from any LEN node or end node PS/2 to the remote AS/400 (and beyond, if the network grows to have more sites).

Other advantages of this network configuration:

1. PS/2s configured as end nodes in the LAN can receive routing directions directly from the local PS/2 network node, thereby avoiding costly traffic across the SDLC line each time a new local connection needs to be established.
2. Applications, such as PC Support, may easily connect to the remote AS/400, as well as any other AS/400 in the APPN network.
3. The PS/2 configured as the network node on the LAN may be used like any other PS/2 (PC Support, customer applications, etc.) and does not have to be dedicated to supporting the SDLC connection to the AS/400.
4. The LAN of PS/2s (PS/2s A, B and C) are protected from changes in the APPN network by directing all LU searches through the PS/2-A network node. That is, if changes are made to any location or availability of a remote LU, the PS/2-A network node will know of this change and act accordingly.

In this scenario, the first thing we will configure is the network node to network node relationship between PS/2-A and the AS/400. This connection will be over a leased SDLC line.

Next, we will include PS/2-B, the end node on the same token-ring LAN as the PS/2-A network node. PS/2-B will use PS/2-A as an intermediate node to establish a 5250 WSF session with the remote AS/400.

The final step will be to configure PS/2-C, which is running DOS 4.01 with the DOS version of PC Support. It too (like PS/2-B) will be using the PS/2-A NN as an intermediate node, routing session data through to the remote AS/400.

AS/400 and PS/2-A Network Node Final Configuration Parameter Mapping

Physical Connection between AS/400 and PS/2-A

The AS/400 and PS/2-A network nodes are connected by a single SDLC leased line.

For the AS/400, this SDLC leased line will be the only logical (and of course physical) link to PS/2-A and the rest of the PS/2s (B and C) on the token-ring LAN. The definition of this link is found in the SDLC line description LIND(SDLCLIN2). Many of the parameters found in SDLCLIN2 have a direct relationship with ones in the Communication Manager's DLC profile on PS/2-A. Please refer to Figure 50 on page 143 for a diagram of these relationships.

The ROLE is set to be *NEG (negotiable) on both the AS/400's LIND and CTLD as well as the link station role on PS/2-A. This allows the AS/400 and the PS/2-A to negotiate their link role to be either primary or secondary. In this setting it really does not matter which host is primary or secondary, and specifying *NEG allows the greatest flexibility.

The exchange identifier (EXCHID on the AS/400 and NODE_ID on the PS/2-A) need only be unique in the network.

CNN(*NONSWTPP), NRZI(*YES), MAXOUT(4) and DUPLEX(*FULL) need to be configured to match their associated parameters in the PS/2-A SDLC DLC profile.

Logical Link Definition between AS/400 and PS/2-A

The AS/400 uses the controller description to define each logical link to an adjacent link node. In this scenario, the AS/400 has only one adjacent link node (PS/2-A) and therefore, only one controller description: CTLD(SDLCCTL2). It is through SDLCCTL2 that all session data will flow across the logical link to PS/2-A (and beyond).

PS/2-A uses DEFINE_LOGICAL_LINK LINK_NAME(LINK0001) to define its logical link (via the SDLC line) to the remote AS/400 network node.

As sessions are established with remote LU partners (located on PS/2-A, PS/2-B and PS/2-C) the AS/400 will automatically create device descriptions: one for each remote LU. In this scenario, the AS/400 will create three DEVDs, all attached to CTLD(SDLCCTL2). The parameter RMTLOCNAME (found in the DEVD) will be automatically set to dddA, dddB, and dddC reflecting the remote LU names on systems PS/2-A, PS/2-B and PS/2-C, respectively. These three device descriptions will be attached to CTLD(SDLCCTL2) because they all use that logical link.

Pictorially, the relationship between the AS/400 communication objects will look like this if you use WRKCFGSTS *LIN SDLCLIN2 (knowing that the AS/400 will automatically create the device descriptions based upon the remote location name they represent):

```
SDLCLIN2 /*SDLC Line Description*/
    SDLCCTL2 /*APPC Controller Description*/
        dddA /*APPC Device Description for RMTLOCNAME(dddA)*/
        dddB /*APPC Device Description for RMTLOCNAME(dddB)*/
        dddC /*APPC Device Description for RMTLOCNAME(dddC)*/
```

5250 WSF Considerations between PS/2-A and the AS/400

The parameter mapping diagram found in Figure 50 on page 143 is complete to the point where one could establish sessions between the PS/2-A network node and the AS/400. The only thing missing from the diagram is the extra work involved configuring the 5250 WSF support.

For the AS/400, the system administrator must create a user profile and add a directory user to the system. This is done via the CRTUSRPRF and ADDDIRE commands on the AS/400.

On PS/2-A, you must ensure that the 5250 feature profile is configured with a session selection of:

- APPC PLU Alias...AS400
- APPC Mode Name...QPCSUPP

and you must start the 5250 WSF session while in Communications Manager.

PS/2-A Additional Logical Link Definitions

The network node PS/2-A has two additional logical links defined to the two other PS/2s on the token-ring LAN. Each of these logical links uses the IBMTRNET ADAPTER_NUMBER(0) for the physical connection to the adjacent nodes. This IBM TRN adapter must have been previously defined in the Communications Manager LAN adapter profile.

LINK0002 to PS/2-B: LINK0002 defines the logical link to PS/2-B, which is a PS/2 running:

- OS/2
- Networking Services/2 as an end node (with CP-to-CP sessions)
- Communications Manager's 5250 WSF.

The DESTINATION_ADDRESS(cccB) is the TRN address of PS/2-B.

The parameter CP_CP_SESSION_SUPPORT(YES) indicates that this logical link will establish a control point session with the remote link station.

LINK0003 to PS/2-C: LINK0003 defines the logical link to PS/2-C, which is a PS/2 running:

- DOS
- PC Support as a low entry networking (LEN) node.

The DESTINATION_ADDRESS(cccC) is the TRN address of PS/2-C.

The parameter CP_CP_SESSION_SUPPORT(NO) indicates that this logical link will not establish a control point session with the remote link station.

```
PS/2-A network node configuration                                AS/400

PS/2-A SDLC DLC Adapter Profile (CM):                            SDLC Line:
  Adapter number(0)                                                LIND(SDLCLIN2)
  Load DLC(Yes)                                                    RSCRCNAME(LIN061)
  Free unused link(No)                                             ROLE(*NEG)
                                                                   INTERFACE(*RS232V24)
  Maximum RU size(512)                                             CNN(*NONSWTPP)
  Send window count(4)                                             EXCHID(05600001)
  Receive window count(4)                                          NRZI(*YES)
                                                                   MAXFRAME(521)
  Line type(non-switched)                                          MAXOUT(4)
  Link station role(Negotiable)                                    DUPLEX(*FULL)
  Local station address(01)

  Line mode(Constant request to send)
  NRZI(Yes)

PS/2-A node definition file (.NDF)

DEFINE_LOCAL_CP  FQ_CP_NAME(USIBMRA.dddA)                        Network Attributes:
                 DESCRIPTION(PS/2-A Network Attributes)            LCLNETID(USIBMRA)
                 CP_ALIAS(PS2LUA  )                                LCLCPNAME(bbb)
                 NAU_ADDRESS(INDEPENDENT_LU)                       LCLLOCNAME(bbb)
                 NODE_TYPE(NN)                                     NODETYPE(*NETNODE)
                 NODE_ID(X'10020')
                 HOST_FP_SUPPORT(NO);

DEFINE_LOGICAL_LINK  LINK_NAME(LINK0001)                         APPC Controller:
                     DESCRIPTION(Logical link to AS/400)           CTLD(SDLCCTL2)
                     ADJACENT_NODE_TYPE(NN)                        LINKTYPE(*SDLC)
                     PREFERRED_NN_SERVER(NO)                       APPN(*YES)
                     DLC_NAME(SDLC    )                            LIND(SDLCLIN2)
                     ADAPTER_NUMBER(0)                             RMTNETID(USIBMRA)
                     CP_CP_SESSION_SUPPORT(YES)                    RMTCPNAME(dddA)
                     ACTIVATE_AT_STARTUP(YES);                     SWITCHED(*NO)
                                                                   CPSSN(*YES)
DEFINE_LOGICAL_LINK  LINK_NAME(LINK0002)                           NODETYPE(*NETNODE)
                     DESCRIPTION(logical link to PS/2-B EN)        ROLE(*NEG)
                     ADJACENT_NODE_TYPE(LEARN)                     MAXFRAME(521)
                     DLC_NAME(IBMTRNET)                            STNADR(01)
                     ADAPTER_NUMBER(0)
                     DESTINATION_ADDRESS(cccB)
                     CP_CP_SESSION_SUPPORT(YES)
                     ACTIVATE_AT_STARTUP(YES);                   APPC Device(s):
                                                                   The AS/400 will auto-
DEFINE_LOGICAL_LINK  LINK_NAME(LINK0003)                           matically create three
                     DESCRIPTION(logical link to PS/2-C LEN)       devices, one for each
                     FQ_ADJACENT_CP_NAME(USIBMRA.dddC)             remote LU as they
                     ADJACENT_NODE_TYPE(LEN)                       first attempt to
                     DLC_NAME(IBMTRNET)                            connect.  They will
                     ADAPTER_NUMBER(0)                             all be attached to the
                     DESTINATION_ADDRESS(cccC)                     CTLD(SDLCCTL2), since
                     CP_CP_SESSION_SUPPORT(NO)                     they use that logical
                     ACTIVATE_AT_STARTUP(NO);                      link to PS/2-A as the
                                                                   first hop.
DEFINE_PARTNER_LU  FQ_PARTNER_LU_NAME(USIBMRA.bbb )
                   DESCRIPTION(Define the Partner LU on the AS/400)
                   PARTNER_LU_ALIAS(AS400)
                   MAX_MC_LL_SEND_SIZE(32767)
                   CONV_SECURITY_VERIFICATION(NO)
                   PARALLEL_SESSION_SUPPORT(YES);

DEFINE_MODE  MODE_NAME(QPCSUPP )                                 Mode Description:
             DESCRIPTION(The PC Support mode)                      MODD(QPCSUPP)
             COS_NAME(#CONNECT)                                    COS(#CONNECT)
             DEFAULT_RU_SIZE(NO)
             MAX_RU_SIZE_UPPER_BOUND(1920)                       Created for PC Support
             RECEIVE_PACING_WINDOW(8)
             MAX_NEGOTIABLE_SESSION_LIMIT(32767)
             PLU_MODE_SESSION_LIMIT(8)
             MIN_CONWINNERS_SOURCE(4);

START_ATTACH_MANAGER;
```

```
Where: N/A = AS/400 LAN adapter addr   cccA = PS/2-A LAN adapter addr   cccB = PS/2-B LAN adapter addr   cccC = PS/2-C LAN adapter addr
       bbb = AS/400 system name        dddA = PS/2-A system name        dddB = PS/2-B system name        dddC = PS/2-C system name
```

Figure 50. AS/400 and PS/2-A NN Final Configuration Parameter Mapping

PS/2-B Final Configuration (OS/2 End Node)

Logical Link Definition between PS/2-B and PS/2-A

PS/2-B is configured to be an end node running with CP-to-CP sessions to its network node server PS/2-A. The DEFINE_LOGICAL_LINK LINK_NAME(LINK0001) on PS/2-B is used to carry all of the session traffic to PS/2-A.

5250 WSF Considerations between PS/2-B and the AS/400

The .NDF file found in Figure 51 on page 145 is complete to the point where one could establish sessions between the PS/2-B end node and the AS/400. The only thing missing from the diagram is the extra work involved in configuring 5250 WSF support.

For the AS/400, the system administrator must create a user profile and add a directory user to the system. This is done via the CRTUSRPRF and ADDDIRE commands on the AS/400.

On PS/2-B, you must ensure that there is a 5250 feature profile configured with a session selection of:

- APPC PLU Alias...AS400
- APPC Mode Name...QPCSUPP

and you must start the 5250 WSF session while in Communications Manager.

Please note - when PS/2-B attempts to establish the session to the AS/400, it uses its CP-to-CP session to the PS/2-A network node to locate the remote LU bbb (the AS/400). This is why you do not have to have any additional verbs in the .NDF file for PS/2-B to describe the location of the remote LU bbb. In fact, the AS/400 machine could be moved to another location in the WAN and the .NDF file for PS/2-B would not have to change, because PS/2-A would know of the move due to its role as a network node.

```
PS/2-B node definition file (.NDF)

DEFINE_LOCAL_CP  FQ_CP_NAME(USIBMRA.dddB )
                 DESCRIPTION(PS/2-B Network Attributes)
                 CP_ALIAS(PS2LUB  )
                 NAU_ADDRESS(INDEPENDENT_LU)
                 NODE_TYPE(EN)
                 NODE_ID(X'10014')
                 HOST_FP_SUPPORT(NO);

DEFINE_LOGICAL_LINK  LINK_NAME(LINK0001)
                     DESCRIPTION(Logical Link to PS/2-A NN)
                     FQ_ADJACENT_CP_NAME(USIBMRA.dddA )
                     ADJACENT_NODE_TYPE(NN)
                     DLC_NAME(IBMTRNET)
                     ADAPTER_NUMBER(0)
                     DESTINATION_ADDRESS(cccA)
                     CP_CP_SESSION_SUPPORT(YES)
                     ACTIVATE_AT_STARTUP(YES);

DEFINE_PARTNER_LU  FQ_PARTNER_LU_NAME(USIBMRA.bbb )
                   DESCRIPTION(Define Partner LU to the remote AS/400)
                   PARTNER_LU_ALIAS(AS400)
                   MAX_MC_LL_SEND_SIZE(32767)
                   CONV_SECURITY_VERIFICATION(NO)
                   PARALLEL_SESSION_SUPPORT(YES);

DEFINE_MODE  MODE_NAME(QPCSUPP )
             DESCRIPTION(The PC Support Mode)
             COS_NAME(#CONNECT)
             DEFAULT_RU_SIZE(NO)
             MAX_RU_SIZE_UPPER_BOUND(1920)
             RECEIVE_PACING_WINDOW(8)
             MAX_NEGOTIABLE_SESSION_LIMIT(32767)
             PLU_MODE_SESSION_LIMIT(8)
             MIN_CONWINNERS_SOURCE(4);

DEFINE_DEFAULTS  IMPLICIT_INBOUND_PLU_SUPPORT(YES)
                 DESCRIPTION(Created by the migration utility on 02-14-91)
                 DEFAULT_MODE_NAME(BLANK)
                 DEFAULT_LOCAL_LU_ALIAS(PS2LUB  )
                 MAX_MC_LL_SEND_SIZE(32767)
                 DIRECTORY_FOR_INBOUND_ATTACHES(*)
                 DEFAULT_TP_OPERATION(NONQUEUED_AM_STARTED)
                 DEFAULT_TP_PROGRAM_TYPE(BACKGROUND)
                 DEFAULT_TP_CONV_SECURITY_RQD(NO)
                 MAX_HELD_ALERTS(10);

Where: N/A = AS/400 LAN adapter addr   cccA = PS/2-A LAN adapter addr   cccB = PS/2-B LAN adapter addr   cccC = PS/2-C LAN adapter addr
       bbb = AS/400 system name        dddA = PS/2-A system name        dddB = PS/2-B system name        dddC = PS/2-C system name
```

Figure 51. PS/2-B EN Final Network Definition File

PS/2-C Final Configuration (DOS) CONFIG.PCS File

The configuration for the DOS version of PC Support for PS/2-C is fairly straight forward. This section will not cover all of the steps to do this, it will only cover the areas which may be confusing and/or problematic.

PS/2-C will behave much like PS/2-B, in that both will be using PS/2-A as a network node server (for directory services) and as an intermediate node for sessions to the AS/400. So, the configuration for PS/2-A must do some of the same things, namely, identify PS/2-A as the network node and request that a session be established with the remote LU bbb (the AS/400).

Final CONFIG.PCS File for PS/2-C

In figure Figure 52 on page 146 below is the final CONFIG.PCS (PC Support configuration file) for PS/2-C. It is this file which defines the physical TRN addresses and the names of LUs that will be used to establish sessions with the AS/400 through PS/2-A. For each four letter identifier in the file we have provided a description:

Identifier	Description
SFLR	This identifier starts a shared folder session with system bbb (which is the remote AS/400).
RTLN	This identifier defines the fully-qualified CP name for PS/2-C. No configuration is necessary on the AS/400 to map to this name. This is because PS/2-A will dynamically inform the AS/400 of its existence.
TRLI	This identifier defines the logical link to the PS/2-A network node server; cccA is PS/2-A's LAN adapter address, and dddA is PS/2-A's CP name. All requests to bind a session with a remote LU will first be sent to this node.
ADRS	This identifier is used to attach our local PS/2-C through an intermediate system (PS/2-A) to the AS/400. The first parameter (bbb) is the system name of the AS/400. The second parameter (dddA) is the PS/2-A system name. Note - since we are using names in the ADRS identifier, the actual location of these machines could change, but this configuration file need not, because APPN will dynamically update the PS/2-A network node with the proper information.
RTYP	This identifier merely identifies that a TRN LAN router will be used.

```
SFLR 1,I,QIWSFLR,bbb
RTLN USIBMRA.dddC
TRLI dddA,cccA
ADRS bbb,dddA
RTYP ITRN
```

```
Where: N/A = AS/400 LAN adapter addr   cccA = PS/2-A LAN adapter addr   cccC = PS/2-C LAN adapter addr
       bbb = AS/400 system name        dddA = PS/2-A system name        dddC = PS/2-C system name
```

Figure 52. PS/2-C LEN (DOS) CONFIG.PCS File

5250 Session Manager Profile

One of the problems with the above configuration for PS/2-C is that the 5250 session manager will use remote system name dddA (which is the PS/2-A) as the default when attempting to establish a session. The correct remote system name should be bbb (the AS/400). This happens because system dddA (the PS/2-A) is defined to be the remote system for the logical link in the TRLI statement.

The solution to this problem is to change the 5250 WSF session profile so that it does not use the default, but rather, uses bbb (the AS/400 system name).

To do this you must use the CFGWSF command to change or create a session profile. The important parameter to define in the session profile is the General Session Option:

```
System name. . . . . . . . . . . bbb
```

Make sure you save the session and master profiles to disk, and that the STARTPCS.BAT file has been updated to look for the new session and master profiles.

Please see the *AS/400 PC Support : OS/2 Operations Reference (SC21-8198)* for more information on how to create or change session and master profiles for the 5250 session support.

11.4 NS/2 Network Node Connection to AS/400 Network Node - via Subarea Network

This scenario is similar to the one in section 11.3, "NS/2 Network Node Connection to AS/400 Network Node - with PC Support" on page 140. The difference is that instead of a direct SDLC connection between the LAN of PS/2s and the AS/400, we have put in its place a subarea network. All session traffic between the PS/2s and the AS/400 will be routed through the subarea.

In addition to the LU-to-LU traffic being routed through the subarea, the final step in this configuration will configure the AS/400 as an alert focal point (FP) for all of the PS/2s. This alert data will be routed (just like the other session traffic) through the subarea network. The AS/400 will also be configured to forward all alerts to the S/370 host NetView product.

Please refer to Figure 53 for a diagram of this network.

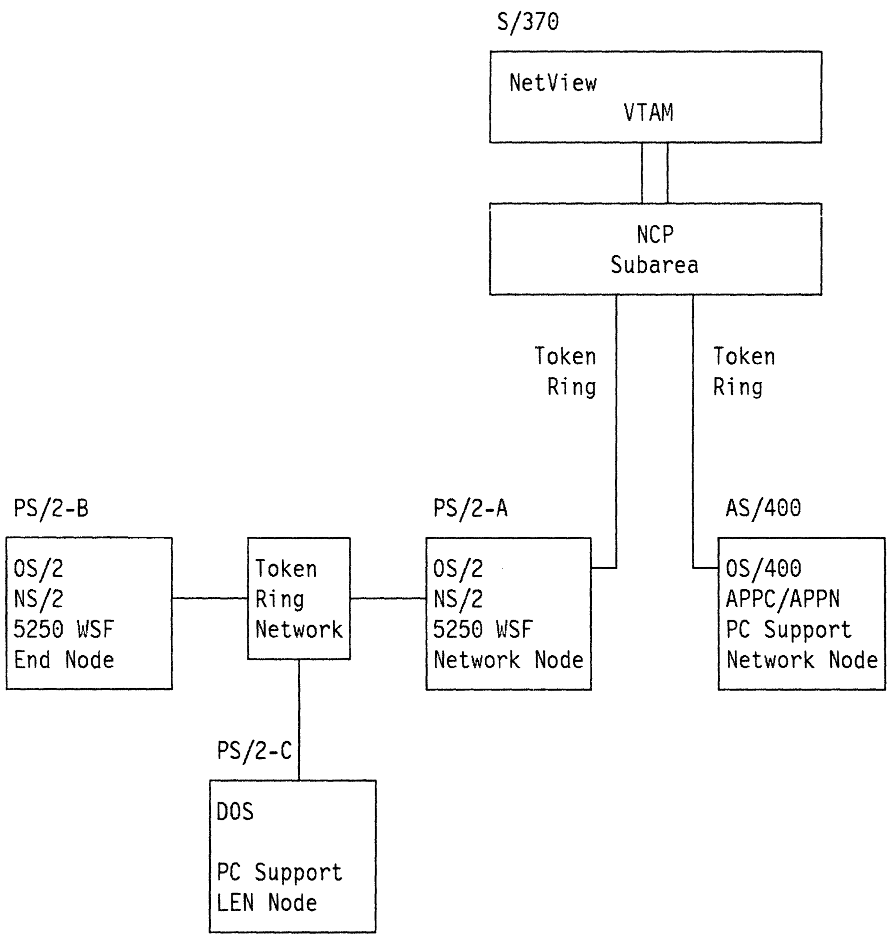


Figure 53. NS/2 NN Connection to AS/400 NN - via Sub-Area Network

This scenario will:

1. Show the special configuration needed to connect two network nodes (one PS/2 and the other AS/400) across a subarea network.
2. Demonstrate the ease in which changes can be made to an APPN network by showing that the configurations of both PS/2-B and PS/2-C do not change from Figure 49 on page 140 and Figure 53 on page 147.
3. Demonstrate alert processing in a distributed network. This will make use of Networking Services/2 Management Service's ability to collect local alerts and forward then onto a focal point. It will also make use of the AS/400's ability to collect those alerts across a subarea network and forward them to NetView.

PS/2-A Final Configuration, with Logical_Link to Subarea

PS/2-A does not have to change much to move from the example in section 11.3, "NS/2 Network Node Connection to AS/400 Network Node - with PC Support" on page 140 to the one here, which includes a subarea network between it and the remote AS/400. Only two things have to change in PS/2-A's .NDF file. One is the DEFINE_LOGICAL_LINK verb, and the other is the addition of a DEFINE_PARTNER_LU_LOCATION verb to define the path to all of the remote LUs.

The DEFINE_LOGICAL_LINK verb has to change because now PS/2-A has to route all of its session data through the subarea network on the way to the AS/400. To define this link to an adjacent node Networking Services/2 uses the DEFINE_LOGICAL_LINK verb.

Please refer to Figure 54 on page 149 for the final .NDF file of PS/2-A. Note - numbers inside of small boxes have been added to the figure as an aid for references in the discussion below:

1. The LINK_NAME(LINK0001) was kept the same as the previous scenario. It should be made clear, however, that this logical link definition is to the adjacent subarea node, not the AS/400.
2. The FQ_ADJACENT_CP_NAME(USIBMRA.yyy) is the fully-qualified SSCP name of the host system. The syntax of the fully-qualified CP name is (<network ID>.<CP name>). Please note that the fully-qualified CP name used here is the same one that has all of the unknown remote LUs routed to it based upon the DEFINE_PARTNER_LU_LOCATION verb mentioned in (6).
3. The adjacent node is of type LEN. This is because the host system does not support CP-to-CP sessions. And it is because of this lack of CP-to-CP sessions that forces PS/2-A (and the AS/400 as you will see later) to define the path to all of the remote LUs (see (6) below). In effect, PS/2-A views the subarea LEN node to be the location of the remote LUs.
4. The DESTINATION_ADDRESS(xxx) is the token-ring LAN adapter address of the subarea node.
5. As was stated above, there are no CP-to-CP sessions between PS/2-A and the host system. This is a limitation of the host.
6. The DEFINE_PARTNER_LU_LOCATION verb is used to define the path to remote LUs that cannot automatically be discovered via APPN. Because there are no CP-to-CP sessions with the host system, our PS/2-A network node cannot find the remote LU named bbb (the AS/400 system name).

   This verb (used as a WILDCARD) tells Networking Services/2 to route all unknown LU searches to the fully-qualified system USIBMRA.yyy, which is the host computer with its subarea network. PS/2-A will assume that the LU is located either at that node, or that the subarea network will route data to the AS/400.

```
              PS/2-A Node Definition File (.NDF)

  DEFINE_LOCAL_CP  FQ_CP_NAME(USIBMRA.dddA )
                   DESCRIPTION(PS/2 Network Attributes)
                   CP_ALIAS(PS2LUA  )
                   NAU_ADDRESS(INDEPENDENT_LU)
                   NODE_TYPE(NN)
                   NODE_ID(X'10020');

| DEFINE_LOGICAL_LINK  LINK_NAME(LINK0001)                 1
|                      DESCRIPTION(logical link to VTAM subarea)
|                      FQ_ADJACENT_CP_NAME(USIBMRA.yyy )       2
|                      ADJACENT_NODE_TYPE(LEN)
|                      PREFERRED_NN_SERVER(NO)               3
|                      DLC_NAME(IBMTRNET)
|                      ADAPTER_NUMBER(0)                 4
|                      DESTINATION_ADDRESS(xxx)
|                      CP_CP_SESSION_SUPPORT(NO)               5
|                      ACTIVATE_AT_STARTUP(YES);

  DEFINE_LOGICAL_LINK  LINK_NAME(LINK0002)
                       DESCRIPTION(logical link definition to PS/2-B EN)
                       ADJACENT_NODE_TYPE(LEARN)
                       DLC_NAME(IBMTRNET)
                       ADAPTER_NUMBER(0)
                       DESTINATION_ADDRESS(cccB)
                       CP_CP_SESSION_SUPPORT(YES)
                       ACTIVATE_AT_STARTUP(YES);

  DEFINE_LOGICAL_LINK  LINK_NAME(LINK0003)
                       DESCRIPTION(logical link definition for PS/2-C LEN)
                       FQ_ADJACENT_CP_NAME(USIBMRA.dddC)
                       ADJACENT_NODE_TYPE(LEN)
                       DLC_NAME(IBMTRNET)
                       ADAPTER_NUMBER(0)
                       DESTINATION_ADDRESS(cccC)
                       CP_CP_SESSION_SUPPORT(NO)
                       ACTIVATE_AT_STARTUP(NO);

  DEFINE_PARTNER_LU  FQ_PARTNER_LU_NAME(USIBMRA.bbb )
                     DESCRIPTION(Created by the migration utility)
                     PARTNER_LU_ALIAS(AS400)
                     MAX_MC_LL_SEND_SIZE(32767)
                     CONV_SECURITY_VERIFICATION(NO)
                     PARALLEL_SESSION_SUPPORT(YES);

| DEFINE_PARTNER_LU_LOCATION   WILDCARD_ENTRY(FULL)          6
|                              FQ_OWNING_CP_NAME(USIBMRA.yyy)
|                              LOCAL_NODE_NN_SERVER(YES);

  DEFINE_MODE  MODE_NAME(QPCSUPP )
               DESCRIPTION(Created by the migration utility)
               COS_NAME(#CONNECT)
               DEFAULT_RU_SIZE(NO)
               MAX_RU_SIZE_UPPER_BOUND(1920)
               RECEIVE_PACING_WINDOW(8)
               MAX_NEGOTIABLE_SESSION_LIMIT(32767)
               PLU_MODE_SESSION_LIMIT(8)
               MIN_CONWINNERS_SOURCE(4);

  DEFINE_DEFAULTS  IMPLICIT_INBOUND_PLU_SUPPORT(YES)
                   DESCRIPTION(Created by the migration utility)
                   DEFAULT_MODE_NAME(BLANK)
                   DEFAULT_LOCAL_LU_ALIAS(PS2LUA  )
                   MAX_MC_LL_SEND_SIZE(32767)
                   DIRECTORY_FOR_INBOUND_ATTACHES(*)
                   DEFAULT_TP_OPERATION(NONQUEUED_AM_STARTED)
                   DEFAULT_TP_PROGRAM_TYPE(BACKGROUND)
                   DEFAULT_TP_CONV_SECURITY_RQD(NO)
                   MAX_HELD_ALERTS(10);

  START_ATTACH_MANAGER;
```

```
Where: xxx = VTAM LAN adapter addr    cccA = PS/2-A LAN adapter addr   cccB = PS/2-B LAN adapter addr   cccC = PS/2-C LAN adapter addr
       yyy = VTAM system name         dddA = PS/2-A system name        dddB = PS/2-B system name        dddC = PS/2-C system name
and  : |   = on the left margin, indicates this item was changed from Figure 50 on page 143.
```

Figure 54. PS/2-A NN Final Network Definition File, with Logical_Link to Subarea

PS/2-B Final Configuration - No Changes

The final configuration for PS/2-B does not change from the previous scenario (see section 11.3, "NS/2 Network Node Connection to AS/400 Network Node - with PC Support" on page 140). This is due to the fact that PS/2-B was configured to rely on PS/2-A's network node abilities to provide directory support, route selection, and perform as an intermediate node to the sessions between PS/2-B and the AS/400. This demonstrates the adaptability of an APPN network.

For a description of the network definition file (.NDF) for PS/2-B please see Figure 51 on page 145.

PS/2-C Final Configuration - No Changes

The final configuration for PS/2-C also did not change from the previous scenario. Please see "PS/2-B Final Configuration - No Changes." for the reasons why.

For a description of the CONFIG.SYS file for PS/2-C please see Figure 52 on page 146.

VTAM Final Configuration

The host computer in this scenario must define the locations of all the remote LUs. In this example, this is done with two switched major node definition files.

One is for the AS/400. The switched major node definition file for the AS/400 can be found in Figure 55 on page 151.

The other is for the remote LUs reached through PS/2-A. Since PS/2-A is a network node (that can do intermediate routing), the VTAM definition file simply thinks that all of the LUs dddA, dddB, and dddC are located at the adjacent node. It is PS/2-A that takes care of routing data destined for a particular LU to the proper system. Please take a look at the switched major node definition file for PS/2-A Figure 56 on page 151.

When you have VTAM V3R4 installed, definitions for the session originator will be created dynamically. Therefore, for 5250 WSF you would not need to define the LUs in the workstations, but only the LU in the AS/400.

```
**********************************************************************
*                                                                    *
*               AS/400 IN A TOKEN-RING NETWORK                       *
*                                                                    *
**********************************************************************
SWAS400B VBUILD MAXGRP=5,             REQUIRED                       X00010480
              MAXNO=12,               REQUIRED                       X00010490
              TYPE=SWNET              REQUIRED                        00010500
**
*--------------PU AND LU'S DEFINITION FOR AS/400 SYSTEM      9404----
**
T13P9404 PU   ADDR=01,                COULD BE ANYTHING (NOT USED)   X00010540
              MAXDATA=265,            AS/400 SYSTEM                  X00010550
              CPNAME=bbb,             AS/400    CP NAME              X00010550
              DISCNT=NO,                                             X00010570
              MAXOUT=7,                                              X00010580
              MAXPATH=2,                                             X00010590
              PACING=(7,1),                                          X00010610
              VPACING=8,                                             X00010610
              PUTYPE=2,                                              X00010620
              PASSLIM=7,                                             X
              ISTATUS=ACTIVE
**                                                                    00010640
TR13A40A PATH DIALNO=0004aaa,          TO AS/400 9404  (SMALL)       X00010830
              GRPNM=EG13L01,           FROM TIC 2                    X00010840
              GID=1,                                                 X00010850
              PID=2,                                                 X00010860
              USE=YES                  INITIALY ACTIVE
**
*-----------------Define AS/400 LUs----------------------------------
bbb      LU   LOCADDR=0,MODETAB=MTGS3X,DLOGMOD=QPCSUPP,ISTATUS=ACTIVE
*
```

```
Where: aaa = AS/400 LAN adapter addr   cccA = PS/2-A LAN adapter addr   cccB = PS/2-B LAN adapter addr   cccC = PS/2-C LAN adapter addr
       bbb = AS/400 system name        dddA = PS/2-A system name        dddB = PS/2-B system name        dddC = PS/2-C system name
```

Figure 55. VTAM Switched Major Node Definition File for the AS/400

```
**********************************************************************
*                                                                    *
*             PS/2 NN   IN A TOKEN-RING NETWORK  WITH BACKBONE SNA   *
*                                                                    *
**********************************************************************
SWASPS2 VBUILD MAXGRP=5,              REQUIRED                       X00010480
              MAXNO=12,               REQUIRED                       X00010490
              TYPE=SWNET              REQUIRED                        00010500
**
*--------------PU AND LU'S DEFINITION FOR PS/2-A NN SYSTEM        ----
**
SWASPS2A PU   ADDR=01,                COULD BE ANYTHING (NOT USED)   X00010540
              MAXDATA=265,            PS/2-A SYSTEM                  X00010550
              CPNAME=dddA,            PS/2-A    ID BLOCK NUMBER      X00010550
              DISCNT=NO,                                             X00010570
              MAXOUT=7,                                              X00010580
              MAXPATH=2,                                             X00010590
              PACING=(7,1),                                          X00010610
              VPACING=8,                                             X00010610
              PUTYPE=2,                                              X00010620
              PASSLIM=7,                                             X
              ISTATUS=ACTIVE
**                                                                    00010640
SWAPS2P  PATH DIALNO=0004cccA,         TO PS/2 NN                    X00010830
              GRPNM=EG13L01,           FROM TIC 2                    X00010840
              GID=1,                                                 X00010850
              PID=2,                                                 X00010860
              USE=YES                  INITIALLY ACTIVE
**
dddA     LU  LOCADDR=0,MODETAB=MTGS3X,DLOGMOD=QPCSUPP,ISTATUS=ACTIVE
dddB     LU  LOCADDR=0,MODETAB=MTGS3X,DLOGMOD=QPCSUPP,ISTATUS=ACTIVE
dddC     LU  LOCADDR=0,MODETAB=MTGS3X,DLOGMOD=QPCSUPP,ISTATUS=ACTIVE
*
**
```

```
Where: aaa = AS/400 LAN adapter addr   cccA = PS/2-A LAN adapter addr   cccB = PS/2-B LAN adapter addr   cccC = PS/2-C LAN adapter addr
       bbb = AS/400 system name        dddA = PS/2-A system name        dddB = PS/2-B system name        dddC = PS/2-C system name
```

Figure 56. VTAM Switched Major Node Definition File for PS/2-A

AS/400 Final Configuration

In Figure 59 on page 154 you will see the final AS/400 configuration objects necessary to participate as a network node in this scenario. One of the things that has changed in this scenario is the AS/400's host controller description.

Another is that if any program must originate a session from the AS/400 to one of the remote PS/2s, we must define how to get to those remote locations via the AS/400's APPN remote location lists.

AS/400 Controller Description

The AS/400 controller description is the AS/400's definition of an adjacent link station. In this case, the adjacent link station is the host system. In this APPN network, the AS/400 views the subarea as a LEN node, because there are no CP-to-CP sessions between them.

Please see Figure 59 on page 154 for a description of the AS/400 controller description and all the other relevant AS/400 configuration objects.

APPN Remote Location Lists

Because the AS/400 does not have CP-to-CP sessions with any other system, there is no way for the AS/400 to search the network to determine where remote LUs are located. Very much like the DEFINE_PARTNER_LU_LOCATION that had to be added in PS/2-A's .NDF file, so must we add APPN remote location lists to the AS/400 for the remote LUs found in our LAN of PS/2s (dddA, dddB, and dddC).

If you have never created an APPN configuration list, you must use the CRTCFGL command:

```
CRTCFGL TYPE(*APPNRMT) TEXT('Remote configuration list for PS/2-A, PS/2-B, and PS/2-C')
           APPNRMTE((dddA USIBMRA bbb yyy USIBMRA)
                    (dddB USIBMRA bbb yyy USIBMRA)
                    (dddC USIBMRA bbb yyy USIBMRA))
```

```
Where: aaa  = AS/400 LAN adapter addr    cccA = PS/2-A LAN adapter addr
       bbb  = AS/400 system name         dddA = PS/2-A system name
       xxx  = VTAM LAN adapter addr      cccB = PS/2-B LAN adapter addr
       yyy  = VTAM system name           dddB = PS/2-B system name
                                         cccC = PS/2-C LAN adapter addr
                                         dddC = PS/2-C system name
```

Figure 57. Create Configuration List CL Example

The steps outlined above will give you the following remote configuration list (QAPPNRMT):

```
                         Display APPN Remote Locations

Configuration list . . . . . . . :   QAPPNRMT

Remote         Remote         Local          Control        Control
Location       Network        Location       Point          Point        Secure
Name           ID             Name           Name           Net ID        Loc
dddA           USIBMRA        bbb            yyy            USIBMRA       *NO
dddB           USIBMRA        bbb            yyy            USIBMRA       *NO
dddC           USIBMRA        bbb            yyy            USIBMRA       *NO











                                                                           Bottom
Press Enter to continue.

F3=Exit   F11=Additional information   F12=Cancel
```

Figure 58. DSPCFGL CFGL(QAPPNRMT) - Display Configuration List for QAPPNRMT

Automatic Creation of APPC Device Descriptions

The AS/400 will still automatically create the APPC device descriptions for the three remote PS/2s (PS/2-A, PS/2-B and PS/2-C). This will occur the first time the remote PS/2s attempt to connect to the AS/400.

AS/400 Final Configuration Objects

```
Network Attributes:
  LCLNETID(USIBMRA)
  LCLCPNAME(bbb)
  LCLLOCNAME(bbb)
  NODETYPE(*NETNODE)

TRN Line:
  LIND(L31TR)
  RSCRCNAME(LIN031)
  ADPTADR(aaa)
  EXCHID(05615533)

Host Controller:
  CTLD(L31CTLTR)
  LINKTYPE(*TRLAN)
  APPN(*YES)
  SWTLINLST(L31TR)
  RMTNETID(USIBMRA)
  RMTCPNAME(yyy)
  CPSSN(*NO)
  NODETYPE(*LENNODE)
  SSCPID(050000000014)
  ADPTADR(xxx)

APPC Device(s):
  The AS/400 will auto-
  matically create three
  devices, one for each
  remote LU as they
  first attempt to
  connect.  They will
  all be attached to the
  CTLD(L31CTLTR), since
  they use that logical
  link to the Host as
  the first hop.

Mode Description:
  MODD(QPCSUPP)
  COS(#CONNECT)

Created for PC Support
```

```
Where: aaa = AS/400 LAN adapter addr   xxx = VTAM LAN adapter addr
       bbb = AS/400 system name        yyy = VTAM system name
```

Figure 59. AS/400 Final Configuration to the Host VTAM Subarea

Alert Processing on PS/2, AS/400 and NetView

The last thing we are going to do in our APPN network is to establish an alert processing design which includes the entire PS/2 LAN, the AS/400, and the host system.

In general, all alerts generated from the LAN of PS/2s will be forwarded to the AS/400 on the other side of the subarea network. This will allow the AS/400 operator to filter the alerts, before they are sent up to the host system and NetView.

By having a somewhat complex arrangement for the flow of alerts we demonstrate how alerts from Networking Services/2 can be directed through a subarea network (or any APPN network that can route LU sessions) to a remote system (like the AS/400) that can act as an alert focal point.

Alert Processing on the PS/2 LAN

Since PS/2-B and PS/2-C both use PS/2-A to do intermediate node routing on the way to the AS/400, we will use PS/2-A's network management to send an alert to the AS/400. Failures in either PS/2-B or PS/2-A will be seen in PS/2-A and should be reported to the AS/400 administrator.

Because of our simplistic view of the PS/2 LAN (all sessions are routed through PS/2-A), all we have to do to receive alerts from PS/2-A is to define in the AS/400 that our sphere of control (SOC) includes PS/2-A. This discussion is left to the next section.

Alert Processing in the AS/400

The AS/400 is in the center of this alert processing design. Because of this, we must do two things to enable the alert management desired. The first is to enable the AS/400 to generate and forward alerts up to the host system; and the second is to define the AS/400's sphere of control (SOC) to include PS/2-A.

Enable Alert Processing on the AS/400: To enable alert processing on the AS/400 one must make changes to the network attributes. Look to Figure 60 for an example of the CL command to make these changes.

The most important parameter on the CHGNETA command is ALRCTLD(L31CTLTR). This parameter indicates that all alerts that the AS/400 receives will be forwarded to the host system via controller description L31CTLTR on the CP-SSCP flow.

Note - Networking Services/2 also has the ability to forward alerts to the host system via a CP-SSCP flow for end nodes in its domain when it is boundary-attached to the subarea. We do not show this in this scenario, however.

```
CHGNETA ALRSTS(*ON) ALRPRIFP(*YES) ALRDFTFP(*NO) ALRLOGSYS(*ALL)
        ALRCTLD(L31CTLTR) ALRHLDCNT(0)
```

Figure 60. Change Network Attributes Command on the AS/400 to Enable Alerts

Define the AS/400 SOC: We must define the AS/400 SOC to include PS/2-A. This is because we need the AS/400 to send an MS Capabilities message to PS/2-A. The MS Capabilities message will tell the PS/2 that the AS/400 is its focal point for alerts. This is done via the WRKSOC command on the AS/400.

The MS Capabilities message is sent to a remote LU name. This is one of the reasons we had to define PS/2-A's remote LU name in the AS/400 APPN remote location list.

Please note - the sending of the MS Capabilities message is not automatic. The system administrator must define the remote location to be in the SOC of the AS/400 to send the MS Capabilities. For this to be successful, the remote location must be up and running. So, before you continue with this section, please ensure that PS/2-A is up and running in order to receive and respond to the MS Capabilities message.

Also note - if the remote system defined in the AS/400's SOC is taken down, and then back up again, it is the responsibility of the system operator to delete and recreate the SOC for that remote system, via the WRKSOC command.

Add PS/2-A's CP Name to the AS/400's SOC via WRKSOC Command: The following screens show the steps necessary to add PS/2-A to the SOC of the AS/400. It is when the "Current Status" of the SOC entry becomes "Add pending" that the AS/400 will send the MS Capabilities message to the remote PS/2. Please see Figure 64 on page 157.

```
                          Command Entry                          bbb
                                                  Request level:   5
 Previous commands and messages:

   (No previous commands or messages)









                                                              Bottom
 Type command, press Enter.
 ===> wrksoc



 F3=Exit   F4=Prompt   F9=Retrieve   F10=Include detailed messages
 F11=Display full      F12=Cancel    F13=User support   F16=System main menu
```

Figure 61. WRKSOC - Work with Sphere of Control

```
                   Work with Sphere of Control (SOC)
                                                    System:   bbb
 Position to . . . . . . . .   _______  Control Point
   Network ID . . . . . . . .    _______

 Type options, press Enter.
   4=Remove


     Control
 Opt  Point     Network ID  Current Status

   (No entries in sphere of control)








                                                              Bottom
 F3=Exit   F5=Refresh           F6=Add entries   F9=Display SOC status
 F11=Display new focal points   F12=Cancel
```

Figure 62. Add PS/2-A's LU Location to the AS/400 SOC (Add Entry)

```
                    Add Sphere of Control Entries
                                                      System:   bbb
Type Network ID and Control point names to add, press Enter.

Control
Point         Network ID
dddA           USIBMRA
________       *NETATR
________       *NETATR
________       *NETATR
________       *NETATR
________       *NETATR
________       *NETATR
________       *NETATR
________       *NETATR
________       *NETATR
________       *NETATR
________       *NETATR
________       *NETATR
________       *NETATR
________       *NETATR
                                                            More...
F3=Exit   F5=Refresh   F12=Cancel
```

Figure 63. Add PS/2-A's CP Name dddA and Network ID USIBMRA to SOC (Enter)

```
                  Work with Sphere of Control (SOC)
                                                      System:   bbb
Position to . . . . . . . .   ________  Control Point
  Network ID . . . . . . . .   ________

Type options, press Enter.
  4=Remove


     Control
Opt  Point      Network ID  Current Status
 _   dddA        USIBMRA     Add pending









                                                             Bottom
F3=Exit   F5=Refresh          F6=Add entries   F9=Display SOC status
F11=Display new focal points   F12=Cancel
1 entries added to sphere of control. 0 entries not added.
```

Figure 64. USIBMRA.dddA Has Been Added to AS/400 SOC - Add Pending MS Capabilities

Incorrect Current Status of Inactive - Session Down: After the AS/400 has properly added the remote PS/2-A to its SOC we typed an F5=Refresh. To our surprise, the "Current Status" for our new USIBMRA.dddA SOC entry went to "Inactive - session down", even though we confirmed that the AS/400 was properly receiving and forwarding all alerts from PS/2-A.

The reason for this misleading "Current Status" is due to the fact that the adjacent link station, through which this alert session is being routed, does not have any CP-to-CP sessions. The connection to the host system only has an SSCP-to-CP session. And it is due to this lack of CP-to-CP sessions that the AS/400 thinks the alert session is down.

We have included this screen (Figure 65) to warn you of the misleading "Current Status" of "Inactive - session down".

```
                         Work with Sphere of Control (SOC)
                                                              System:   bbb
Position to . . . . . . . .   _______   Control Point
  Network ID . . . . . . . .    _______

Type options, press Enter.
  4=Remove


     Control
Opt  Point     Network ID  Current Status
 _   dddA       USIBMRA     Inactive - session down









                                                                        Bottom
F3=Exit   F5=Refresh          F6=Add entries   F9=Display SOC status
F11=Display new focal points   F12=Cancel
```

Figure 65. Inactive - Session Down: Due to Lack of CP-to-CP Session with Host System

Deleting a SOC Entry: To delete a SOC entry, simply enter a *4* in the "Opt" column and press Enter. This will terminate the AS/400's SOC over the remote PS/2, and allow you to create a SOC entry later.

```
                        Work with Sphere of Control (SOC)
                                                          System:   bbb
Position to . . . . . . . .   _______   Control Point
  Network ID . . . . . . . .   _______

Type options, press Enter.
  4=Remove


     Control
Opt  Point     Network ID  Current Status
 4   dddA       USIBMRA








                                                                 Bottom
F3=Exit   F5=Refresh          F6=Add entries   F9=Display SOC status
F11=Display new focal points   F12=Cancel
```

Figure 66. Remove the SOC Entry

```
                   Confirm Remove of Sphere of Control Entries
                                                          System:   bbb
Press Enter to confirm your choices for 4=Remove.
Press F12 to return to change your choices.


     Control
Opt  Point     Network ID  Current Status
 4   dddA       USIBMRA












                                                                 Bottom
F11=Display new focal points   F12=Cancel
```

Figure 67. Removing SOC Entry Confirmation

Alert Processing in the Host System

The host system is the final focal point for all alerts in our network. For information on the NetView definitions necessary for managing an APPN network see *Management of AS/400 in SNA Subarea Network using NetView Products*.

Chapter 12. Performance Study

12.1 Introduction

This chapter is provided as an aid in understanding how APPC transaction programs (TPs) perform in the new Networking Services/2 environment relative to the previously announced APPC support included under OS/2 EE 1.2 Communications Manager.

Representative benchmark TPs are used to measure performance. By utilizing these benchmark results, you can estimate performance improvements in your application.

12.2 Methodology

Over the years, a series of APPC performance benchmarks evolved that provide a standard method to measure the performance of various APPC implementations. Further, these benchmarks provide a method by which we can compare the performance of different releases of the same APPC implementations. By measuring the performance of these typical application TPs, we can accurately gauge Networking Services/2 performance improvements from an end-user perspective.

The following APPC performance benchmarks were used in the study:

- Credit check transaction
- Inquiry transaction
- Database update transaction
- Pipeline transaction
- File transfer transaction.

See "Benchmark Descriptions" on page 173 for details concerning these benchmarks.

A sizable number of TPs were written for the OS/2 EE 1.1 Communications Manager and OS/2 EE 1.2 Communications Manager APPC APIs. Many of these TPs will be migrated to execute under Networking Services/2. Consequently, APPC performance benchmark TPs written for the OS/2 EE 1.1 Communications Manager and OS/2 EE 1.2 Communications Manager APPC APIs were executed on both OS/2 EE 1.2 Communications Manager and Networking Services/2 in order to measure performance improvements in the underlying Networking Services/2 software.

In addition, many newly written transaction programs will likely utilize Networking Services/2's CPI-C interface. CPI-C APPC performance benchmarks were measured to understand how the additional Networking Services/2 CPI-C software layer (on top of APPC) impacts application TP performance. However, we cannot directly compare the CPI-C benchmark results with the previously described benchmarks executed on the Networking Services/2 APPC implementation because of an important operational restriction for CPI-C: each CPI-C conversation is uniquely associated with an OS/2 process. In order to avoid timing the overhead of starting and terminating an OS/2 process with each benchmark iteration, each CPI-C benchmark TP was coded as a long running transaction. In other words, CPI-C benchmark timings do not include the overhead of allocating and de-allocating each conversation. In order to gauge the impact of the CPI-C benchmark performance results, OS/2 EE 1.2 Communications Manager long running performance benchmark TPs were executed. The difference in performance between the CPI-C and OS/2 EE 1.2 Communications Manager long running benchmarks will provide the CPI-C software layer degradation. The OS/2 EE 1.2 Communications Manager long running performance benchmark TPs are simply referred to as the "long" benchmark TPs in the rest of this chapter; whereby the long running CPI-C benchmark TPs are simply referred to as the "CPI-C" benchmark TPs.

Finally, Networking Services/2 introduced the network node (NN) variable into the performance equation. Network nodes provide the capability to route sessions through themselves without being a session end-point. This capability is known as intermediate session routing (ISR). The APPC performance benchmarks were executed on a two node Networking Services/2 configuration, and then retested after introducing a Networking Services/2 intermediate network node into the configuration. The degradation between the two node and three node performance results indicates the delay introduced by a Networking Services/2 NN providing ISR.

12.3 Benchmark Performance Results

This section provides the raw performance data gathered from executing the APPC performance benchmarks. Results are broken down into two sets of data for comparison purposes:

- OS/2 EE 1.1 Communications Manager and OS/2 EE 1.2 Communications Manager APPC performance benchmarks: This data allows us to calculate the performance gains for TPs migrated from OS/2 EE 1.1 Communications Manager to OS/2 EE 1.2 Communications Manager to Networking Services/2.
- Long and CPI-C APPC performance benchmarks: This data allows us to analyze the performance impact of the Networking Services/2 CPI-C software layer.

OS/2 EE 1.1 Communications Manager and OS/2 EE 1.2 Communications Manager APPC Benchmark Performance Results

The various OS/2 EE 1.1 Communications Manager and OS/2 EE 1.2 Communications Manager performance benchmark TPs are listed down the left column of each table. The row of data to the right of each benchmark indicates its performance executing on different APPC implementations and node configurations.

The first two columns of data to the right of each benchmark indicate performance results from the base OS/2 EE 1.2 Communications Manager APPC implementation. The next two columns of data give performance results for each benchmark executed on OS/2 EE 1.2 Communications Manager with Networking Services/2 installed. The final two columns of data provide the benchmark performance results from execution on a three node Networking Services/2 configuration.

A pair of performance results are provided for each execution of each benchmark TP:

1. Average number of the times the benchmark TP executed per second
2. Average duration of each benchmark TP

See "Measurement Configuration" on page 171 for details concerning the test configurations.

Table 2. 4Mbps APPC Benchmark Performance Results

Benchmark TP	Base 1.2 2 Node Config		NS/2 2 Node Config		NS/2 3 Node Config	
	TPs/Sec	Secs	TPs/Sec	Secs	TPs/Sec	Secs
1.1 Credit Check	17	0.0579	65	0.0152	47	0.0209
1.1 Inquiry	15	0.0632	56	0.0178	42	0.0235
1.1 Update	10	0.0923	35	0.0284	24	0.0402
1.1 Pipeline	60	0.0166	125	0.0080	120	0.0083
1.1 File Xfer (16K)	8	0.1116	18	0.0531	13	0.0762
1.1 File Xfer (100K)	1	0.5562	4	0.2330	3	0.3200
1.2 Credit Check	17	0.0563	71	0.0139	50	0.0198
1.2 Inquiry	16	0.0591	66	0.0150	47	0.0209
1.2 Update	11	0.0860	40	0.0244	27	0.0367
1.2 Pipeline	65	0.0153	138	0.0072	136	0.0073
1.2 File Xfer (16K)	9	0.1053	19	0.0520	13	0.0742
1.2 File Xfer (100K)	1	0.5247	4	0.2330	3	0.3300

Table 3. 16Mbps APPC Benchmark Performance Results

Benchmark TP	Base 1.2 2 Node Config		NS/2 2 Node Config		NS/2 3 Node Config	
	TPs/Sec	Secs	TPs/Sec	Secs	TPs/Sec	Secs
1.1 Credit Check	17	0.0580	67	0.0149	49	0.0201
1.1 Inquiry	15	0.0629	57	0.0174	45	0.0222
1.1 Update	10	0.0922	36	0.0276	26	0.0384
1.1 Pipeline	60	0.0165	125	0.0080	120	0.0083
1.1 File Xfer (16K)	9	0.1043	22	0.0442	14	0.0671
1.1 File Xfer (100K)	1	0.5247	6	0.1590	3	0.2570
1.2 Credit Check	17	0.0562	73	0.0136	52	0.0191
1.2 Inquiry	16	0.0590	68	0.0146	50	0.0200
1.2 Update	11	0.0860	42	0.0238	28	0.0346
1.2 Pipeline	65	0.0153	138	0.0072	136	0.0073
1.2 File Xfer (16K)	10	0.0994	23	0.0431	15	0.0666
1.2 File Xfer (100K)	2	0.4950	6	0.1590	3	0.2570

Long and CPI-C APPC Benchmark Performance Results

The various long and CPI-C performance benchmark TPs are listed down the left column of each table. The row of data to the right of each benchmark indicates its performance executing on different node configurations.

The first two columns of data to the right of each benchmark indicate results for each benchmark executed on a two node Networking Services/2 configuration. The final two columns of data provide the benchmark performance results from execution on a three node Networking Services/2 configuration.

A pair of performance results are provided for each execution of each benchmark TP:

1. Average number of the times the benchmark TP executed per second
2. Average duration of each benchmark TP.

See "Measurement Configuration" on page 171 for details concerning the test configurations.

Table 4. 4Mbps APPC Benchmark Performance Results				
Benchmark TP	**NS/2** **2 Node Config**		**NS/2** **3 Node Config**	
	TPs/Sec	Secs	TPs/Sec	Secs
Long Credit Check	107	0.0093	64	0.0156
Long Inquiry	93	0.0107	59	0.0167
Long Update	50	0.0200	31	0.0321
Long Pipeline	357	0.0028	357	0.0028
Long File Xfer (16K)	20	0.0493	13	0.0729
Long File Xfer (100K)	4	0.2330	3	0.3250
CPI-C Credit Check	102	0.0098	64	0.0156
CPI-C Inquiry	81	0.0122	55	0.0179
CPI-C Update	44	0.0223	29	0.0341
CPI-C Pipeline	357	0.0028	357	0.0028
CPI-C File Xfer (16K)	19	0.0501	13	0.0734
CPI-C File Xfer (100K)	4	0.2330	3	0.3310

Table 5. 16Mbps APPC Benchmark Performance Results				
Benchmark TP	**NS/2** **2 Node Config**		**NS/2** **3 Node Config**	
	TPs/Sec	Secs	TPs/Sec	Secs
Long Credit Check	111	0.0090	67	0.0148
Long Inquiry	98	0.0102	63	0.0157
Long Update	52	0.0192	32	0.0307
Long Pipeline	400	0.0025	357	0.0028
Long File Xfer (16K)	28	0.0353	16	0.0615
Long File Xfer (100K)	6	0.1550	3	0.2600
CPI-C Credit Check	105	0.0095	65	0.0152
CPI-C Inquiry	84	0.0119	58	0.0172
CPI-C Update	46	0.0217	30	0.0329
CPI-C Pipeline	370	0.0027	357	0.0028
CPI-C File Xfer (16K)	28	0.0355	16	0.0614
CPI-C File Xfer (100K)	6	0.1600	3	0.2580

12.4 Conclusions and Observations

There are five major components that effect overall benchmark TP performance. These five are:

- Main system processor
- Disk sub-system (controller, disk driver, and device drivers)
- Token-ring adapter cards (and device drivers)
- APPC communication software
- Benchmark TPs.

The key to understanding performance is to determine when one of these components is acting as a bottleneck for a given benchmark. It is important to understand that the bottleneck may change with differing benchmark TPs. Improving performance of only one component will not necessarily improve overall performance. This is especially true if the component being improved is not a limiting factor for a particular benchmark.

Before analyzing benchmark results, we need to recognize that the main system processor, disk sub-system, and token-ring adapter cards are constants in our performance equation. The token-ring device drivers, APPC software, and benchmark TPs are the variables.

Knowing the variable components, we can draw a number of conclusions from the benchmark TP results:

- The limiting component in the base OS/2 EE 1.2 Communications Manager APPC implementation was the APPC software. While varying the token-ring speed from 4 to 16Mbps, we achieved virtually no benchmark TP performance improvement even with throughput oriented benchmarks like file transfer, thereby eliminating the token-ring component as a bottleneck candidate. The benchmark TPs themselves can be eliminated because we know from Networking Services/2 benchmark tests that these TPs are capable of executing much quicker. This leaves APPC as our bottleneck.

  Further, TPs written to take advantage of the combined indicator and combined verb capabilities of OS/2 EE 1.2 Communications Manager gain little (roughly 0-10%) over those TPs written for OS/2 EE 1.1 Communications Manager when executed on the base OS/2 EE 1.2 Communications Manager.

- Networking Services/2 claims a times two (x2) performance improvement over OS/2 EE 1.2 Communications Manager when executing in a LAN-only environment. In reality, Networking Services/2 achieves roughly a x2 to x11 performance improvement.

  However, for the non-file transfer benchmarks executed on the Networking Services/2 APPC implementation, virtually no performance improvements are noted when varying the LAN speed from 4 to 16Mbps for the benchmarks. This could indicate that either the benchmark TPs or the APPC software are the performance bottleneck for the non-file transfer benchmarks on the Networking Services/2 APPC implementation, or that the major contributing factor in the performance was the latency or delay of the Token-Ring components. This latency changes little between 4Mbps and 16Mbps Token-Ring components.

  Conversely, the file transfer benchmarks executed on the 4Mbps LAN are partially bandwidth delimited in performance. When executed on the 16Mbps

LAN, these benchmarks provide a significant jump in performance. In particular, the 100KB file transfer benchmark executes in excess of 5Mbps on the 16Mbps LAN.

- As expected, the impact of an intermediate NN on performance is dependent on the line flows of the benchmark. For example, the Pipeline benchmark merely sends one packet of data from the client to the server without waiting for an acknowledgement. Consequently, the introduction of an intermediate NN has little effect on performance (under 5%).

  However, benchmarks that alternate line flows (Credit Check, Inquiry, and Update) suffer a greater performance degradation (roughly 20-40%). This degradation is attributable to the client having to wait for the intermediate NN to forward client requests to the server, and in turn, forward replies back to the client.

  While the file transfer benchmarks do not alternate line flows at the API-level, these benchmarks do require LAN-level acknowledgements of data receipt at the server. In addition, the file transfer benchmarks place a greater demand on the movement of data between the adapter and main memory. Consequently, file transfer performance is degraded even further on the 16Mbps LAN (roughly 30-45%). Because the 4Mbps LAN itself is the limiting factor for the file transfer benchmarks, performance is degraded less (roughly 25-35%).

  It should be noted that the only configuration parameters that made **any** significant difference in performance when going from a two node to a three node configuration were the Receive Window Count and Send Window Count parameters that are both specified in the IBM token-ring Network DLC Adapter Profile. These counts should never be set below 4 in order to achieve optimal results. See "IBM Token-Ring Network DLC Adapter Profile" on page 281 for details on this profile.

- The overhead in using the CPI-C API rather than the APPC API is under 15%. Short transactions in a two node configuration provide the most significant delays. When adding an intermediate NN to the configuration the overhead drops below 10%. This drop is attributable to the overall lengthening of the transaction time while keeping the CPI-C overhead constant.

  When transferring large amounts of data in any configuration, the CPI-C overhead drops below 5%. Again, this is attributable to the relatively small CPI-C overhead when compared to the overall duration of the transaction.

- After benchmark performance results were recorded, the same series of APPC performance benchmarks were re-run on each configuration in order to monitor CPU utilization. The table below reflects these observations:

Table 6. Workstation CPU Utilizations

Node	**Base 1.2**	**NN-NN**	**NN-NN-NN**
Client	65-75%	45-55%	35-45%
Server	70-75%	50-55%	40-45%
ISR	n/a	n/a	30-50%

This chart indicates that Networking Services/2 is consuming a significantly smaller slice of the available CPU cycles while at the same time achieving greater throughput. In other words, significantly more processing power is left for the application TPs under Networking Services/2 than under base OS/2 EE 1.2 Communications Manager.

- While testing the base OS/2 EE 1.2 Communications Manager APPC implementation and the two node Networking Services/2 APPC implementation, these observations were made:
  - The performance of all test TPs except the file transfer benchmark was not significantly impacted by **any** changes to the Networking Services/2 configuration (.NDF file) or the underlying Communications Manager configuration (.CFG file). This is due to the relatively small amount of data being exchanged by these benchmark TPs. Consequently, you should feel confident that these performance results will directly apply to your application regardless of the configuration specifics.
  - The performance of the file transfer benchmarks are significantly affected by the specifics of the underlying Communications Manager configuration file (.CFG). Again, this is due to the relatively large amount of data being exchanged by these benchmark TPs.

    The following configurable parameters play a significant role:

    Transmit buffer size This parameter should never be set less than 1KB. Note that at 1KB and above, Networking Services/2 surpasses NetBIOS performance on large data transfers.

    Number of transmit buffers Performance is greatly boosted when this parameter is set to 2.

    Receive buffer size This parameter should be set as small as possible. No significant performance reduction was noted due to the chaining of receive buffers by LAN device driver software.

    Maximum RU size No significant performance improvements were noted when this parameter was set above 2KB for 4Mbps LAN testing, or above 4KB for 16Mbps LAN testing that used the IBM token-ring 16/4 Adapter/A.

    Send window count This parameter should never be set less than 4. Settings above 4 show no significant performance improvements on traversing a bridge-less LAN. In general, overall performance improves when you maximize the window count when traversing LAN bridges. Conversely, when traversing WAN bridges (such as T1 links), the WAN bridge tends to congest when given large incoming frames with large receive windows. Weight these factors when determining your DLC window sizes.

    Receive window count Always set this parameter equal to the Send window count.

    All of these parameters are part of the token-ring adapter configuration under Communications Manager. See "IEEE 802.2 Token-Ring Profile" on page 279 and "IBM Token-Ring Network DLC Adapter Profile" on page 281 for details concerning the Communications Manager profiles.

    By default, no Networking Services/2 configurable parameter played a significant role in the performance of the file transfer benchmarks. In particular, the mode-level RU size and the session pacing windows are dynamically adapted to optimal settings when allowed to default.

However, the size of the data buffers used by the benchmarks TPs did significantly impact performance. The smaller the data buffers associated with the SEND_DATA or RECEIVE_AND_WAIT verbs, the more numerous the crossings of the APPC API. Design your application such that the data buffers are at least as large as the underlying RU sizes (2KB for the 4Mbps LAN, 4KB for the 16Mbps LAN).

Also, refer to the *IBM SAA Networking Services/2 APPC Programming Reference* for additional Networking Services/2 tuning recommendations.

12.5 Benchmark Performance Details

Measurement Configuration

This section details the configurations used for executing the APPC performance benchmarks.

Node Topology

The base OS/2 EE 1.2 Communications Manager and Networking Services/2 (NN-NN) benchmarks were run on the following configuration:

```
┌─────────┐                     ┌─────────┐
│ Mod 80  │   4/16Mbps T/R      │ Mod 80  │
│ 20 MHz  ├─────────────────────┤ 20 MHz  │
│  8 Meg  │                     │  8 Meg  │
└─────────┘                     └─────────┘
```

Figure 68. Two Node Benchmark Configuration

The Networking Services/2 (NN-NN-NN) benchmarks were run on the following configuration:

```
┌─────────┐                   ┌─────────┐                   ┌─────────┐
│ Mod 80  │ 4/16Mbps T/R #1   │ Mod 80  │ 4/16Mbps T/R #2   │   P70   │
│ 20 MHz  ├───────────────────┤ 20 MHz  ├───────────────────┤ 20 MHz  │
│  8 Meg  │                   │  8 Meg  │                   │  8 Meg  │
└─────────┘                   └─────────┘                   └─────────┘
```

Figure 69. Three Node Benchmark Configuration

Other Configuration Factors

A number of other performance factors were closely regulated in order to minimize the performance variables:

- Hardware
  - Private LANs were utilized for the testing. Other traffic on the LAN would have skewed the accuracy of our results.
  - No LAN bridges existed between the client and server nodes. Bridges would have added another hardware variable to our performance equation.
  - All LAN adapter cards were the IBM token-ring 16/4 Adapter/A (FRU 53F7748) cards configured for 32KB of shared memory. These cards were chosen to maximize performance.

    You should note that there are effects on performance due to using this adapter in systems with different processor speeds. The IBM token-ring 16/4 Adapter/A is a shared memory design. This design taps the processing power of the main system processor to move data, process network requests, and manage network message control blocks. Therefore, this adapter will appear to perform better when installed on a system with more main processor power. In such an environment, it is not the adapter that is providing improved performance. Rather, the improved performance is due to the main system processor.

- OS/2 EE Communications Manager
  - There was not any performance improvement when using OS/2 EE 1.3 Communications Manager instead of OS/2 EE 1.2 Communications Manager in execution of the APPC performance benchmarks. Therefore, OS/2 EE 1.2 Communications Manager was used as the foundation for providing test results.
  - The CONFIG.SYS file used for all base OS/2 EE 1.2 Communications Manager testing was the default as given by OS/2. The CONFIG.SYS file used for all Networking Services/2 testing was the default as given by OS/2 with Networking Services/2 installed.
  - In order to maximize the OS/2 time slice given to our benchmarks, we:
    - Minimized the number of processes executing in each node. To this end, CPU monitoring was performed on subsequent testing.
    - Executed the benchmarks from a full screen environment. By default, OS/2 gives an inordinate number of cycles to the currently "active" screen group. By executing the benchmarks from the active full screen, any cycle stealing by Presentation Manager (PM) was also minimized.
- Communications Manager and Networking Services/2 Configurations
  - See section D.1, "OS/2 EE 1.2 Communications Manager Configuration (.CFG)" on page 279 for Communications Manager configuration specifics. This configuration was chosen because it provides for a properly tuned Networking Services/2 node as given by the *IBM SAA Networking Services/2 APPC Programming Reference*.
  - See section D.2, "Networking Services/2 Configuration (.NDF)" on page 282 for Networking Services/2 configuration specifics. This configuration was chosen because it was the simplest that met our connectivity needs.
  - Nodes were configured as network nodes (NN) for Networking Services/2 testing. Configuring Networking Services/2 nodes as NNs instead of as end nodes (EN) is inconsequential as far as these performance benchmarks are concerned.
  - TPs were configured as **operator started** for base OS/2 EE 1.2 Communications Manager testing. TPs were configured as **operator pre-loaded** for Networking Services/2 testing. This approach was chosen to eliminate the server TP disk load time from measurement. This disk delay would have dominated the overall timing in each benchmark.

    In the real world, it is unreasonable to assume that all server TPs will be configured as operator pre-loaded. You can take a number of steps to minimize disk delay on the server:
    - Execute server TPs as background processes whenever possible. TPs requiring screen I/O are started and terminated much slower by OS/2 than those TPs that execute in the background.

Our benchmark TPs were executed from a full screen because we guaranteed that only one application TP in each node (i.e. one OS/2 process) would be active at a time. However, we observed that when the benchmark TPs were executed in parallel, the fastest performance times were achieved when the TPs were executed without a screen group.

- Install OS/2 EE 1.3. File load times are greatly improved over OS/2 EE 1.2.
- Install the High Performance File System (HPFS). The HPFS is a marked performance improvement over the more conventional File Allocation Table (FAT).
- Use the fastest available hardware. At present, that hardware is the Model 90 XP 486 and Model 95 XP 486 family of processors. In brief, these systems incorporate 25-33Mhz 80486 processor speeds with SCSI 320MB hard drives and disk caching algorithms that provide disk access delays that are an industry leader.

— For Networking Services/2 testing, the IBM-supplied mode #BATCH was used for the File Transfer and Pipeline benchmarks. All other benchmarks used the IBM-supplied mode #INTER. Under Networking Services/2, these modes optimally tune the RU size to accommodate the frame size configured for the link.

For base OS/2 EE 1.2 Communications Manager testing, modes were defined that matched the implicit Networking Services/2 mode definitions. See section D.1, "OS/2 EE 1.2 Communications Manager Configuration (.CFG)" on page 279 for details concerning these mode definitions.

- Benchmarks

— The following sequence was adhered to for our testing:

1. The communications manager for the client and server were started.
2. For Networking Services/2 testing, the links were explicitly activated and sessions were explicitly CNOSed up for both the #BATCH and #INTER modes. Links are implicitly established and sessions CNOSed up for base OS/2 EE 1.2 Communications Manager testing.
3. The server benchmark TPs were serially executed from a full screen.
4. The client benchmark TPs were serially executed from a full screen.
5. Client benchmark timings were used as our results.

— A verb buffer size of 16KB bytes was used for the file transfer benchmark. All others tests used a verb buffer size of 100 bytes. These verb buffer sizes were chosen because these settings minimized the number of APPC API crossings.

Benchmark Descriptions

This section provides brief descriptions and flow diagrams for benchmarks used in this performance study.

Credit Check Transaction (Confirmed Delivery)

The Credit Check transaction is typically used when a client program must request permission to perform a specified function. It is used in situations when the probability that the server will grant permission is much larger than the probability that the server will not grant permission.

This transaction differs from the Inquiry transaction in that no data is returned by the server; the server simply returns an acknowledgement that the data sent by the client program was successfully received and processed.

This transaction is also used when a client program needs to send information to the server, and needs a guarantee that the information has been successfully received and processed. That is why it is called the "Confirmed Delivery" transaction.

The following diagram illustrates the data flows for the Credit Check transaction.

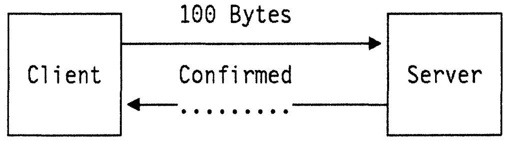


Figure 70. Data Flows for the Credit Check Transaction

The Inquiry Transaction (Request and Reply)

The Inquiry transaction is typically used to request information from a server program. This transaction is also known as "Request and Reply," because the entire conversation is made up of one request and one reply. A client sends a request to a server which obtains the answer and replies.

The following diagram illustrates the data flows for the Inquiry transaction.

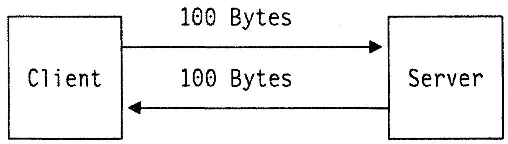


Figure 71. Data Flows for the Inquiry Transaction

The Database Update Transaction (Conversational Reply)

The Database Update transaction is typically used to update information managed by a partner program. It is used in database applications where a client program requests information from the database server, updates the information, and returns the update to the server to be set into the database.

This transaction is really an Inquiry transaction followed by a Credit Check transaction performed on the same conversation. It shows the transfer of responsibility between the client and the server. A single conversation is used to control the scope of recovery.

This same transaction may be used when a client requests information from a server and the server, in turn, requests information (usually for accounting or auditing purposes) from the client. In this case, the server appends the new request to the reply sent to the original request and the result is returned in a another record. In this environment, this transaction is called a "Conversational Reply" because the reply solicits an additional reply from the originator.

The following diagram illustrates the data flows for the Database Update transaction.

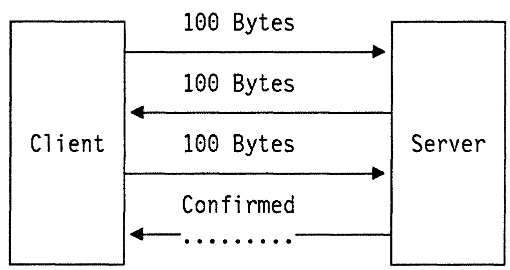


Figure 72. Data Flows for the Database Update Transaction

The Pipeline Transaction (One Way Bracket)

This transaction is generally used to send a message to which a reply is not expected. The client sends a chunk of data and then leaves. There is no positive acknowledgement of the data. Importantly, if the application does include a reply (for instance, at a later time), the programs must correlate their requests and replies across conversations, because there is no indication at the client that the server completely processed the incoming record, or even received the record. It may be used where the application complexity and APPC resource trade-off is made in a way to minimize the APPC resources. Your throughput requirements may be too high to have a separate session for every partner.

The following diagram illustrates the data flows for the Pipeline transaction.

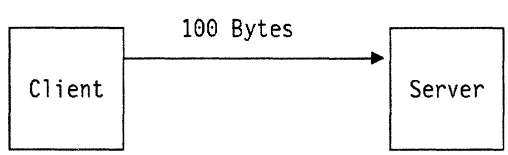


Figure 73. Data Flows for the Pipeline Transaction

The File Transfer Transaction (Batch Send)

This transaction is an extended version of the Credit Check transaction.

The File Transfer transaction is typically used to send relatively large amounts of data from one location to another. It is used in situations where several related data records need to be moved. It is also called the "Batch Send" transaction, because a batch of records is sent at the same time.

The following diagram illustrates the data flows for the File Transfer transaction using a 4Mbps LAN.

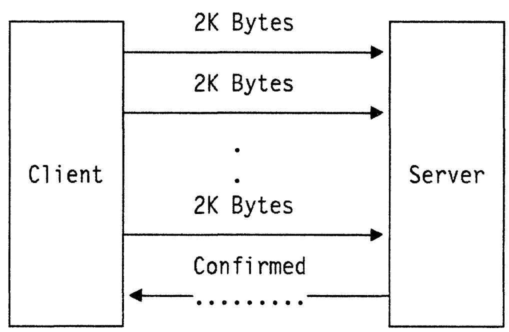


Figure 74. Data Flows for the File Transfer Transaction over a 4Mbps LAN. The total data transferred from the client to the server is 16KB or 100KB.

The following diagram illustrates the data flows for the File Transfer transaction using a 16Mbps LAN.

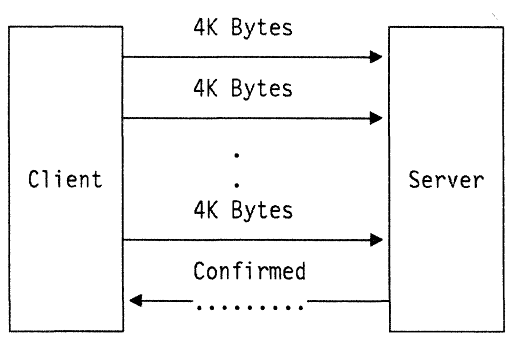


Figure 75. Data Flows for the File Transfer Transaction over a 16Mbps LAN. The total data transferred from the client to the server is 16KB or 100KB.

Chapter 13. Debugging

In this chapter we will discuss how to find out what went wrong in your network definitions.

First, we list some general considerations about the basic checks to do, and then we will consider the tracing facilities. The last section of this chapter indicates the information IBM service will need if you are going to report the problem.

13.1 Hints and Tips

The following paragraphs list some checks that you should do if you get in trouble. These checks should be done before using the tracing facilities whenever possible:

Adapter

- The largest frame size that can be used by an IBM token-ring adapter is set by configuring the adapter: if you do not want the default you must boot the reference diskette and change the configuration to map all of its RAM memory. This will allow you to use the largest size in the IEEE 802.2 profile.

Address

- Verify the addresses that are being used. For instance, if you are using a token-ring LAN, look at the C:\CMLIB\ACSLAN.LOG, to check your address on the LAN. Are you defined to other nodes with this address?

Files

- Does the .CFG file that appears in your CONFIG.SYS match the one you are really using in Communications Manager (or at least, if you are on a token-ring LAN does this .CFG file contain the same adapter address in its IEEE 802.2 profile)?
- Do the .CFG and .NDF files have the same filename?
- Are you running the .CF2 that was built with the .NDF you intend to use?
- If you have built or modified your .NDF file through the Presentation Manager interface, check the result with an editor.

Node Definition File

- Each verb you put in your .NDF file has default values for its undefined parameters. These default values are written in the APPNV.CTL file (see *Appendix A, "File APPNV.CTL" on page 191*).
- There are default values for alias, LU, PLU, and mode.
- The complete explanations for every verb and parameter and their defaults are in the *Networking Services/2 System Management Programming Reference.*
- There are default transaction programs. If a TP name is not explicitly associated with an executable .EXE file, it is associated by default with an executable .EXE file whose filename is the TP name (see section 8.7, "Default TPs" on page 113).

- If you want to define a .CMD as a remotely startable transaction program, you must specify FILESPEC(C:\OS2\CMD.EXE) and PARMSTRING(/C filename.CMD parameters). This may be done from the Configuration Management window by selecting `Advanced SNA` and then `Transaction Programs`.
- The connection between a DEFINE_PARTNER_LU and a DEFINE_LOGICAL_LINK is accomplished with a CP name. The value you specify on the FQ_OWNING_CP_NAME parameter on a DEFINE_PARTNER_LU must match the value specified on the FQ_ADJACENT_CP_NAME parameter on the DEFINE_LOGICAL_LINK.

Cleaning the Node

- If you want to be sure that a network node only contains what you have defined in the .CF2 built with your .NDF, you must first stop Communications Manager and then erase the saved directory C:\CMLIB\APPN\APPCDS.DAT and restart Communications Manager. However, the node will still dynamically learn the topology from its neighbors.

Running

- Use the Display window to check the current configuration.
- Check the state of your links. Use the Configuration Management window and choose `APPN` and then `Subsystem Management` to activate or deactivate a link.
- The LU alias is used by the local program. Only the LU name gets sent in the bind. The same for situation applies for the PLU alias and name.
- CP name check is performed during the XID exchange whenever the ADJACENT_NODE_TYPE is **not** LEN.

Dynamic Updates

- When you modify the .NDF, you may have done modifications that cannot be used to update the current configuration when you run the verification with the update option or select `Update` on the Presentation Manager interface. To have such modifications take effect, stop and restart Communications Manager.
- No dynamic updates to your running configuration interfere with anything active in your configuration. In some cases the information affected by the dynamic update will be made pending the completion of a running TP or session. For example, when you change something for a mode, it creates a new mode definition. However this mode definition will not go into effect until all the sessions started under the old definition have been terminated.

Directory

- The LUs known in your workstation are shown in the directory (use the PMDSPLAY window).
- The directory database is saved on disk only in network nodes. It is saved every 20 updates to the directory cache. This frequency cannot be changed. It is also saved when you exit Communications Manager (exit immediately or exit when complete) and when you use the Desktop Manager shutdown facility. So, if you want to clear out the directory in a network node, erase it after you have taken down Communications Manager. The file where the directory is saved is C:\CMLIB\APPN\APPCDS.DAT.

Topology

- The topology information resides only in network nodes. It is never saved: When you power on a network node, it dynamically learns the topology from its neighbors.

Subarea

- If you go through a subarea network, **be especially careful if you use defaults in the APPN network**, and check that the subarea network knows:
  - The modes you use (you may use a special logon mode table as in Figure 35 on page 103)
  - The LUs which have sessions through the subarea network. For instance if you use APPCTELL.EXE, your local default LU must be defined in the subarea network.
- The network node that connects an APPN network to a subarea must have ADJACENT_NODE_TYPE(LEN) on the DEFINE_LOGICAL_LINK that goes to the subarea. If not, Networking Services/2 will perform CP name checking when it exchanges an XID and if the subarea does not send a matching CP name, your link will not activate. With ADJACENT_NODE_TYPE(LEN), CP name checking will be bypassed and you can use any CP name value to make the connection between the DEFINE_PARTNER_LU and the DEFINE_LOGICAL_LINK.
- If a node has a link to a subarea that will be used by 3270 emulation, the verification process overrides what is in the .NDF file and sets SOLICIT_SSCP_SESSION(YES).

Error Messages, APPC Return Codes and Sense Codes

- Use the Communications Manager messages. From the first screen of Communications Manager select:

  ```
  Message
     Display messages
  ```

  Put the cursor on the message number and press F1 to get a detailed explanation of the message. Do not forget to look at the preceding messages (press F7).
- The detailed trace file .DET contains the primary and secondary return codes of the APPC verbs, as well as the sense codes.
- Look for information in every node involved. You may have an error message in one node that says something which will make you misunderstand what is happening, while the messages in another node contain the answer to the problem.

  For example, we got an "unknown mode" on a requester and the error was on the server where the required file did not exist. In that case only the traces and messages on the server were useful.
- For more complete information on error return codes and sense codes refer to the *Problem Determination Guide for Networking Services/2*.

13.2 The Tracing Facilities

Networking Services/2 offers an easy way of using the Communications Manager tracing facilities. The trace can be controlled from:

- The Presentation Manager interface, in the Group - IBM SAA Networking Services/2 window
- An OS/2 Command Interpreter
- A batch .CMD file.

Two programs are provided: CMTRACE.EXE and FMTTRACE.EXE. Both are located in the C:\CMLIB\APPN\ directory.

The CM Trace Facility

The CMTrace command provides command line control over the Communications Manager trace functions. With CMTrace you can start and stop tracing of particular trace categories and copy a trace to a file.

Command line control of trace functions is much easier than wading through the panels. Also, with CMTrace, you can control the trace functions from a batch file. This is very useful for testing (see "Using a Batch Command File" on page 186).

The signification of the system event is often ignored. The following are most useful:

Event 1 : internal DLC interface
Event 2 : APPC verbs
Event 3 : internal APPC flows
Event 4 : APPC send and receive
Event 5 : XID flows
Event 12 : utility verbs such as error log entries.

Examples

Some examples should make the operation of CMTrace clear:

cmtrace start /api appc services

To start tracing the APPC and services APIs.

cmtrace start /data trnet

Starts tracing token-ring data. Other traces that were already active (for instance API traces) remain active.

cmtrace stop /data trnet /api services

Stops tracing the services API and token-ring data.

cmtrace stop

Stops all tracing.

cmtrace copy xyz.trc

Copies the trace to file "xyz.trc" in the current directory.

Summary

A summary of the CMTrace command syntax can be obtained by typing:

```
cmtrace ?
```

This summary is reproduced here:

```
CMTRACE - IBM Internal Use Only
  (C) Copyright IBM Corporation 1990.  All rights reserved.

Usage:

  CMTRACE AUTOSTART flags         Define autostart trace categories
  CMTRACE START     flags         Start one or more trace categories
  CMTRACE STOP      flags         Stop one or more trace categories
  CMTRACE COPY      flags file    Copy a trace to a file

The flags are:
   /api, followed by one or more (blank separated) of:
         ACDI, APPC, EHLLAPI, RUI, SERVICES, SLI, SRPI,
         SUBSYSM, X25, X25FRAME
   /data, followed by one or more (blank separated) of:
         DFT, ETHERAND, PCNET, SDLC, TRNET, TWINAXIAL, X25
   /event, followed by one or more (blank separated) numbers
         between 1 and 30
   /key, followed by a 1-8 character key
   /reset, resets the trace buffer. Previous trace records are lost
   /stdout, write the trace data to standard output
   /storage <n>, where <n> is number of 64KB segments for
         trace buffers
   /trunc <n>, where <n> length at which trace records are
         truncated

The flags that can be used with the various operations are:

   AUTOSTART /key, /api, /data, /event, /trunc, /storage
   START     /key, /api, /data, /event, /reset, /trunc, /storage
   STOP      /key, /api, /data, /event
   COPY      /key, /stdout

Case is immaterial in all flags and keywords.  Flags and
keywords may be abbreviated so long as they remain unique.
```

The AUTOSTART must be used when you want to trace what is happening during the Communications Manager initialization. There is something special about AUTOSTART: you cannot stop it with the CMTRACE STOP command. The only way to stop it is to go in the Communications Manager panels and to select:

```
Advanced
   Problem determination aids
      Trace services
         Auto-trace services...
            Disable auto-trace
```

In fact it is easier not to disable the auto-trace but to make it trace nothing! You do it by typing AUTOSTART without flags; the result is the same as when you really disable the auto-trace.

The Format CM Trace Facility

FmtTrace is an OS/2 program that formats an OS/2 Communications Manager trace file into human-readable form. It formats trace records for the APPC API, APPC send events, and DLC data.

Two forms of formatted output may be produced: a summary file in sequence diagram form with one line per trace event, and a detail file with one line per formatted field.

The FmtTrace Command

The FmtTrace command has the following form:

```
fmttrace /flags file
```

The optional "flags" control the FmtTrace output, and "file" identifies the trace input file.

Note: The "flags" must appear before the filename. They will be ignored if they follow the filename.

FmtTrace will give a summary of its command syntax if invoked as:

```
fmttrace ?
```

The summary is written to stdout and is longer than 24 lines. You may want to redirect it to a file or pipe it through "more" if your screen has only 24 lines. The summary is reproduced in "Summary" on page 184.

Flags

Flags are optional and must be preceded with a "/". Each flag can have its own "/", or the flags can be run together with a single leading "/". The FmtTrace defaults for the flags remain in effect until explicitly overridden in the command.

Output file type selection: FmtTrace can produce a summary output file and/or a detail output file. The following flags select the output file type:

/D Produce a detail output file
/d Don't produce a detail output file (default)
/S Produce a summary output file (default)
/s Don't produce a summary output file.

The defaults for these flags are "/S /d".

Output formatted event type selection: FmtTrace divides the formatted trace events into two types:

- APPC API
- DLC data, including XIDs (also called line flows).

The following flags select the trace event types that will be formatted:

/A Format the API trace (default)
/a Don't format the API trace
/F Format the line flow trace (default)
/f Don't format the line flow trace.

The defaults for these flags are "/A /F".

Selection of trace records based on ID: Most APPC verbs have associated transaction program and conversation IDs. DLC data has an associated LFSID in the TH. Trace records can be included or excluded from formatting, based on their ID. The following flags select the trace records to be formatted, based on ID:

/Txxxxxxxx Format the APPC API trace records with a TP ID matching xxxxxxxx(hex)
/txxxxxxxx Don't format the APPC API trace records with a TP ID matching xxxxxxxx(hex)
/Cxxxxxxxx Format the APPC API trace records with a conversation ID matching xxxxxxxx(hex)
/cxxxxxxxx Don't format the APPC API trace records with a conversation ID matching xxxxxxxx(hex)
/Lxxxxx Format the DLC data trace records with a send LFSID matching xxxxx(hex)
/lxxxxx Don't format the DLC data trace records with a send LFSID matching xxxxx(hex).

There are no defaults for these flags. By default records are formatted independent of their ID.

The flags "/T", "/C" and "/L" are called include flags. The flags "/t", "/c" and "/l" are called exclude flags. An include flag cannot be specified with its corresponding exclude flag. The flags are additive: "/Cxxxxxxxx /Cyyyyyyyy" includes verbs with a conversation of xxxxxxxx or yyyyyyyy.

Only the first four bytes of the TP ID are used for selection. Some verbs do not have a TP and/or conversation ID. The LFSID is defined to be (ODAI,DAF,OAF). Note that the include/exclude LFSID is specified for the send direction. In SNA, the OAF and DAF bytes are reversed in each data direction. XIDs and interprocess signals do not have IDs and cannot be subsetted.

Miscellaneous Flags

/H Use uppercase alphabetics in hex output: "0XBC2F"
/h Use lowercase alphabetics in hex output: "0xbc2f".

The defaults for these flags are "/h".

Input Trace File

The "file" parameter identifies the trace input file. It may optionally include drive, path, and extension information. If not specified, the drive and path default the current drive and path, and the extension defaults to ".trc". Wildcard characters cannot be used in the "file" parameter.

The input file drive/path/name are used as drive/path/name of the output file(s). The summary file has the extension .SUM and the detail file has the extension .DET.

A "file" parameter value of "/" is special and tells FmtTrace to get its trace input from stdin. In this case, the output files are fmttrace.sum" and fmttrace.det" in the current drive and directory.

Examples

Some examples should help in understanding the operation of FmtTrace:

fmttrace sample

Format "sample.trc" and produce a summary trace of the APPC API and DLC data in "sample.sum".

fmttrace /

Format the data read from stdin and produce a summary trace of the APPC API and DLC data in fmttrace.sum".

fmttrace /D c:\cmlib\sample.out

Format "c:\cmlib\sample.out" and produce a summary trace of the APPC API and DLC data in "c:\cmlib\sample.sum" and a detailed trace in "c:\cmlib\sample.det".

fmttrace /Ds sample

Format "sample.trc" and produce a detailed trace (only) of the APPC API and DLC data in "sample.det".

fmttrace /D /s sample

Same as above.

fmttrace /L00301 /T00008f1c sample

Format "sample.trc" and produce a summary trace (only) of the APPC API for the transaction program with ID 0x00008f1c and DLC data for the session with send LSFID 0x00301 in "sample.sum".

The recommended usage is:

```
fmttrace /D trace
```

Summary

A summary of the FmtTrace command syntax can be obtained by typing:

```
fmttrace ?
```

This summary is reproduced here:

```
FMTTRACE
(C) Copyright IBM Corporation 1990, 1991

fmttrace </flags> file
   where flags are:
      D(d) - produce (don't produce) a detail file
      S(s) - produce (don't produce) a summary file
      A(a) - format (don't format) the API trace
      P(p) - format (don't format) the CPI-C trace
      F(f) - format (don't format) the line flow trace
      R(r) - format (don't format) TestRTS
      T(t)xxxxxxxx - include (exclude) verbs with matching
      TP ID
      C(c)xxxxxxxx - include (exclude) verbs with matching
      conversation ID
      L(l)xxxxxxxx - include (exclude) flows with matching
      LFSID
      H(h) - use uppercase (lowercase) alphabetics in hex
      output
   the default flag setting is /SdAPFRh

file is the name of the input trace file.  The file extension
defaults to .trc.
If the D flag is specified, a file with the same name
and extension .det is produced.
If the S flag is specified, a file with the same name
and extension .sum is produced.
If the file is specified as '/', input is read from stdin
and the output files, if any, are fmttrace.det and fmttrace.sum
```

FmtTrace Input

The input file for FmtTrace is an OS/2 Communications Manager trace file. It can be created with the Communications Manager panels or with the CMTrace program. For convenience in using FmtTrace, it is recommended that the trace file have a file extension of .TRC.

FmtTrace can format trace records for the following trace types:

- APPC API
- DLC data
- APPC verbs
- APPC send and receive
- XID flow.

Records for all other trace types are ignored by FmtTrace.

FmtTrace Output

Only the sending of the interprocess signal is shown. FmtTrace recognizes all SC, DFC and NS RUs. In addition, for normal FM data, it recognizes LU 6.2 FMHs and some GDS variables.

FmtTrace treats each line flow trace record independently. In particular, it does not try to reassemble RUs that have been segmented or GDS variables that have been broken into separate RUs. What this means is that FmtTrace will try to format a line flow only if it represents the first segment in the first RU in a chain.

For example, if a long BIND RU is segmented into two line flows, FmtTrace will format the first segment, but it will know nothing (other than the contents of the TH) about the second segment.

Summary File

Since the summary file can be wide (> 80 columns), the first character of the summary file is 0x0f, to enable condensed printing on a ProPrinter.

The summary file contains one line per formatted trace record. The summary is in the form of a sequence diagram. Each line contains the line number of the input trace file, the IDs (TP/conversation ID for API, LFSID for DLC data), if any, for the trace record and an annotated arrow.

Right pointing arrows represent verb requests or sent line flows. Left pointing arrows represent verb replies or received line flows. Interprocess signals have no arrowheads.

The arrows are annotated with the verb or flow name. In the case of verbs, the verb name may be followed by additional parameters in parentheses. If a verb reply has a non-zero return code, the primary return code is shown in hex.

For verb requests and replies with a zero return code, the additional parameters are as follows:

Allocate(rq) Partner LU alias, mode name, TP name (truncated to eight characters, if necessary)

Confirm(reply) Rts (if request to send received)

Dealloc(rq) Type

PrepRcv(rq) Type, Locks

RcvAlloc(rq) TP name (truncated to eight characters, if necessary)

RcvAlloc(reply) LU alias, Partner LU alias, Mode name

RcvWait(rq) Fill, Max length

RcvWait(reply) Status received, Data received, Rts (if request to send received), Data length

RcvImmed Same as RcvWait

SendData(rq) Data length, Type

SendData(reply) Rts (if request to send received)

TpEnded(rq) Type

TpStrted(rq) LU alias, TP name (truncated to eight characters, if necessary).

Detail File

The detail file has one line per formatted field.

Using a Batch Command File

When you do debugging, it is often easier to use batch command files, rather than typing the same things repeatedly under the OS/2 Command Interpreter.

Here are two samples you can use to build your own batch files.

The first command file, TRC.CMD, starts the trace, while the second command file, FMT.CMD, stops the trace, copies it to a file and formats it.

The options that have been chosen are recommended.

TRC.CMD

```
CMTRACE START /reset
              /api     appc services
              /data    ibmtrnet
              /event   5 12
              /storage 3
```

This will trace XID flows (event 5) and the utility verbs (event 12).

The following program supposes that you have defined a directory named TRACES on your D: disk. This program takes the filename of the trace as a parameter and stores it with the detail and summary in D:\TRACES\.

FMT.CMD

```
d:
cd \traces
CMTRACE STOP
CMTRACE COPY %1.trc
FMTTRACE /D %1
```

Networking Services/2 provides two sample batch command files, APPNT.CMD and APPNF.CMD, located in C:\CMLIB\APPN\ subdirectory:

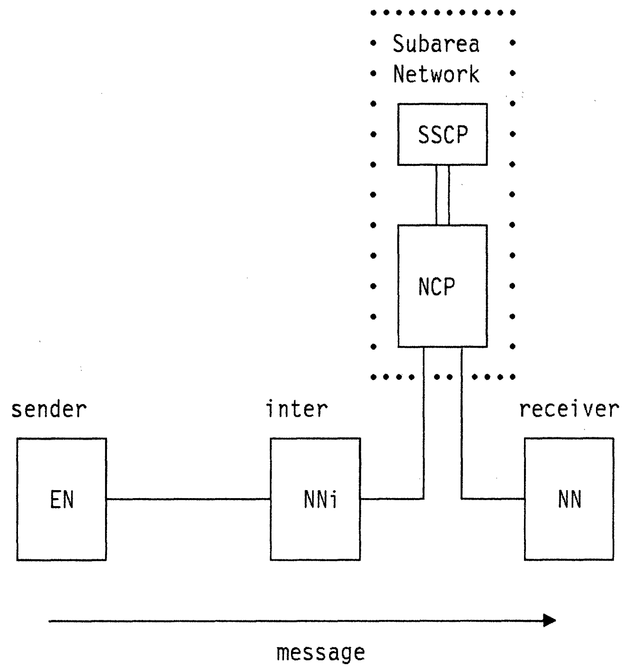
APPNT.CMD

```
CMTRACE START -reset -api appc services -data ibmtrnet -event 1 2 3 4 5 12
```

APPNF.CMD

```
CMTRACE STOP
CMTRACE COPY %1.trc
FMTTRACE -DS %1
```

Example of utilization: Here is an example of how to use these batch programs. We suppose you want to trace what happens when you send a message with APPCTELL.EXE from an end node EN to a network node NN through an intermediate network node NNi.



To take a trace on each machine, you must type the following commands without forgetting to respect the sequence:

EN	NNi	NN
TRC	TRC	TRC
APPCTELL NN message		
		press ENTER
FMT sender	FMT inter	FMT receiver

The traces you will get are:

- For EN1
  - sender.trc
  - sender.sum
  - sender.det
- For NN
  - inter.trc
  - inter.sum
  - inter.det
- For EN2
  - receiver.trc

- receiver.sum
- receiver.det.

You will find some of these traces in the appendix (Appendix C, "Traces" on page 259).

13.3 What Is Required to Report a Problem to IBM Service

If you can't determine the cause of a problem, the following documentation is required for problem analysis:

1. A description of the problem.
2. Message and error logs: a description of the messages that were present or missing). Copies of \CMLIB\MESSAGE.DAT, \CMLIB\ERROR.DAT, \CMLIB\yourconfig.CFG, \CMLIB\APPN\yourconfig.NDF are desirable. You will have to exit Communications Manager to make the copies.
3. The system level: the command `SYSLEVEL` tells the level and CSDs of OS/2 and Networking Services/2. Under the OS/2 Command Interpreter type: `SYSLEVEL > SYSLEVEL.DAT` to put this information in the file SYSLEVEL.DAT.
4. A trace taken when the problem occurred:
   a. Start tracing with the following command: `CMTRACE START /RESET /API appc services /DATA ibmtrnet /STORAGE 4 /EVENT 1 2 3 4 5 12`
   b. Recreate your problem
   c. Stop, copy and format the trace to a file :

```
CMTRACE STOP
CMTRACE COPY PROBLEM.TRC
FMTTRACE -DS PROBLEM
```

5. Contact IBM service.

Appendix A. File APPNV.CTL

This appendix contains the file APPNV.CTL which is located in the C:\CMLIB\APPN\ directory.

```
// This file serves two purposes. It gives a description of the node
// definitions file and the format of the commands that can be placed in this
// file. This file also defines the command, parameter, and value names
// that are allowed in the node definitions file, along with the delimiters
// used in the node definitions file to separate commands, parameters,
// values, and comments. You can customize the format of the commands and
// delimiters used in the node definitions file by changing the delimiters and
// keywords contained within this file (the configuration control file).
//
// As you may have already guessed, this file is a free-format (not column or
// line dependent) file. Comments are allowed in this file and the node
// definitions file by using the (//) delimiter to comment an entire line.
//
// The node definitions file also allows the (/* */) delimiters to comment
// a section of a line or extend a comment over several lines. For example:
//
// /* This is an allowed comment. When using (/*), all characters are ignored
//    until the matching end comment delimiter is given: */
//
// The (/* */) form of commenting lines is NOT supported within this file
// because it would limit the values you could specify when configuring your
// delimiter values (see below).
//
// WARNING: Comments are ignored when the node definitions file is parsed,
//          so any utilities that create or re-create the node definitions
//          file will erase all comments in the file. Use the DESCRIPTION
//          parameter to annotate your configuration files, or make backups
//          of your files so that when they are re-written you can restore
//          the comments. The APPNC.EXE, APPNRST.EXE, and APPNMIG.EXE
//          utilities will all replace the node definitions file.
//
//-------------------------------------------------------------------------
//-------------------------------------------------------------------------
//---------------------- The NODE DEFINITIONS FILE -------------------------
//-------------------------------------------------------------------------
//-------------------------------------------------------------------------
//
// The node definitions file is a free-format file containing the commands
// used to define a Networking Services/2 configuration. The syntax of these
// commands are defined using the information in this file, along with the
// values of the delimiters used to delineate the information in the file. The
// commands in the file can be specified in any order. Likewise, spaces are not
// significant in the node definitions file unless explicitly stated for a
// particular command, parameter, or value. For example NODE_TYPE(EN) is the
// same as NODE_TYPE (EN   ).
//
// This file defines the syntax of the node definition commands. For more
// information on the commands and the system management verbs they represent,
// refer to the Networking Services/2 System Management Programming Reference
```

```
// (SC52-1111). There will be some differences between the syntax of the node
// definition commands and their corresponding system management verbs. Some
// of the verb parameters may be combined into a single command parameter
// parameter (for example, the xxx_MIN and xxx_MAX parameters of the DEFINE_COS
// verb are combined into the xxx_RANGE parameters of the DEFINE_COS command)
// or are implied and not explicitly specified on the command. Another
// difference is that the configuration utilities will handle all conversions
// from ASCII to EBCDIC when reading the node definitions file, and will
// perform any necessary padding of values.
//
//------------------------------ Delimiters ----------------------------------
//
// The following delimiter characters are used in the node definitions file:
//
// Delimiter character name     default value     Description
// ------------------------     -------------     -----------
// LPAREN                       '(', x'28'        Left parenthesis
// RPAREN                       ')', x'29'        Right parenthesis
// COMMA                        ',', x'2C'        Comma
// SEMI                         ';', x'3B'        Semicolon
// SLASH                        '/', x'2F'        Forward slash
// ASTERISK                     '*', x'2A'        Asterisk
// QUOTE                        ''', x'27'        Single quotation mark
// BLANK                        ' ', x'20'        Blank
//
// The value for these delimiters is defined in this file, and can be changed
// if you want to (excluding the BLANK delimiter). Unfortunately, these
// delimiters are referenced in this section when describing the format of the
// node definitions file. This section will use the delimiter description
// followed by the delimiter character name to identify delimiters. For
// example,  left parenthesis (LPAREN) refers to the '(' character if you are
// using the default delimiter definitions.
//
// A few of the delimiters are used in combination with other delimiters or
// characters to form other delimiters. These combinations are:
//
// Complex delimiter name   Description of syntax             Default value
// ----------------------   -------------------------------   -------------
// LINE COMMENT             A forward slash (SLASH) followed      //
//                          by another forward slash (SLASH)
// LEFT COMMENT             A forward slash (SLASH) followed      /*
//                          by an asterisk (ASTERISK)
// RIGHT COMMENT            An asterisk (ASTERISK) followed       */
//                          by a forward slash (SLASH)
// HEX INDICATOR            The letter x (in upper or lower     X' or x'
//                          case) followed by a single
//                          quotation mark (QUOTE)
//
// The values of these delimiters are implicitly changed when you change the
// values of the character delimiters. These delimiters will be referred to
// within this file using their complex delimiter name. The value of the
// letter x is not configurable (x'78' lower case, x'58' upper case).
//
// The value of these delimiters can be any valid "printable" ASCII character
// (0x20 - 0xFF) except for the following characters:
```

```
//
//          a-z lowercase letters
//          A-Z uppercase letters
//          0-9 digits
//          ' ' space (this is always set to the blank (BLANK) delimiter)
//          '.' period
//          '$' dollar sign
//          '#' pound or numeric sign
//          '@' at sign
//          ':' colon
//          '\' back slash
//
// Note: Changing the value of the LINE COMMENT, LEFT COMMENT, or RIGHT COMMENT
//      delimiters does NOT change their values within this file.  This file
//      always uses the default settings for these delimiters.
//
//---------------------- General Command Syntax ------------------------------
//
// The general format of a command is the command name, followed by one or more
// command parameters, and terminated with a semicolon (SEMI).  The parameters
// may be specified in any order.  The general format of a command parameter is
// the parameter name, followed by the parameter value enclosed in a left
// parenthesis (LPAREN) and right parenthesis (RPAREN).  Parameter values may be
// one or more numbers, hexadecimal numbers, hexadecimal strings, value
// keywords, strings, or sub-parameters.
//
// Command names, parameter names, and value keywords are all case insensitive
// (the strings "DEFINE_LOCAL_CP" and "define_local_cp" both identify the same
// command).
//
//---------------------------- Parameter values ------------------------------
//
// Numbers may be specified as unsigned decimal values (e.g. 256) or
// as hexadecimal numbers (which are translated to their integer equivalent).
// Integer numbers consists of one or more of the decimal digits 0 - 9.
//
// Hexadecimal numbers are specified by enclosing two or more hexadecimal digits
// (0 - 9, a - f, A - F) within a HEX INDICATOR and a single quotation mark
// (QUOTE).  For example, using the default values for the delimiters, a valid
// hex number would be X'2B'.  x'2b' would indicate the same hexadecimal value.
// Hexadecimal numbers must be specified using an EVEN number of hexadecimal
// digits.
//
// Hexadecimal strings are specified the same as hexadecimal numbers except
// hexadecimal strings may be specified using an EVEN or ODD number of
// hexadecimal digits.
//
// Value keywords are specified using the names of the keywords (specified
// in this file).  Value keywords are used to indicate a specific value without
// worrying about its internal representation within Networking Services/2.
// When describing the syntax of the commands (see below), the allowed value
// keywords for each parameter will be given.
//
// Strings are specified as one or more characters (making sure the characters
// are part of the character set valid for that parameter).  Specify string
```

```
// values as is, do not enclose them in quotes, etc.  You may specify a string
// with the same value as a command name, parameter name, or value keyword.
//
//   For example, (using the default values), EN is a value keyword which can
//   be specified for the NODE_TYPE parameter of the DEFINE_LOCAL_CP command.
//   The Networking Services/2 support will translate the value keyword
//   EN into some internal representation.  The value of the CP_ALIAS parameter
//   of the DEFINE_LOCAL_CP command is specified using a string.  Therefore,
//   specifying EN for the CP_ALIAS parameter, will instruct the Networking
//   Services/2 support to use the actual string "EN" for the control point
//   alias name.
//
// Most parameters that accept strings as their values also restrict the
// characters that may be specified in the string (referred to as the parameter
// character set).  The next section describes the character sets used in the
// node definitions file.
//
// Sub-parameters are used when a parameter is actually a set of parameters.
// Sub parameters are specified the same as parameters and can take on any of
// the values a parameter can, including sub-parameters.  For example, (using
// the default values), the value of the ADAPTER_INFO parameter of the
// DEFINE_CONNECTION_NETWORK command is two sub-parameters (DLC_NAME and
// ADAPTER_NUMBER).  To specify a ADAPTER_INFO parameter which uses a DLC named
// IBMTRNET and adapter number 1, you would specify:
//
//         ADAPTER_INFO (DLC_NAME(IBMTRNET) ADAPTER_NUMBER(1))
//
// Finally, some parameters accept (or require) more than one value, where the
// values are not sub-parameters.  The values are specified as a list of values
// separated by commas (COMMA).  For example, (using the default values), the
// value of the COST_PER_BYTE_RANGE parameter of the DEFINE_COS command is
// actually two numbers.  Therefore, to specify a range between 0 and 255, you
// would specify:
//
//        COST_PER_BYTE_RANGE(0,255)
//
//-------------- Notes on string values and their character sets ---------------
//
//
// Some special notes on entering string values:
//
//        1) It is not necessary to pad strings with blanks, as required when
//           using the programming interface.  The Networking Services/2
//           support will perform any necessary padding.
//
//        2) In some of the string types described below, the allowed
//           characters include some of the node definition file delimiters.
//           Unless noted in the string definition, the delimiters are not
//           allowed to be a part of the string, even if they are a part of the
//           string's defined character set.  This is the main reason
//           Networking Services/2 allows you to change the delimiter
//           definitions.  You can change the delimiters such that they no
//           longer clash with the characters you wish to place in your names.
//           Strings cannot contain the ASCII line feed (LF), carriage return
//           (CR), tab (HT or VT), or end-of-text-file (x'1A') characters.
```

```
//
//        3) Type-a strings are entered in ASCII.  The Networking Services/2
//           support will translate the strings to EBCDIC.  Although type-a
//           strings are uppercase only, the Networking Services/2 support
//           will accept type-a strings in lower or upper case.  They will be
//           converted to uppercase when they are translated to EBCDIC
//           (therefore the type-a strings "appn" and "APPN" are equivalent).
//
//           Type-a strings consist of the uppercase letters (A-Z), digits
//           (0-9), and the special characters $, #, and @.  Fully-qualified
//           names that are type-a strings also allow a period '.'.
//           Type-a strings cannot start with a digit.
//
//        4) Type-ae strings are entered in ASCII.  The Networking Services/2
//           support will translate the strings to EBCDIC.  Type-ae strings
//           are case sensitive, so the Networking Services/2 support will
//           convert mixed case ASCII type-ae strings to mixed case EBCDIC
//           strings.
//
//           Type-ae strings consist of the upper case and lower case letters
//           (a-z, A-Z), digits (0-9), and the special characters $, #, @, and
//           period '.'.  The first character of a type-ae string can be any
//           type-ae character.
//
//        5) Character set 01134 strings are entered in ASCII.  The Networking
//           Services/2 support will translate the strings to EBCDIC.
//           Although character set 01134 strings are uppercase only, the
//           Networking Services/2 support will accept character set 01134
//           strings in lower or upper case.  They will be converted to upper
//           case when they are translated to EBCDIC  (therefore the character
//           set 01134 strings "appn" and "APPN" are equivalent).
//
//           Character set 01134 strings consist of the uppercase letters (A-Z)
//           and digits (0-9).  Fully-qualified names that are character set
//           01134 strings also allow a period '.'.  Character set 01134
//           strings cannot start with a digit.
//
//           The Networking Services/2 support allows the '#' character in
//           character set 01134 strings to identify IBM-supplied names,
//           although '#' is not a part of character set 01134 (first character
//           only).
//
//        6) Character set 00640 strings are entered in ASCII.  The Networking
//           Services/2 support will translate the strings to EBCDIC.
//           Character set 00640 strings are case sensitive, so the Networking
//           Services/2 support will convert mixed case ASCII character
//           set 00640 strings to mixed case EBCDIC strings.
//
//           Character set 00640 strings consist of the uppercase and lower
//           case letters (a-z, A-Z), digits (0-9), and the following special
//           characters:
//
//             ' ' space          (not supported by Networking Services/2)
//             '.' period
//             '<' less than
```

```
//          '>' greater than
//          '(' left parenthesis
//          ')' right parenthesis
//          '+' plus
//          '-' dash or minus
//          '&' ampersand
//          '*' asterisk
//          ';' semicolon
//          '/' slash
//          ',' comma
//          '%' percent
//          '_' underscore
//          '?' question mark
//          ':' colon
//          ''' single quote
//          '"' double quote
//
//        The Networking Services/2 support does not allow the space
//        character in character set 00640 strings, even though the
//        SNA definition of character set 00640 includes the space
//        character.
//
//        Many of the characters in character set 00640 are also default
//        delimiters.  To minimize these conflicts and the need to redefine
//        the delimiters,  the following exceptions have been made for
//        character set 00640 strings:
//
//        a) A character set 00640 string can start with any character set
//           00640 character EXCEPT when the character is also one of the
//           following delimiters:
//
//           left parenthesis (LPAREN)
//           right parenthesis (RPAREN)
//           semicolon (SEMI)
//           line comment (SLASH,SLASH)
//           left comment (SLASH,ASTERISK)
//           right comment (ASTERISK,SLASH) (if a comment is active)
//
//        b) After the first character, a character set 00640 string can
//           contain any character in character set 00640 EXCEPT when
//           the character is also one of the following delimiters:
//           following delimiters:
//
//           right parenthesis (RPAREN)
//           line comment (SLASH,SLASH)
//           left comment (SLASH,ASTERISK)
//
//      7) ASCII strings can be any valid "printable" character.  The
//        Networking Services/2 support allows any character to be specified
//        as part of a ASCII string except characters that are also defined
//        as a delimiter.  The forward slash (SLASH), asterisk (ASTERISK),
//        and single quotation mark (QUOTE) delimiters can be a part of
//        an ASCII string as long as they are not combined to form the
//        line comment (SLASH,SLASH), left comment (SLASH,ASTERISK),
//        or HEX INDICATOR (letter x,QUOTE) delimiters.
```

```
//
//          Some ASCII strings are uppercase only.  The Networking Services/2
//          support will accept uppercase only ASCII strings in lower and
//          upper case, and convert them to uppercase.
//
//        8) Free form strings are ASCII strings with fewer character
//          restrictions.  Free form strings can be any valid "printable"
//          character with the following exceptions:
//
//          a) A free form string can start with any valid ASCII character
//            EXCEPT when the character is also one of the following
//            delimiters:
//
//            blank (BLANK)
//            left parenthesis (LPAREN)
//            right parenthesis (RPAREN)
//            semicolon (SEMI)
//            line comment (SLASH,SLASH)
//            left comment (SLASH,ASTERISK)
//            right comment (ASTERISK,SLASH) (if a comment is active)
//
//          b) After the first character, a free form string can contain
//            any ASCII character EXCEPT when the character is also one
//            of the following delimiters:
//
//            right parenthesis (RPAREN)
//            line comment (SLASH,SLASH)
//            left comment (SLASH,ASTERISK)
//
//            SPACES ARE SIGNIFICANT IN FREE FORM STRINGS!!!
//
//        9) A few parameters (e.g. MODE_NAME) allow a blank name to be
//          specified.  Since the node definitions file is free-format,
//          blank (BLANK) characters are ignored (except for free form
//          strings).  To specify a blank name, use the BLANK value keyword
//          (of course, you can change the value keyword BLANK to any name
//          you wish).  For example, using the default definitions, to use
//          the blank mode name as the default mode name, specify
//          DEFAULT_MODE_NAME(BLANK) on the DEFINE_DEFAULTS command.
//
//       10) Command names, parameter names, and value keywords are case
//          insensitive ASCII strings with the restriction that these names
//          cannot contain any delimiters (either character delimiters
//          or complex delimiters).
//
//---------------------------------------------------------------------------
//---------------------------------------------------------------------------
//-------------------- The CONFIGURATION COMMANDS ---------------------------
//---------------------------------------------------------------------------
//---------------------------------------------------------------------------
//
// Following is a very brief description of the configuration commands, showing
// each command's command name, its parameter names, and their value keywords.
// The names shown here are the DEFAULT names defined in this file.  You may
// customize any of these names to fit your requirements.
```

```
//
// Also shown is the syntax of each command, listing all the valid parameters.
// For each parameter is an indication whether it is required or optional
// (along with its default value, if one exists), any restrictions/dependencies
// with other parameters or their values, and the parameter's valid values.
//
// Note: Although the command names, parameter names, and value keywords may
//       be changed, the overall syntax of the commands is not altered.
//
// You can change this section, although this is not recommended. All parameters
// for a command are shown indented underneath the command name, with an
// indication to the left of the parameter name indicating whether the parameter
// is required (R), optional (O), or has special restrictions described at the
// end of the command description (digit). To the right of each parameter are
// the allowed parameter values. The special restrictions and default values
// for the parameters are listed below the command description, along with an
// example of the command.
//
// Note: Each command example is syntactically correct. The command examples
//       are not meant to be combined to form a viable configuration.
//
// All valid value keywords and sub-parameters for a parameter are shown
// indented underneath their associated parameter name. Unless explicitly
// stated otherwise, a parameter may be specified only once per command.
// Likewise, a sub-parameter may be specified only once per PARAMETER (not
// command) unless explicitly stated otherwise.
//
// Note: The required, optional, or restrictions indications applies to the
//       command or parameter "containing" the parameter (in other words, the
//       command or parameter the parameter is indented underneath). For
//       example, a required sub-parameter indicates that if its associated
//       parameter is specified, then the sub-parameter must be specified as
//       part of the parameter's value.
//
// Note: String sizes are given in byte values. For most languages, a byte is
//       the same as a single character. But some languages use two bytes to
//       represent a character. Therefore, if you are using a language that
//       uses more than one byte to represent a character, you must take that
//       into account when specifying string values. For example, if your
//       language uses two bytes for every character, you can only specify
//       four characters for an eight byte string value.
//
// Also shown in each command description is whether this command is dynamic.
// When you verify a configuration (using APPNMIG, which automatically verifies
// the created configuration, APPNV, or the verify options of APPNC), you can
// optionally dynamically update the Networking Services/2 active configuration
// with the new configuration. Therefore, in most cases, you do not have to
// stop and start the Networking Services/2 support to make your changes active.
// The verify function will only attempt to update the Networking Services/2
// active configuration with the dynamic (as indicated below) commands, and only
// if you specify that the active configuration should be dynamically updated.
// If you make changes to commands which are not dynamic, then you must stop and
// start Networking Services/2 to make your changes active.
//
//----------------------------------------------------------------------------
```

```
//------------------------ DEFINE_LOCAL_CP -----------------------------------
//----------------------------------------------------------------------------
//
// DEFINE_LOCAL_CP
//(R) FQ_CP_NAME                  (3-17 byte type-a string)
//                           (must be fully-qualified (netid.name))
//(R) CP_ALIAS                  (1-8 byte ASCII string)
//(1) HOST_FP_LINK_NAME           (1-8 byte type-a string)
//(O) HOST_FP_SUPPORT             (see keywords)
//     YES
//     NO
//(O) NAU_ADDRESS                 (number between 1 & 254 or INDEPENDENT_LU)
//     INDEPENDENT_LU
//(O) NODE_ID                   (5 digit hex string)
//(O) NODE_TYPE                   (see keywords)
//     EN
//     NN
//(O) DESCRIPTION                 (1-64 byte free format string)
//
// Notes: 1) Specify HOST_FP_LINK_NAME only if HOST_FP_SUPPORT(YES).
//
// Defaults: HOST_FP_SUPPORT    (NO)
//          NAU_ADDRESS        (INDEPENDENT_LU)
//          NODE_ID           (X'00000')
//          NODE_TYPE          (EN)
//
// Dynamic: NO
//
// Example: DEFINE_LOCAL_CP fq_cp_name(appn.home)
//                     cp_alias(home)
//                     host_fp_link_name(homelan)
//                     host_fp_support(yes)
//                     nau_address(independent_lu)
//                     node_id(x'00001')
//                     node_type(en)
//                     description(local cp definition for node home);
//
//
//----------------------------------------------------------------------------
//----------------------- DEFINE_CONNECTION_NETWORK --------------------------
//----------------------------------------------------------------------------
//
// DEFINE_CONNECTION_NETWORK
//(R) FQ_CN_NAME                  (3-17 byte type-a string)
//                           (must be fully-qualified (netid.name))
//(R) ADAPTER_INFO                (see sub-parameters)
//                           (more than one ADAPTER_INFO parameter may
//                            be specified).
//(R)   ADAPTER_NUMBER            (number between 0 & 255)
//(R)   DLC_NAME                (1-8 byte ASCII string)
//                           (The following names are supported by
//                            Networking Services/2).
//                              IBMTRNET - IBM Token-Ring Network
//                              ETHERAND - ETHERAND Network
//                              IBMPCNET - IBM PC Network
```

```
//(O) DESCRIPTION                (1-64 byte free format string)
//
// Notes: none
//
// Defaults: none
//
// Dynamic: NO
//
// Example: DEFINE_CONNECTION_NETWORK fq_cn_name(appn.cn1)
//                           adapter_info(dlc_name(IBMTRNET)
//                                    adapter_number(1))
//                           adapter_info(dlc_name(IBMTRNET)
//                                    adapter_number(0))
//                           description(connection network cn1);
//
//-----------------------------------------------------------------------------
//-------------------------- DEFINE_LOGICAL_LINK -----------------------------
//-----------------------------------------------------------------------------
//
// DEFINE_LOGICAL_LINK
//(R) LINK_NAME               (1-8 byte type-a string)
//(R) DLC_NAME                (1-8 byte ASCII string)
//                           (The following names are supported by
//                            Networking Services/2).
//                             SDLC     - SDLC
//                             IBMTRNET - IBM Token-Ring Network
//                             ETHERAND - ETHERAND Network
//                             IBMPCNET - IBM PC Network
//                             X25DLC   - X.25
//                             TWINAX   - Twinaxial
//(R) ACTIVATE_AT_STARTUP           (see keywords)
//      YES
//      NO
//(R) CP_CP_SESSION_SUPPORT          (see keywords)
//      YES
//      NO
//(1) ADAPTER_NUMBER              (number between 0 & 255)
//(O) ADJACENT_NODE_TYPE            (see keywords)
//      LEARN
//      LEN
//      NN
//(2) PREFERRED_NN_SERVER           (see keywords)
//      YES
//      NO
//(3) DESTINATION_ADDRESS          (1-16 byte hex string)
//(3) X25_DIRECTORY_ENTRY          (1-8 byte ASCII string)
//(O) FQ_ADJACENT_CP_NAME           (3-17 byte type-a string)
//                           (must be a fully-qualified (netid.name))
//(O) EFFECTIVE_CAPACITY         (number between 0 and 16000000 or
//                           USE_ADAPTER_DEFINITION)
//      USE_ADAPTER_DEFINITION
//(O) COST_PER_BYTE              (number between 0 and 255 or
//                           USE_ADAPTER_DEFINITION)
//      USE_ADAPTER_DEFINITION
//(O) COST_PER_CONNECT_TIME         (number between 0 and 255 or
```

```
//                              USE_ADAPTER_DEFINITION)
//      USE_ADAPTER_DEFINITION
//(O) PROPAGATION_DELAY            (see keywords)
//      MINIMUM
//      LAN
//      TELEPHONE
//      PACKET_SWITCHED_NETWORK
//      SATELLITE
//      MAXIMUM
//      USE_ADAPTER_DEFINITION
//(O) SECURITY                     (see keywords)
//      NONSECURE
//      PUBLIC_SWITCHED_NETWORK
//      UNDERGROUND_CABLE
//      SECURE_CONDUIT
//      GUARDED_CONDUIT
//      ENCRYPTED
//      GUARDED_RADIATION
//(O) USER_DEFINED_1               (number between 0 and 255 or
//                              USE_ADAPTER_DEFINITION)
//      USE_ADAPTER_DEFINITION
//(O) USER_DEFINED_2               (number between 0 and 255 or
//                              USE_ADAPTER_DEFINITION)
//      USE_ADAPTER_DEFINITION
//(O) USER_DEFINED_3               (number between 0 and 255 or
//                              USE_ADAPTER_DEFINITION)
//      USE_ADAPTER_DEFINITION
//(O) LIMITED_RESOURCE             (see keywords)
//      YES
//      NO
//      USE_ADAPTER_DEFINITION
//(O) LINK_STATION_ROLE            (see keywords)
//      NEGOTIABLE
//      PRIMARY
//      SECONDARY
//      USE_ADAPTER_DEFINITION
//(4) SOLICIT_SSCP_SESSION         (see keywords)
//      YES
//      NO
//(O) DESCRIPTION                  (1-64 byte free format string)
//
// Notes: 1) If DLC_NAME(X25DLC) is not specified, then ADAPTER_NUMBER must be
//           specified.  If DLC_NAME(X25DLC) is specified, then ADAPTER_NUMBER
//           is ignored.
//
//        2) Specify PREFERRED_NN_SERVER(YES) only if
//           ADJACENT_NODE_TYPE(NN).  You can specify PREFERRED_NN_SERVER(YES)
//           only if CP_CP_SESSION_SUPPORT(YES) is specified.
//
//        3) DESTINATION_ADDRESS and X25_DIRECTORY_ENTRY are mutually exclusive
//           (if one is specified, the other cannot be specified).
//           If X25_DIRECTORY_ENTRY is specified, then DLC_NAME(X25DLC) must
//           be specified.  If DESTINATION_ADDRESS is specified, then
//           DLC_NAME(X25DLC) must not be specified.
//
```

```
//         DESTINATION_ADDRESS is required if a LAN DLC is specified.  For
//         the LAN DLCs, the DESTINATION_ADDRESS must specify a valid
//         LAN address (6 byte MAC address or a 6 byte MAC address appended
//         with a one byte SAP address).  The names of the LAN DLCs are:
//
//            IBMTRNET - IBM Token-Ring Network
//            ETHERAND - ETHERAND Network
//            IBMPCNET - IBM PC Network
//
//         Do not specify DESTINATION_ADDRESS if one of the following names
//         is specified for DLC_NAME:
//
//            SDLC     - SDLC
//            X25DLC   - X.25
//            TWINAX   - Twinaxial
//
//         X25_DIRECTORY_ENTRY is required if DLC_NAME(X25DLC) is specified.
//
//       4) SOLICIT_SSCP_SESSION is always set to YES if the link is defined
//         as the host focal point link (DEFINE_LOCAL_CP HOST_FP_LINK_NAME).
//
//       5) CP_CP_SESSION_SUPPORT is always set to NO if the adjacent node
//         is a LEN node (ADJACENT_NODE_TYPE(LEN)).
//
// Defaults: ADJACENT_NODE_TYPE    (LEARN)
//         PREFERRED_NN_SERVER   (NO)
//         LIMITED_RESOURCE      (USE_ADAPTER_DEFINITION)
//                               (if CP_CP_SESSION_SUPPORT(NO) is specified)
//                              (NO)
//                               (if CP_CP_SESSION_SUPPORT(YES) is specified)
//         LINK_STATION_ROLE     (USE_ADAPTER_DEFINITION)
//         SOLICIT_SSCP_SESSION  (NO)
//         EFFECTIVE_CAPACITY    (USE_ADAPTER_DEFINITION)
//         COST_PER_BYTE         (USE_ADAPTER_DEFINITION)
//         COST_PER_CONNECT_TIME (USE_ADAPTER_DEFINITION)
//         PROPAGATION_DELAY     (USE_ADAPTER_DEFINITION)
//         SECURITY              (USE_ADAPTER_DEFINITION)
//         USER_DEFINED_1        (USE_ADAPTER_DEFINITION)
//         USER_DEFINED_2        (USE_ADAPTER_DEFINITION)
//         USER_DEFINED_3        (USE_ADAPTER_DEFINITION)
//
// Dynamic: YES
//
// Example: DEFINE_LOGICAL_LINK link_name(link1)
//                        ADAPTER_NUMBER(1)
//                        DLC_NAME(sdlc)
//                        ACTIVATE_AT_STARTUP(NO)
//                        CP_CP_SESSION_SUPPORT(yes)
//                        ADJACENT_NODE_TYPE(nn)
//                        preferred_nn_server(no)
//                        DESTINATION_ADDRESS(x'01')
//                        FQ_ADJACENT_CP_NAME(appn.neighbor)
//                        effective_capacity(4000000)
//                        cost_per_byte(255)
//                        cost_per_connect_time(use_adapter_definition)
```

```
//                          propagation_delay(lan)
//                          security(NONSECURE)
//                          user_defined_1(use_adapter_definition)
//                          user_defined_2(use_adapter_definition)
//                          user_defined_3(use_adapter_definition)
//                          limited_resource(no)
//                          link_station_role(secondary)
//                          solicit_sscp_session(yes)
//                          description(link to node neighbor);
//
//---------------------------------------------------------------------------
//---------------------------- DEFINE_LOCAL_LU -------------------------------
//---------------------------------------------------------------------------
//
// DEFINE_LOCAL_LU
//(R) LU_NAME                   (1-8 byte type-a string)
//(O) LU_ALIAS                  (1-8 byte ASCII string)
//(O) NAU_ADDRESS                  (number between 1 & 254 or INDEPENDENT_LU)
//      INDEPENDENT_LU
//(O) DESCRIPTION                 (1-64 byte free format string)
//
// Notes: none
//
// Defaults: LU_ALIAS    (same value as LU_NAME)
//           NAU_ADDRESS (INDEPENDENT_LU)
//
// Dynamic: YES
//
// Example: DEFINE_LOCAL_LU lu_name(filetran)
//                      lu_alias(mylu)
//                      nau_address(independent_lu)
//                      description(Local LU for file transfer);
//
//---------------------------------------------------------------------------
//--------------------------- DEFINE_PARTNER_LU ------------------------------
//---------------------------------------------------------------------------
//
// DEFINE_PARTNER_LU
//(R) FQ_PARTNER_LU_NAME            (1-17 byte type-a string)
//                            (can be fully-qualified (netid.name)
//                             or a simple 8 character name (name))
//(O) PARTNER_LU_ALIAS              (One or more aliases, separated by
//                            commas (COMMA).  Up to 256 aliases may
//                            be specified.  Each alias is a 1-8
//                            byte ASCII string)
//(O) PARTNER_LU_UNINTERPRETED_NAME  (1-8 byte type-a string)
//(O) CONV_SECURITY_VERIFICATION     (see keywords)
//      YES
//      NO
//(O) MAX_MC_LL_SEND_SIZE           (number between 2048 and 32767)
//(O) PARALLEL_SESSION_SUPPORT       (see keywords)
//      YES
//      NO
//(O) DESCRIPTION                  (1-64 byte free format string)
//
```

```
// Notes: none
//
// Dynamic: YES
//
// Defaults: PARTNER_LU_ALIAS          (partner LU name (without the netid))
//          CONV_SECURITY_VERIFICATION (NO)
//          MAX_MC_LL_SEND_SIZE       (32767)
//          PARALLEL_SESSION_SUPPORT   (YES)
//
// Example: DEFINE_PARTNER_LU fq_partner_lu_name(pipeline)
//                         partner_lu_alias(pipeline)
//                         partner_lu_uninterpreted_name(piping)
//                         conv_security_verification(no)
//                         max_mc_ll_send_size(4096)
//                         parallel_session_support(yes)
//                         description(Remote LU for pipeline);
//
// Example: DEFINE_PARTNER_LU fq_partner_lu_name(pipeline)
//                         partner_lu_alias(pipeline,
//                                          pipe2,
//                                          pipe3)
//                         partner_lu_uninterpreted_name(piping)
//                         conv_security_verification(no)
//                         max_mc_ll_send_size(4096)
//                         parallel_session_support(yes)
//                         description(Remote LU with multiple aliases);
//
//---------------------------------------------------------------------------
//----------------------- DEFINE_PARTNER_LU_LOCATION -------------------------
//---------------------------------------------------------------------------
//
// DEFINE_PARTNER_LU_LOCATION
//(R) FQ_OWNING_CP_NAME              (3-17 byte type-a string)
//                          (must be fully-qualified (netid.name))
//(O) WILDCARD_ENTRY                 (see keywords)
//      FULL
//      PARTIAL
//      NO
//(1) FQ_PARTNER_LU_NAME             (1-17 byte type-a string)
//                          (can be fully-qualified (netid.name)
//                           or a simple 8 character name (name))
//(2) FQ_SERVING_NN_CP_NAME          (3-17 byte type-a string)
//                          (must be fully-qualified (netid.name))
//(3) LOCAL_NODE_NN_SERVER           (see keywords)
//      YES
//      NO
//(O) DESCRIPTION                    (1-64 byte free format string)
//
// Notes: 1) FQ_PARTNER_LU_NAME is required if WILDCARD_ENTRY(NO) or
//          WILDCARD_ENTRY(PARTIAL).
//        2) Specify FQ_SERVING_NN_CP_NAME only if WILDCARD_ENTRY(NO)
//          or WILDCARD_ENTRY(PARTIAL)
//        3) This parameter is only referenced if the local node is a
//          network node (DEFINE_LOCAL_CP NODE_TYPE(NN). If the local node
//          is a network node, the following rules apply:
```

```
//
//          a) If LOCAL_NODE_NN_SERVER(NO) is specified:
//             - FQ_SERVING_NN_CP_NAME must be specified.
//             - FQ_SERVING_NN_CP_NAME must not be the same as the
//               local cp name (DEFINE_LOCAL_CP FQ_CP_NAME).
//
//          b) If LOCAL_NODE_NN_SERVER(YES) is specified:
//             - FQ_SERVING_NN_CP_NAME can be specified, but it must equal
//               the local cp name (DEFINE_LOCAL_CP FQ_CP_NAME).
//
//          When defining LUs attached to your network node via a LEN
//          connection, you must still specify LOCAL_NODE_NN_SERVER(YES).
//          This parameter is ignored if the local node is an end node.
//
// Defaults: WILDCARD_ENTRY (NO)
//          LOCAL_NODE_NN_SERVER(NO)
//
// Dynamic: YES
//
// Example: DEFINE_PARTNER_LU_LOCATION wildcard_entry(no)
//                              fq_partner_lu_name(pipeline)
//                              fq_owning_cp_name(appn.neighbor)
//                              local_node_nn_server(no)
//                              fq_serving_nn_cp_name(appn.nn)
//                              description(Location of pipeline LU);
//
//----------------------------------------------------------------------------
//------------------------------- DEFINE_COS ---------------------------------
//----------------------------------------------------------------------------
//
// DEFINE_COS
//(R) COS_NAME                      (1-8 byte type-a string)
//                              (see note 1)
//(R) TRANSMISSION_PRIORITY         (see keywords)
//     NETWORK
//     HIGH
//     MEDIUM
//     LOW
//(R) NODE_ROW                      (see sub-parameters)
//                              (more than one NODE_ROW parameter may
//                               be specified).
//(R)    WEIGHT                     (number between 0 and 255)
//(R)    CONGESTION_RANGE           (multi-valued parameter consisting of two
//                              value keywords (see list below). If the
//                              second value is NO, then the first value
//                              must be NO)
//        YES
//        NO
//(R)    ROUTE_ADDITION_RES_RANGE   (multi-valued parameter consisting of
//                              two numbers between 0 and 255, with the
//                              second number being greater than or
//                              equal to the first number)
//(R) TG_ROW                        (see sub-parameters)
//                              (more than one TG_ROW parameter may
//                               be specified).
```

```
//(R)   WEIGHT                  (number between 0 and 255)
//(R)   COST_PER_BYTE_RANGE         (multi-valued parameter consisting of two
//                              numbers between 0 and 255, with the
//                              second number being greater than or equal
//                              to the first number)
//(R)   COST_PER_CONNECT_TIME_RANGE  (multi-valued parameter consisting of two
//                              numbers between 0 and 255, with the
//                              second number being greater than or equal
//                              to the first number)
//(R)   EFFECTIVE_CAPACITY_RANGE    (multi-valued parameter consisting of two
//                              numbers between 0 and 255, with the
//                              second number being greater than or equal
//                              to the first number)
//(R)   PROPAGATION_DELAY_RANGE     (multi-valued parameter consisting of two
//                              value keywords (see list below).  The
//                              second value can be the same as the first
//                              value or any value appearing after the
//                              first value in the list below)
//        MINIMUM
//        LAN
//        TELEPHONE
//        PACKET_SWITCHED_NETWORK
//        SATELLITE
//        MAXIMUM
//(R)   SECURITY_RANGE              (multi-valued parameter consisting of two
//                              value keywords (see list below).  The
//                              second value can be the same as the first
//                              value or any value appearing after the
//                              first value in the list below)
//        NONSECURE
//        PUBLIC_SWITCHED_NETWORK
//        UNDERGROUND_CABLE
//        SECURE_CONDUIT
//        GUARDED_CONDUIT
//        ENCRYPTED
//        GUARDED_RADIATION
//(R)   USER_DEFINED_1_RANGE        (multi-valued parameter consisting of two
//                              numbers between 0 and 255, with the
//                              second number being greater than or equal
//                              to the first number)
//(R)   USER_DEFINED_2_RANGE        (multi-valued parameter consisting of two
//                              numbers between 0 and 255, with the
//                              second number being greater than or equal
//                              to the first number)
//(R)   USER_DEFINED_3_RANGE        (multi-valued parameter consisting of two
//                              numbers between 0 and 255, with the
//                              second number being greater than or equal
//                              to the first number)
//(O) DESCRIPTION                   (1-64 byte free format string)
//
// Notes: 1) The IBM-supplied COS definitions are automatically created by the
//           configuration utilities.  Therefore, these definitions cannot be
//           created using the DEFINE_COS command.  The names of the
//           IBM-supplied COS definitions are: #CONNECT, #INTER, #INTERSC,
//           #BATCH, #BATCHSC, CPSVCMG, and SNASVCMG.
```

```
//
// Defaults: none
//
// Dynamic: YES
//
// Example: DEFINE_COS cos_name(cos1)
//                 transmission_priority(network)
//                 node_row (weight(101)
//                         congestion_range(yes,yes)
//                         route_addition_res_range(11,21)
//                        )
//                 node_row (weight(102)
//                         congestion_range(no,yes)
//                         route_addition_res_range(12,22)
//                        )
//                 node_row (weight(103)
//                         congestion_range(no,no)
//                         route_addition_res_range(13,23)
//                        )
//                 tg_row   (weight(201)
//                         cost_per_byte_range(41,51)
//                         cost_per_connect_time_range(21,31)
//                         effective_capacity_range(121,131)
//                         propagation_delay_range(minimum,maximum)
//                         security_range(NONSECURE,guarded_radiation)
//                         user_defined_1_range(61,71)
//                         user_defined_2_range(81,91)
//                         user_defined_3_range(101,111)
//                        )
//                 tg_row   (weight(202)
//                         cost_per_byte_range(42,52)
//                         cost_per_connect_time_range(22,32)
//                         effective_capacity_range(122,132)
//                         propagation_delay_range(telephone,
//                                            PACKET_SWITCHED_NETWORK
)
//                         security_range(public_switched_network,
//                                     encrypted)
//                         user_defined_1_range(62,72)
//                         user_defined_2_range(82,92)
//                         user_defined_3_range(102,112)
//                        )
//                 tg_row   (weight(203)
//                         cost_per_byte_range(43,53)
//                         cost_per_connect_time_range(23,33)
//                         effective_capacity_range(123,133)
//                         propagation_delay_range(telephone,telephone)
//                         security_range(UNDERGROUND_CABLE,
//                                     GUARDED_CONDUIT)
//                         user_defined_1_range(63,73)
//                         user_defined_2_range(83,93)
//                         user_defined_3_range(103,113)
//                        )
//                 tg_row   (weight(204)
//                         cost_per_byte_range(44,54)
```

```
//                        cost_per_connect_time_range(24,34)
//                        effective_capacity_range(124,134)
//                        propagation_delay_range(telephone,telephone)
//                        security_range(SECURE_CONDUIT,SECURE_CONDUIT)
//                        user_defined_1_range(64,74)
//                        user_defined_2_range(84,94)
//                        user_defined_3_range(104,114)
//                       )
//                  description(Sample COS definition)
//                  ;
//
//---------------------------------------------------------------------------
//------------------------------ DEFINE_MODE --------------------------------
//---------------------------------------------------------------------------
//
// DEFINE_MODE
//(R) MODE_NAME                      (1-8 byte type-a string or BLANK)
//     BLANK                         (see note 1)
//(2) MAX_RU_SIZE_UPPER_BOUND        (number between 256 & 16384)
//(O) COS_NAME                       (1-8 byte type-a string)
//(O) DEFAULT_RU_SIZE                (see keywords)
//     YES
//     NO
//(O) MAX_NEGOTIABLE_SESSION_LIMIT   (number between 0 and 32767)
//(O) MIN_CONWINNERS_SOURCE          (number between 0 and 32767)
//(O) PLU_MODE_SESSION_LIMIT         (number between 0 and 32767)
//(O) RECEIVE_PACING_WINDOW          (number between 0 and 63)
//(O) DESCRIPTION                    (1-64 byte free format string)
//
// Notes: 1) The IBM-supplied mode definitions are automatically created by the
//           configuration utilities.  These definitions can be superseded
//           using the DEFINE_MODE command, except for the CPSVCMG mode.
//           The names of the IBM-supplied mode definitions are: #CONNECT,
//           #INTER, #INTERSC, #BATCH, #BATCHSC, CPSVCMG, SNASVCMG, and
//           BLANK (the blank mode name).
//
//        2) MAX_RU_SIZE_UPPER_BOUND is required if DEFAULT_RU_SIZE(NO).
//
//        3) The value of MAX_NEGOTIABLE_SESSION_LIMIT must be greater than
//           or equal to the value of PLU_MODE_SESSION_LIMIT.
//
//        3) The value of PLU_MODE_SESSION_LIMIT must be greater than
//           or equal to the value of MIN_CONWINNERS_SOURCE.
//
// Defaults: COS_NAME(#CONNECT)
//           DEFAULT_RU_SIZE(YES)
//           RECEIVE_PACING_WINDOW(4)
//           MAX_NEGOTIABLE_SESSION_LIMIT(32767)
//           PLU_MODE_SESSION_LIMIT(32767 or MAX_NEGOTIABLE_SESSION_LIMIT
//                                  value, whichever is less)
//           MIN_CONWINNERS_SOURCE(1/2 of PLU_MODE_SESSION_LIMIT value)
//
// Dynamic: YES
//
// Example: DEFINE_MODE        mode_name(mode1)
```

```
//                    max_ru_size_upper_bound(4096)
//                    cos_name(#connect)
//                    default_ru_size(yes)
//                    max_negotiable_session_limit(1)
//                    min_conwinners_source(1)
//                    plu_mode_session_limit(1)
//                    receive_pacing_window(7)
//                    description(single session mode);
//
//---------------------------------------------------------------------------
//---------------------------- DEFINE_DEFAULTS -------------------------------
//---------------------------------------------------------------------------
//
// DEFINE_DEFAULTS
//(O) DEFAULT_TP_CONV_SECURITY_RQD    (see keywords)
//      YES
//      NO
//(O) DEFAULT_TP_OPERATION           (see keywords)
//      QUEUED_OPERATOR_STARTED
//      QUEUED_OPERATOR_PRELOADED
//      QUEUED_AM_STARTED
//      NONQUEUED_AM_STARTED
//(O) DEFAULT_TP_PROGRAM_TYPE         (see keywords)
//      BACKGROUND
//      FULL_SCREEN
//      PRESENTATION_MANAGER
//      VIO_WINDOWABLE
//(O) DIRECTORY_FOR_INBOUND_ATTACHES  (1-64 byte ASCII string)
//(O) IMPLICIT_INBOUND_PLU_SUPPORT    (see keywords)
//      YES
//      NO
//(O) DEFAULT_MODE_NAME              (1-8 byte type-a string or BLANK)
//      BLANK                   (see note  )
//(O) DEFAULT_LOCAL_LU_ALIAS         (1-8 byte ASCII string)
//(O) MAX_HELD_ALERTS               (number between 0 & 255)
//(O) MAX_MC_LL_SEND_SIZE            (number between 2048 and 32767)
//(O) DESCRIPTION                  (1-64 byte free format string)
//
// Notes: 1) DIRECTORY_FOR_INBOUND_ATTACHES uses the special value (*)
//         to indicate that the system PATH statement should be used
//         when starting an undefined transaction program.  This value
//         does NOT change if you change the value of the ASTERISK
//         delimiter.
//       2) The CPSVCMG mode cannot be used for user sessions, therefore
//         CPSVCMG cannot be specified for DEFAULT_MODE_NAME.
//
// Defaults: DEFAULT_TP_OPERATION(NONQUEUED_AM_STARTED)
//         DEFAULT_TP_PROGRAM_TYPE(BACKGROUND)
//         DEFAULT_TP_CONV_SECURITY_RQD(NO)
//         DEFAULT_LOCAL_LU_ALIAS(the local cp becomes the default LU)
//         IMPLICIT_INBOUND_PLU_SUPPORT(YES)
//         MAX_HELD_ALERTS(10)
//         MAX_MC_LL_SEND_SIZE(32767)
//
// Dynamic: NO
```

```
//
// Example: DEFINE_DEFAULTS default_tp_conv_security_rqd(no)
//                    default_tp_operation(queued_am_started)
//                    default_tp_program_type(vio_windowable)
//                    directory_for_inbound_attaches(c:\cmlib\appn)
//                    implicit_inbound_plu_support(yes)
//                    default_mode_name(mode1)
//                    default_local_lu_alias(locallu)
//                    max_held_alerts(15)
//                    max_mc_ll_send_size(2048)
//                    description(Default node properties for node home);
//
//--------------------------------------------------------------------------
//------------------------------- DEFINE_TP --------------------------------
//--------------------------------------------------------------------------
//
// DEFINE_TP
//(1) TP_NAME                        (1-64 byte type-ae string)
//(1) SNA_SERVICE_TP_NAME                 (multi-valued parameter consisting
//                             of a one byte hex number with a value
//                             between x'00' and x'3F' (excluding
//                             x'0E' and x'0F'), and a 1-3 byte char
//                             type-a string with no restriction on
//                             the first digit)
//                                  or
//                            (a one byte hex number with a value
//                             between x'00' and x'3F' (excluding
//                             x'0E' and x'0F'))
//(R) FILESPEC                       (1-80 byte ASCII string)
//(O) ICON_FILESPEC                    (1-80 byte ASCII string)
//(O) PARM_STRING                      (1-128 byte ASCII string)
//(O) CONV_SECURITY_RQD                   (see keywords)
//      YES
//      NO
//(O) CONVERSATION_TYPE                   (see keywords)
//      BASIC
//      MAPPED
//      EITHER
//(2) INCOMING_ALLOCATE_QUEUE_DEPTH   (number between 1 & 255)
//(3) INCOMING_ALLOCATE_TIMEOUT       (number between 0 & 32767 or INFINITE)
//      INFINITE
//(O) PROGRAM_TYPE                   (see keywords)
//      BACKGROUND
//      FULL_SCREEN
//      PRESENTATION_MANAGER
//      VIO_WINDOWABLE
//(O) RECEIVE_ALLOCATE_TIMEOUT       (number between 0 & 32767 or INFINITE)
//      INFINITE
//(O) SYNC_LEVEL                   (see keywords)
//      NONE
//      CONFIRM
//      EITHER
//(O) TP_OPERATION                   (see keywords)
//      QUEUED_OPERATOR_STARTED
//      QUEUED_OPERATOR_PRELOADED
```

```
//      QUEUED_AM_STARTED
//      NONQUEUED_AM_STARTED
//(O) DESCRIPTION                (1-64 byte free format string)
//
// Notes: 1) TP_NAME and SNA_SERVICE_TP_NAME are mutually exclusive
//          (if one is specified, the other cannot be specified), but one
//          (either TP_NAME or SNA_SERVICE_TP_NAME) must be specified.
//        2) Specify INCOMING_ALLOCATE_QUEUE_DEPTH only if
//          TP_OPERATION(NONQUEUED_AM_STARTED) is not specified.
//        3) Specify INCOMING_ALLOCATE_TIMEOUT only if
//          TP_OPERATION(NONQUEUED_AM_STARTED) is not specified.
//
// Defaults: CONV_SECURITY_RQD(NO)
//          CONVERSATION_TYPE(EITHER)
//          INCOMING_ALLOCATE_QUEUE_DEPTH(255) (ignored if TP_OPERATION is
//                                    NONQUEUED_AM_STARTED)
//          INCOMING_ALLOCATE_TIMEOUT(INFINITE) (ignored if TP_OPERATION is
//                                    QUEUED_OPERATOR_PRELOADED)
//          PROGRAM_TYPE(BACKGROUND)
//          RECEIVE_ALLOCATE_TIMEOUT(INFINITE)
//          SYNC_LEVEL(EITHER)
//          TP_OPERATION(NONQUEUED_AM_STARTED)
//
// Dynamic: YES
//
// Example: DEFINE_TP tp_name(home$program)
//                   filespec(c:\cmlib\home.exe)
//                   icon_filespec(c:\cmlib\home.ico)
//                   parm_string(/hello /goodbye)
//                   conv_security_rqd(no)
//                   conversation_type(mapped)
//                   incoming_allocate_queue_depth(20)
//                   incoming_allocate_timeout(100)
//                   program_type(presentation_manager)
//                   receive_allocate_timeout(200)
//                   sync_level(confirm)
//                   tp_operation(queued_operator_started)
//                   description(Define the home transaction program);
//
//        DEFINE_TP sna_service_tp_name(X'06',1)
//                   filespec(c:\cmlib\svctp.exe)
//                   icon_filespec(c:\cmlib\svctp.ico)
//                   parm_string(/hello /goodbye)
//                   conv_security_rqd(no)
//                   conversation_type(either)
//                   incoming_allocate_queue_depth(20)
//                   incoming_allocate_timeout(100)
//                   program_type(presentation_manager)
//                   receive_allocate_timeout(200)
//                   sync_level(either)
//                   tp_operation(queued_operator_started)
//                   description(Define the SNA service tp x'06F1');
//
//---------------------------------------------------------------------------
//------------------------- DEFINE_CPIC_SIDE_INFO -----------------------------
```

```
//----------------------------------------------------------------------------
//
// DEFINE_CPIC_SIDE_INFO
//(R) SYMBOLIC_DESTINATION_NAME      (1-8 byte char set 01134 string)
//(1) PARTNER_LU_ALIAS               (1-8 byte ASCII string)
//(1) FQ_PARTNER_LU_NAME             (1-17 byte char set 01134 string)
//                                   (can be fully-qualified (netid.name)
//                                    or a simple 8 character name (name))
//(2) TP_NAME                        (1-64 byte char set 00640 string)
//(2) SNA_SERVICE_TP_NAME            (multi-valued parameter consisting
//                                   of a one byte hex number with a value
//                                   between x'00' and x'3F' (excluding
//                                   x'0E' and x'0F'), and a 1-3 byte char
//                                   set 01134 string with no restriction
//                                   on the first digit)
//                                           or
//                                   (a one byte hex number with a value
//                                   between x'00' and x'3F' (excluding
//                                   x'0E' and x'0F'))
//(R) MODE_NAME                      (1-8 byte char set 01134 string or BLANK)
//      BLANK                        (see note 3)
//(O) DESCRIPTION                    (1-64 byte free format string)
//
// Notes: 1) PARTNER_LU_ALIAS and FQ_PARTNER_LU_NAME are mutually exclusive
//          (if one is specified, the other cannot be specified), but one
//          (either PARTNER_LU_ALIAS or FQ_PARTNER_LU_NAME) must be specified.
//        2) TP_NAME and SNA_SERVICE_TP_NAME are mutually exclusive
//          (if one is specified, the other cannot be specified), but one
//          (either TP_NAME or SNA_SERVICE_TP_NAME) must be specified.
//        3) The CPSVCMG mode cannot be used for user sessions, therefore
//          CPSVCMG cannot be specified for MODE_NAME.
//
// Defaults: none
//
// Dynamic: YES
//
// Example: DEFINE_CPIC_SIDE_INFO symbolic_destination_name(cpic)
//                         partner_lu_alias(pipeline)
//                         mode_name(mode1)
//                         sna_service_tp_name(x'3C',sna);
//
//----------------------------------------------------------------------------
//------------------------- START_ATTACH_MANAGER -----------------------------
//----------------------------------------------------------------------------
//
// START_ATTACH_MANAGER
//
// Notes: 1) START_ATTACH_MANAGER has no parameters.
//
// Defaults: none
//
// Dynamic: NO
//
// Example: START_ATTACH_MANAGER;
//
```

```
//--------------------------------------------------------------------------
//------------------------- ACTIVATE_LOGICAL_LINKS ---------------------------
//--------------------------------------------------------------------------
//
// ACTIVATE_LOGICAL_LINKS
//(R) LINK_NAME                     (1-8 byte type-a string)
//
// Defaults: none
//
// Dynamic: NO
//
// Example: ACTIVATE_LOGICAL_LINKS link_name(link1);
//
//--------------------------------------------------------------------------
//---------------------------------- CNOS -----------------------------------
//--------------------------------------------------------------------------
//
// CNOS
//(O) LOCAL_LU_ALIAS                (1-8 byte ASCII string)
//(1) PARTNER_LU_ALIAS              (1-8 byte ASCII string)
//(1) FQ_PARTNER_LU_NAME            (1-17 byte type-a string)
//                          (can be fully-qualified (netid.name)
//                           or a simple 8 character name (name))
//(2) MODE_NAME                     (1-8 byte type-a string or BLANK)
//                          (see note 3 about restrictions on the
//                           mode names and other parameters)
//     BLANK
//(R) SET_NEGOTIABLE                (see keywords)
//     YES
//     NO
//(5) AUTO_ACTIVATE                 (number between 0 and 32767)
//(O) PLU_MODE_SESSION_LIMIT        (number between 0 and 32767)
//                          (see note 4)
//(O) MIN_CONWINNERS_SOURCE         (number between 0 and 32767)
//                          (see note 4)
//(O) MIN_CONWINNERS_TARGET         (number between 0 and 32767)
//                          (see note 4)
//(6) RESPONSIBLE                   (see keywords)
//     SOURCE
//     TARGET
//(6) DRAIN_SOURCE                  (see keywords)
//     YES
//     NO
//(6) DRAIN_TARGET                  (see keywords)
//     YES
//     NO
//
// Notes: 1) PARTNER_LU_ALIAS and FQ_PARTNER_LU_NAME are mutually exclusive
//           (if one is specified, the other cannot be specified), but one
//           (either PARTNER_LU_ALIAS or FQ_PARTNER_LU_NAME) must be specified.
//        2) MODE_NAME is required if PLU_MODE_SESSION_LIMIT > 0.  If
//           PLU_MODE_SESSION_LIMIT = 0, MODE_NAME is optional.
//        3) When MODE_NAME(SNASVCMG), the settings for PLU_MODE_SESSION_LIMIT,
//           MIN_CONWINNERS_SOURCE, and MIN_CONWINNERS_TARGET are limited to
//           the following combinations:
```

```
//                                      allowed combinations
//                                      (a)     (b)     (c)
//          PLU_MODE_SESSION_LIMIT       2       1       0
//          MIN_CONWINNERS_SOURCE        1       0       0
//          MIN_CONWINNERS_TARGET        1       1       0
//
//        The session limits of the CPSVCMG mode cannot be changed by a
//        user command, therefore CPSVCMG cannot be specified for MODE_NAME.
//
//      4) PLU_MODE_SESSION_LIMIT must be greater than the sum of
//        MIN_CONWINNERS_SOURCE and MIN_CONWINNERS_TARGET
//      5) Specify AUTO_ACTIVATE only if PLU_MODE_SESSION_LIMIT > 0
//      6) Specify RESPONSIBLE, DRAIN_SOURCE, and DRAIN_TARGET only if
//        PLU_MODE_SESSION_LIMIT(0) and MODE_NAME is not SNASVCMG.
//        RESPONSIBLE, DRAIN_SOURCE, and DRAIN_TARGET are required if
//        PLU_MODE_SESSION_LIMIT(0) and MODE_NAME is not SNASVCMG.
//
// Defaults: PLU_MODE_SESSION_LIMIT(32767)
//        MIN_CONWINNERS_SOURCE(0)
//        MIN_CONWINNERS_TARGET(0)
//        AUTO_ACTIVATE(0)   (ignored if PLU_MODE_SESSION_LIMIT(0))
//
// Dynamic: NO
//
// Example: CNOS local_lu_alias(home)
//           fq_partner_lu_name(appn.neighbor)
//           mode_name(mode2)
//           set_negotiable(no)
//           plu_mode_session_limit(4)
//           min_conwinners_source(2)
//           min_conwinners_target(2)
//           auto_activate(2);
//
//---------------------------------------------------------------------------
//---------------------------------------------------------------------------
//-------------------------- DELIMITER SETTINGS ------------------------------
//---------------------------------------------------------------------------
//---------------------------------------------------------------------------
//
// Left parenthesis (LPAREN) delimiter
// |
// |Right parenthesis (RPAREN) delimiter
// ||
// ||Comma (COMMA) delimiter
// |||
// |||Semicolon (SEMI) delimiter
// ||||
// ||||Forward slash (SLASH) delimiter
// |||||
// |||||Asterisk (ASTERISK) delimiter
// ||||||
// ||||||Single quotation mark (QUOTE) delimiter
// |||||||
   (),;/*'                 0   // Delimeter values
//
```

```
//--------------------------------------------------------------------------
//--------------------------------------------------------------------------
//---------- COMMAND NAME, PARAMETER NAME, AND VALUE KEYWORD SETTINGS ----------
//--------------------------------------------------------------------------
//--------------------------------------------------------------------------
//
// Following is each command name, parameter name, and value keyword along with
// their associated internal ids. You can change the command names, parameter
// names, and value keywords by changing the text in this file. To change a
// name, find the name in this section and enter your new name, leaving the
// internal id unchanged.  NEVER change the internal id values.  Back up this
// file before making any changes in case you accidentally delete an entry or
// alter an internal id.  After this file has been changed, the node definitions
// files will be interpreted using the new command names, parameter names,
// and value keywords.  The command names, parameter names, and value keywords
// are sometimes referred to collectively as keywords.
//
//--------------------------------------------------------------------------
//------------------------------ COMMAND NAMES ------------------------------
//--------------------------------------------------------------------------
//
// Commands (arranged alphabetically):
//
ACTIVATE_LOGICAL_LINKS        167  // Literal: ACTIVATE_LOGICAL_LINKS
CNOS                          168  // Literal: CNOS
DEFINE_CPIC_SIDE_INFO         174  // Literal: DEFINE_CPIC_SIDE_INFO
DEFINE_CONNECTION_NETWORK     155  // Literal: DEFINE_CONNECTION_NETWORK
DEFINE_COS                    162  // Literal: DEFINE_COS
DEFINE_DEFAULTS               164  // Literal: DEFINE_DEFAULTS
DEFINE_LOCAL_CP               154  // Literal: DEFINE_LOCAL_CP
DEFINE_LOCAL_LU               158  // Literal: DEFINE_LOCAL_LU
DEFINE_LOGICAL_LINK           157  // Literal: DEFINE_LOGICAL_LINK
DEFINE_LU_LU_PASSWORD         159  // Literal: DEFINE_LU_LU_PASSWORD
DEFINE_MODE                   163  // Literal: DEFINE_MODE
DEFINE_PARTNER_LU             160  // Literal: DEFINE_PARTNER_LU
DEFINE_PARTNER_LU_LOCATION    161  // Literal: DEFINE_PARTNER_LU_LOCATION
DEFINE_TP                     165  // Literal: DEFINE_TP
DEFINE_USER_ID_PASSWORD       156  // Literal: DEFINE_USER_ID_PASSWORD
START_ATTACH_MANAGER          166  // Literal: START_ATTACH_MANAGER
//
//--------------------------------------------------------------------------
//----------------------------- PARAMETER NAMES -----------------------------
//--------------------------------------------------------------------------
//
// Parameters (arranged alphabetically):
//
SOLICIT_SSCP_SESSION          130  // Literal: SOLICIT_SSCP_SESSION
ACTIVATE_AT_STARTUP            80  // Literal: ACTIVATE_AT_STARTUP
ADAPTER_INFO                   35  // Literal: ADAPTER_INFO
ADAPTER_NUMBER                  9  // Literal: ADAPTER_NUMBER
ADJACENT_NODE_TYPE             47  // Literal: ADJACENT_NODE_TYPE
AUTO_ACTIVATE                  50  // Literal: AUTO_ACTIVATE
CP_ALIAS                       19  // Literal: CP_ALIAS
CONGESTION_RANGE               66  // Literal: CONGESTION_RANGE
CONV_SECURITY_RQD              87  // Literal: CONV_SECURITY_RQD
```

```
CONV_SECURITY_VERIFICATION       59 // Literal: CONV_SECURITY_VERIFICATION
CONVERSATION_TYPE               86 // Literal: CONVERSATION_TYPE
COS_NAME                   14 // Literal: COS_NAME
COST_PER_BYTE               2 // Literal: COST_PER_BYTE
COST_PER_BYTE_RANGE           70 // Literal: COST_PER_BYTE_RANGE
COST_PER_CONNECT_TIME          1 // Literal: COST_PER_CONNECT_TIME
COST_PER_CONNECT_TIME_RANGE      69 // Literal: COST_PER_CONNECT_TIME_RANGE
CP_CP_SESSION_SUPPORT          49 // Literal: CP_CP_SESSION_SUPPORT
DEFAULT_LOCAL_LU_ALIAS         177 // Literal: DEFAULT_LOCAL_LU_ALIAS
DEFAULT_MODE_NAME             38 // Literal: DEFAULT_MODE_NAME
DEFAULT_RU_SIZE             76 // Literal: DEFAULT_RU_SIZE
DEFAULT_TP_CONV_SECURITY_RQD     43 // Literal: DEFAULT_TP_CONV_SECURITY_RQD
DEFAULT_TP_OPERATION          41 // Literal: DEFAULT_TP_OPERATION
DEFAULT_TP_PROGRAM_TYPE          42 // Literal: DEFAULT_TP_PROGRAM_TYPE
DESCRIPTION                173 // Literal: DESCRIPTION
DESTINATION_ADDRESS           48 // Literal: DESTINATION_ADDRESS
DIRECTORY_FOR_INBOUND_ATTACHES   40 // Literal: DIRECTORY_FOR_INBOUND_ATTACHES
DLC_NAME                    8 // Literal: DLC_NAME
DRAIN_SOURCE               101 // Literal: DRAIN_SOURCE
DRAIN_TARGET               102 // Literal: DRAIN_TARGET
EFFECTIVE_CAPACITY           34 // Literal: EFFECTIVE_CAPACITY
EFFECTIVE_CAPACITY_RANGE         68 // Literal: EFFECTIVE_CAPACITY_RANGE
FILESPEC                 84 // Literal: FILESPEC
FQ_ADJACENT_CP_NAME            46 // Literal: FQ_ADJACENT_CP_NAME
FQ_CN_NAME                 33 // Literal: FQ_CN_NAME
FQ_CP_NAME                 18 // Literal: FQ_CP_NAME
FQ_OWNING_CP_NAME             61 // Literal: FQ_OWNING_CP_NAME
FQ_PARTNER_LU_NAME            12 // Literal: FQ_PARTNER_LU_NAME
FQ_SERVING_NN_CP_NAME          62 // Literal: FQ_SERVING_NN_CP_NAME
HOST_FP_LINK_NAME            27 // Literal: HOST_LINK_NAME
HOST_FP_SUPPORT             28 // Literal: HOST_FP_SUPPORT
ICON_FILESPEC              45 // Literal: ICON_FILESPEC
IMPLICIT_INBOUND_PLU_SUPPORT      39 // Literal: IMPLICIT_INBOUND_PLU_SUPPORT
INCOMING_ALLOCATE_QUEUE_DEPTH     91 // Literal: INCOMING_ALLOCATE_QUEUE_DEPTH
INCOMING_ALLOCATE_TIMEOUT        92 // Literal: INCOMING_ALLOCATE_TIMEOUT
LIMITED_RESOURCE            51 // Literal: LIMITED_RESOURCE
LINK_NAME                 11 // Literal: LINK_NAME
LINK_STATION_ROLE            52 // Literal: LINK_STATION_ROLE
LOCAL_LU_ALIAS             94 // Literal: LOCAL_LU_ALIAS
LOCAL_NODE_NN_SERVER           99 // Literal: LOCAL_NODE_NN_SERVER
LU_ALIAS                 54 // Literal: LU_ALIAS
LU_NAME                  53 // Literal: LU_NAME
MAX_HELD_ALERTS             44 // Literal: MAX_HELD_ALERTS
MAX_MC_LL_SEND_SIZE           10 // Literal: MAX_MC_LL_SEND_SIZE
MAX_NEGOTIABLE_SESSION_LIMIT     79 // Literal: MAX_NEGOTIABLE_SESSION_LIMIT
MAX_RU_SIZE_UPPER_BOUND         77 // Literal: MAX_RU_SIZE_UPPER_BOUND
MIN_CONWINNERS_SOURCE          97 // Literal: MIN_CONWINNERS_SOURCE
MIN_CONWINNERS_TARGET          98 // Literal: MIN_CONWINNERS_TARGET
MODE_NAME                 16 // Literal: MODE_NAME
NAU_ADDRESS                20 // Literal: NAU_ADDRESS
NODE_ID                  22 // Literal: NODE_ID
NODE_ROW                  64 // Literal: NODE_ROW
NODE_TYPE                 21 // Literal: NODE_TYPE
PARALLEL_SESSION_SUPPORT        58 // Literal: PARALLEL_SESSION_SUPPORT
PARM_STRING                85 // Literal: PARM_STRING
```

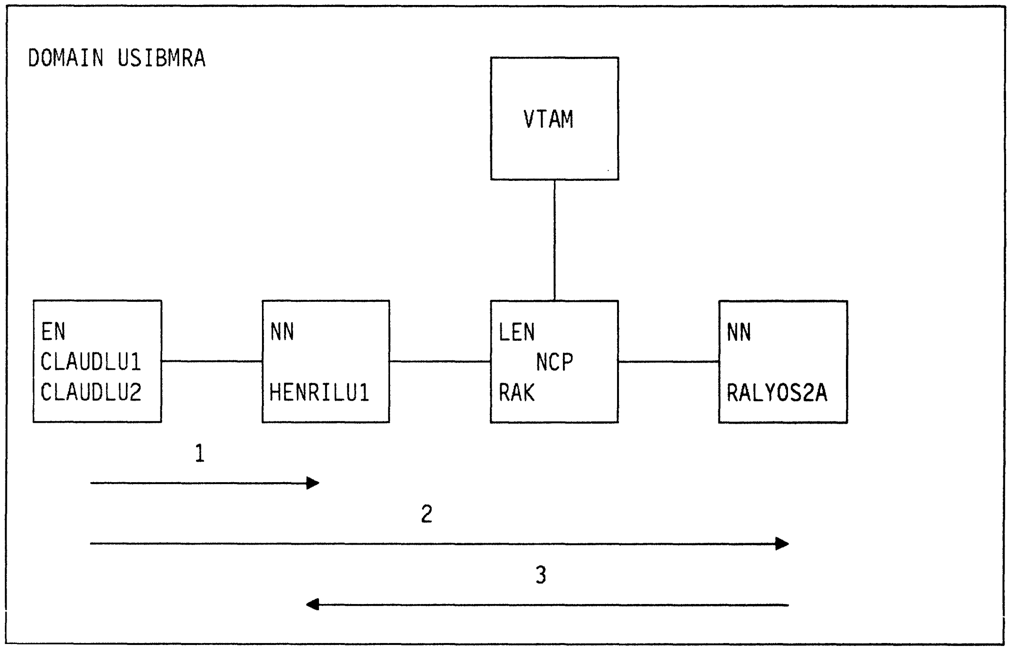
```
PARTNER_LU_ALIAS               13 // Literal: PARTNER_LU_ALIAS
PARTNER_LU_UNINTERPRETED_NAME   57 // Literal: PARTNER_LU_UNINTERPRETED_NAME
PASSWORD                      37 // Literal: PASSWORD
PLU_MODE_SESSION_LIMIT          17 // Literal: PLU_MODE_SESSION_LIMIT
PREFERRED_NN_SERVER            56 // Literal: PREFERRED_NN_SERVER
PROGRAM_TYPE                  90 // Literal: PROGRAM_TYPE
PROPAGATION_DELAY               4 // Literal: PROPAGATION_DELAY
PROPAGATION_DELAY_RANGE          72 // Literal: PROPAGATION_DELAY_RANGE
RECEIVE_ALLOCATE_TIMEOUT        93 // Literal: RECEIVE_ALLOCATE_TIMEOUT
RECEIVE_PACING_WINDOW          78 // Literal: RECEIVE_PACING_WINDOW
RESPONSIBLE                  100 // Literal: RESPONSIBLE
ROUTE_ADDITION_RES_RANGE         65 // Literal: ROUTE_ADDITION_RES_RANGE
SECURITY                      3 // Literal: SECURITY
SECURITY_RANGE                71 // Literal: SECURITY_RANGE
SET_NEGOTIABLE                95 // Literal: SET_NEGOTIABLE
SNA_SERVICE_TP_NAME            176 // Literal: SNA_SERVICE_TP_NAME
SYMBOLIC_DESTINATION_NAME       175 // Literal: SYMBOLIC_DESTINATION_NAME
SYNC_LEVEL                    88 // Literal: SYNC_LEVEL
TG_ROW                       67 // Literal: TG_ROW
TP_NAME                      81 // Literal: TP_NAME
TP_OPERATION                  89 // Literal: TP_OPERATION
TRANSMISSION_PRIORITY           63 // Literal: TRANSMISSION_PRIORITY
USER_DEFINED_1                 5 // Literal: USER_DEFINED_1
USER_DEFINED_2                 6 // Literal: USER_DEFINED_2
USER_DEFINED_3                 7 // Literal: USER_DEFINED_3
USER_DEFINED_1_RANGE            73 // Literal: USER_DEFINED_1_RANGE
USER_DEFINED_2_RANGE            74 // Literal: USER_DEFINED_2_RANGE
USER_DEFINED_3_RANGE            75 // Literal: USER_DEFINED_3_RANGE
USER_ID                      36 // Literal: USER_ID
WEIGHT                       15 // Literal: WEIGHT
WILDCARD_ENTRY                 60 // Literal: WILDCARD_ENTRY
X25_DIRECTORY_ENTRY             55 // Literal: X25_DIRECTORY_ENTRY
//
//-----------------------------------------------------------------------------
//--------------------------- VALUE KEYWORDS ---------------------------------
//-----------------------------------------------------------------------------
//
// Value keywords (arranged alphabetically):
//
BACKGROUND                   125 // Literal: BACKGROUND
BASIC                     144 // Literal: BASIC
BLANK                      141 // Literal: BLANK
CONFIRM                     148 // Literal: CONFIRM
EITHER                     146 // Literal: EITHER
EN                        103 // Literal: EN
ENCRYPTED                   115 // Literal: ENCRYPTED
FULL                       172 // Literal: FULL
FULL_SCREEN                  126 // Literal: FULL_SCREEN
GUARDED_CONDUIT                114 // Literal: GUARDED_CONDUIT
GUARDED_RADIATION               116 // Literal: GUARDED_RADIATION
HIGH                       138 // Literal: HIGH
INDEPENDENT_LU                 109 // Literal: INDEPENDENT_LU
INFINITE                    149 // Literal: INFINITE
LAN                        119 // Literal: LAN
LEARN                      129 // Literal: LEARN
```

```
LEN                       131  // Literal: LEN
LOCALLY                     142  // Literal: LOCALLY
LOW                        140  // Literal: LOW
MAPPED                      145  // Literal: MAPPED
MAXIMUM                      120  // Literal: MAXIMUM
MEDIUM                      139  // Literal: MEDIUM
NONSECURE                     171  // Literal: NONSECURE
MINIMUM                     110  // Literal: MINIMUM
NEGOTIABLE                    133  // Literal: NEGOTIABLE
NETWORK                      137  // Literal: NETWORK
NN                        104  // Literal: NN
NO                        108  // Literal: NO
NONE                       147  // Literal: NONE
NONQUEUED_AM_STARTED            124  // Literal: NONQUEUED_AM_STARTED
PACKET_SWITCHED_NETWORK          118  // Literal: PACKET_SWITCHED_NETWORK
PARTIAL                      136  // Literal: PARTIAL
PRESENTATION_MANAGER            127  // Literal: PRESENTATION_MANAGER
PRIMARY                     134  // Literal: PRIMARY
PUBLIC_SWITCHED_NETWORK          111  // Literal: PUBLIC_SWITCHED_NETWORK
QUEUED_AM_STARTED              123  // Literal: QUEUED_AM_STARTED
QUEUED_OPERATOR_STARTED          121  // Literal: QUEUED_OPERATOR_STARTED
QUEUED_OPERATOR_PRELOADED         122  // Literal: QUEUED_OPERATOR_PRELOADED
REMOTELY                     143  // Literal: REMOTELY
SATELLITE                    170  // Literal: SATELLITE
SECONDARY                     135  // Literal: SECONDARY
SECURE_CONDUIT                  113  // Literal: SECURE_CONDUIT
SOURCE                      152  // Literal: SOURCE
TARGET                      153  // Literal: TARGET
TELEPHONE                    117  // Literal: TELEPHONE
UNDERGROUND_CABLE               112  // Literal: UNDERGROUND_CABLE
USE_ADAPTER_DEFINITION           132  // Literal: USE_ADAPTER_DEFINITION
VIO_WINDOWABLE                 128  // Literal: VIO_WINDOWABLE
YES                        107  // Literal: YES
//
//----------------------------------------------------------------------------
//-------------------- RESERVED KEYWORDS (for future use) --------------------
//----------------------------------------------------------------------------
//
RESERVED23                    23  // Literal: RESERVERD23
RESERVED24                    24  // Literal: RESERVERD24
RESERVED25                    25  // Literal: RESERVERD25
RESERVED26                    26  // Literal: RESERVERD26
RESERVED29                    29  // Literal: RESERVERD29
RESERVED30                    30  // Literal: RESERVERD30
RESERVED31                    31  // Literal: RESERVERD31
RESERVED32                    32  // Literal: RESERVERD32
RESERVED82                    82  // Literal: RESERVERD82
RESERVED83                    83  // Literal: RESERVERD83
RESERVED96                    96  // Literal: RESERVERD96
RESERVED105                   105  // Literal: RESERVERD105
RESERVED106                   106  // Literal: RESERVERD106
RESERVED150                   150  // Literal: RESERVERD150
RESERVED151                   151  // Literal: RESERVERD151
RESERVED169                   169  // Literal: RESERVERD169
```

Appendix B. What PMDSPLAY Shows

This appendix shows an example of what can be displayed using the Display Active Configuration (PMDSPLAY) window.

The configuration used is:



There are three conversations (requester/server):

1. CLAUDLU1 - HENRILU1
2. CLAUDLU1 - RALYOS2A
3. RALYOS2A - HENRILU1.

Here is what can be displayed with the Display Active Configuration (PMDSPLAY) window on the HENRILU1 workstation.

B.1 APPC

Adapter Information

```
**************************************
*        Adapter Information         *
**************************************
Number of adapters                       2

1>DLC name                               IBMTRNET
  Adapter number                         0
  Link station role                      Negotiable
  Line type                              Switched
  Limited resource                       No
  Limited resource timeout               30
  Max frame data (BTU) size              1033
```

```
  Receive window                    1
  Send window                       2
  Maximum link stations             10
  Asynchronous balanced mode        Yes
  Effective capacity                4000000 bits per second
  Cost per connect time             0
  Cost per byte                     0
  Propagation delay                 384.00 microseconds (local area network)
  User defined parameter 1          128
  User defined parameter 2          128
  User defined parameter 3          128
  Security                          Nonsecure

2>DLC name                          IBMTRNET
  Adapter number                    1
  Link station role                 Negotiable
  Line type                         Switched
  Limited resource                  Yes
  Limited resource timeout          30
  Max frame data (BTU) size         1033
  Receive window                    1
  Send window                       2
  Maximum link stations             4
  Asynchronous balanced mode        Yes
  Effective capacity                4000000 bits per second
  Cost per connect time             0
  Cost per byte                     0
  Propagation delay                 384.00 microseconds (local area network)
  User defined parameter 1          128
  User defined parameter 2          128
  User defined parameter 3          128
  Security                          Nonsecure
```

SNA Global Information

```
**************************************
*       SNA Global Information       *
**************************************
Network name                        USIBMRA
Control point (CP) name             HENRILU1
Physical unit (PU) name             HENRILU1
Node ID (for XID)                   X'05D22221'
CP alias                            HENRILU1
Node type                           Network node
CP local address                    Not used (independent LU)
Workstation serial number           00-0000000
Machine type                        8570
Machine model number                000
Communications Manager version      1.3
Networking Services/2 version       1.0.0000
```

Link Definition Information

```
**************************************
*    Link Definition Information     *
**************************************
Number of links                     2

1>Link name                         RAKSA20
  Adjacent node CP name             USIBMRA.RAK
```

```
  Adjacent node type                   LEN
  DLC name                             IBMTRNET
  Adapter number                       0
  Destination DLC address              X'40000124000004'
  CP-CP session support                No
  Preferred NN server                  No
  Auto-activate link                   Yes
  Transmission group number            0
  Limited resource                     No
  Solicit SSCP session                 Yes
  Init self                            No
  BIND support                         Yes
  Link station role                    Negotiable
  Line type                            Switched
  Effective capacity                   4000000 bits per second
  Cost per connect time                0
  Cost per byte                        0
  Propagation delay                    384.00 microseconds (local area network)
  User defined parameter 1             128
  User defined parameter 2             128
  User defined parameter 3             128
  Security                             Nonsecure

2>Link name                            CLAUDLU1
  Adjacent node CP name
  Adjacent node type                   Learn
  DLC name                             IBMTRNET
  Adapter number                       1
  Destination DLC address              X'400032BB119B04'
  CP-CP session support                Yes
  Preferred NN server                  No
  Auto-activate link                   Yes
  Transmission group number            0
  Limited resource                     No
  Solicit SSCP session                 No
  Init self                            No
  BIND support                         Yes
  Link station role                    Negotiable
  Line type                            Switched
  Effective capacity                   4000000 bits per second
  Cost per connect time                0
  Cost per byte                        0
  Propagation delay                    384.00 microseconds (local area network)
  User defined parameter 1             128
  User defined parameter 2             128
  User defined parameter 3             128
  Security                             Nonsecure
```

Active Links Information

```
*************************************
*      Active Links Information     *
*************************************
Number of active links                 2

1>Link name                            RAKSA20
  DLC name                             IBMTRNET
  Adapter number                       0
  Destination DLC address              X'40000124000004'
```

```
  Link activated                      Locally
  Link state                          Active
  Deactivating link                   No
  Active and activating sessions      8
  Max frame data (BTU) size           1033
  Adjacent node CP name               USIBMRA.RAK
  Adjacent node type                  LEN
  CP-CP session support               No
  Connection type                     Host and peer
  Link station role                   Secondary
  Line type                           Switched
  Transmission group number           0
  Effective capacity                  4000000 bits per second
  Cost per connect time               0
  Cost per byte                       0
  Propagation delay                   384.00 microseconds (local area network)
  User defined parameter 1            128
  User defined parameter 2            128
  User defined parameter 3            128
  Security                            Nonsecure

2>Link name                           CLAUDLU1
  DLC name                            IBMTRNET
  Adapter number                      1
  Destination DLC address             X'400032BB119B04'
  Link activated                      Locally
  Link state                          Active
  Deactivating link                   No
  Active and activating sessions      5
  Max frame data (BTU) size           1033
  Adjacent node CP name               USIBMRA.CLAUDLU1
  Adjacent node type                  End node
  CP-CP session support               Yes
  Connection type                     Peer
  Link station role                   Primary
  Line type                           Switched
  Transmission group number           21
  Effective capacity                  4000000 bits per second
  Cost per connect time               0
  Cost per byte                       0
  Propagation delay                   384.00 microseconds (local area network)
  User defined parameter 1            128
  User defined parameter 2            128
  User defined parameter 3            128
  Security                            Nonsecure
```

Logical Units 0 to 3 Information

```
**************************************
*  Logical Units 0 to 3 Information  *
**************************************
Number of LUs                         4

1>Access type                         3270 emulation
  LU type                             2
  LU local address                    X'02'
  LU short name                       A
  LU long name                        A
  Session ID                          X'0000000000000000'
```

```
  DLC name                              IBMTRNET
  Adapter number                        0
  Destination DLC address               X'40000124000004'
  Link ID                               X'46E36F1CCA4EC432C42D2309'
  SSCP-LU session state                 Active
  LU-LU session state                   Inactive

2>Access type                           3270 emulation
  LU type                               2
  LU local address                      X'03'
  LU short name                         B
  LU long name                          B
  Session ID                            X'0000000000000000'
  DLC name                              IBMTRNET
  Adapter number                        0
  Destination DLC address               X'40000124000004'
  Link ID                               X'46E36F1CCA4EC432C42D2309'
  SSCP-LU session state                 Active
  LU-LU session state                   Inactive

3>Access type                           3270 emulation
  LU type                               2
  LU local address                      X'04'
  LU short name                         C
  LU long name                          C
  Session ID                            X'0000000000000000'
  DLC name                              IBMTRNET
  Adapter number                        0
  Destination DLC address               X'40000124000004'
  Link ID                               X'46E36F1CCA4EC432C42D2309'
  SSCP-LU session state                 Active
  LU-LU session state                   Inactive

4>Access type                           3270 emulation
  LU type                               2
  LU local address                      X'05'
  LU short name                         D
  LU long name                          D
  Session ID                            X'0000000000000000'
  DLC name                              IBMTRNET
  Adapter number                        0
  Destination DLC address               X'40000124000004'
  Link ID                               X'46E36F1CCA4EC432C42D2309'
  SSCP-LU session state                 Active
  LU-LU session state                   Inactive
```

Logical Unit 6.2 Information

```
**************************************
*    Logical Unit 6.2 Information    *
**************************************
Number of logical units (LUs)           1

1>LU name                               HENRILU1
  LU alias                              HENRILU1
  Fully-qualified LU name               USIBMRA.HENRILU1
  Default LU                            Yes
  LU local address                      Independent
  Configured sessions limit             65535
```

```
  Transaction programs limit         No limit
  LU type                            6.2
  Number of partner LUs (PLUs)       2

1.1>Partner LU alias                 @I000000
    Partner LU uninterpreted name
    Partner LU name                  USIBMRA.CLAUDLU1
    Partner LU session limit         65535
    DLC name
    Adapter number                   0
    Destination DLC address          X''
    Parallel sessions                Supported
    Session security                 Not configured
    Conversation security            Configured, Active
    Already verified security        Not configured
    Implicit partner                 Yes
    Number of modes for this PLU     3

1.1.1>Mode name                      CPSVCMG
      Max RU size, lower limit       512
      Max RU size, upper limit       256
      Max negotiable session limit   2
      Current session limit          2
      Min negotiated winner limit    1
      Min negotiated loser limit     1
      Active session count           2
      Pending session count          0
      Auto-activated winner sessions 0
      Active winner sessions         1
      Active loser sessions          1
      Session termination count      0
      Drain source                   No
      Drain target                   No
      Pacing size                    1
      Implicit mode                  No

1.1.2>Mode name                      SNASVCMG
      Max RU size, lower limit       512
      Max RU size, upper limit       256
      Max negotiable session limit   2
      Current session limit          2
      Min negotiated winner limit    1
      Min negotiated loser limit     1
      Active session count           1
      Pending session count          0
      Auto-activated winner sessions 0
      Active winner sessions         0
      Active loser sessions          1
      Session termination count      0
      Drain source                   No
      Drain target                   No
      Pacing size                    1
      Implicit mode                  No

1.1.3>Mode name                      MODE1
      Max RU size, lower limit       1024
      Max RU size, upper limit       256
      Max negotiable session limit   8
      Current session limit          8
```

```
      Min negotiated winner limit      0
      Min negotiated loser limit       4
      Active session count             1
      Pending session count            0
      Auto-activated winner sessions   0
      Active winner sessions           0
      Active loser sessions            1
      Session termination count        0
      Drain source                     Yes
      Drain target                     Yes
      Pacing size                      3
      Implicit mode                    Yes

1.2>Partner LU alias                   RALYOS2A
    Partner LU uninterpreted name      X'0000000000000000'
    Partner LU name                    USIBMRA.RALYOS2A
    Partner LU session limit           65535
    DLC name
    Adapter number                     0
    Destination DLC address            X''
    Parallel sessions                  Supported
    Session security                   Not configured
    Conversation security              Configured, Active
    Already verified security          Not configured
    Implicit partner                   No
    Number of modes for this PLU       2

1.2.1>Mode name                        SNASVCMG
      Max RU size, lower limit         512
      Max RU size, upper limit         256
      Max negotiable session limit     2
      Current session limit            2
      Min negotiated winner limit      1
      Min negotiated loser limit       1
      Active session count             1
      Pending session count            0
      Auto-activated winner sessions   0
      Active winner sessions           0
      Active loser sessions            1
      Session termination count        0
      Drain source                     No
      Drain target                     No
      Pacing size                      1
      Implicit mode                    No

1.2.2>Mode name                        MODE1
      Max RU size, lower limit         1024
      Max RU size, upper limit         256
      Max negotiable session limit     8
      Current session limit            2
      Min negotiated winner limit      0
      Min negotiated loser limit       0
      Active session count             1
      Pending session count            0
      Auto-activated winner sessions   0
      Active winner sessions           0
      Active loser sessions            1
      Session termination count        0
      Drain source                     No
```

```
     Drain target                      No
     Pacing size                       3
     Implicit mode                     No
```

LU Definition Information

```
**************************************
*     LU Definition Information      *
**************************************
Number of logical units (LUs)         1

1>LU name                             HENRILU1
  LU alias                            HENRILU1
  LU local address                    X'00'
```

Management Services Information

```
**************************************
*  Management Services Information   *
**************************************
Number of held MDS alerts             0
Number of held NMVT alerts            0
Number of focal points                0
Number of MS applications             0
Number of active transactions         0
```

Mode Definition Information

```
**************************************
*    Mode Definition Information     *
**************************************
Number of modes                       8

1>Mode name
  Class of service name               #CONNECT
  Max RU size, upper limit            2048
  Receive pacing window               3
  Default RU size                     Yes
  Max negotiable session limit        8
  Current session limit               8
  Min negotiated winner limit         4

2>Mode name                           #BATCH
  Class of service name               #BATCH
  Max RU size, upper limit            2048
  Receive pacing window               3
  Default RU size                     Yes
  Max negotiable session limit        8
  Current session limit               8
  Min negotiated winner limit         4

3>Mode name                           #BATCHSC
  Class of service name               #BATCHSC
  Max RU size, upper limit            2048
  Receive pacing window               3
  Default RU size                     Yes
  Max negotiable session limit        8
  Current session limit               8
  Min negotiated winner limit         4
```

```
4>Mode name                              #INTER
  Class of service name                  #INTER
  Max RU size, upper limit               2048
  Receive pacing window                  7
  Default RU size                        Yes
  Max negotiable session limit           8
  Current session limit                  8
  Min negotiated winner limit            4

5>Mode name                              #INTERSC
  Class of service name                  #INTERSC
  Max RU size, upper limit               2048
  Receive pacing window                  7
  Default RU size                        Yes
  Max negotiable session limit           8
  Current session limit                  8
  Min negotiated winner limit            4

6>Mode name                              CPSVCMG
  Class of service name                  CPSVCMG
  Max RU size, upper limit               512
  Receive pacing window                  1
  Default RU size                        No
  Max negotiable session limit           2
  Current session limit                  2
  Min negotiated winner limit            1

7>Mode name                              SNASVCMG
  Class of service name                  SNASVCMG
  Max RU size, upper limit               512
  Receive pacing window                  1
  Default RU size                        No
  Max negotiable session limit           2
  Current session limit                  2
  Min negotiated winner limit            1

8>Mode name                              MODE1
  Class of service name                  #CONNECT
  Max RU size, upper limit               2048
  Receive pacing window                  3
  Default RU size                        Yes
  Max negotiable session limit           8
  Current session limit                  8
  Min negotiated winner limit            4
```

Partner LU Definition Information

```
**************************************
* Partner LU Definition Information  *
**************************************
Number of partner logical units          2

1>Partner LU name                        USIBMRA.RALYOS2A
  Partner LU alias                       RALYOS2A
  Partner LU uninterpreted name          X'0000000000000000'
  Maximum logical record send size       32767
  Conversation security                  No
  Parallel sessions                      Supported
```

```
2>Partner LU name                      USIBMRA.CLAUDLU1
  Partner LU alias                     @I000000
  Partner LU uninterpreted name
  Maximum logical record send size     32767
  Conversation security                No
  Parallel sessions                    Supported
```

Session Information

```
**************************************
*       Session Information          *
**************************************
Number of sessions                     7

1>Session ID                           X'10228F1CDC4EC432'
  Conversation ID                      X'00000000'
  LU alias                             HENRILU1
  Partner LU alias
  Mode name
  Send maximum RU size                 512
  Receive maximum RU size              256
  Send pacing window                   0
  Receive pacing window                0
  Link name                            RAKSA20
  Outbound destination address (DAF)   X'00'
  Outbound origin address (OAF)        X'00'
  OAF-DAF assignor indicator (ODAI)    B'0'
  Session type                         SSCP-PU session
  Connection type                      Host and peer
  Procedure correlator ID (PCID)       X'4040404040404040'
  PCID generator CP name
  Conversation group ID                X'00000000'
  LU name                              USIBMRA.HENRILU1
  Partner LU name
  Pacing type                          Fixed

2>Session ID                           X'0E1A8F1CD24EC432'
  Conversation ID                      X'00000000'
  LU alias                             HENRILU1
  Partner LU alias                     @I000000
  Mode name                            CPSVCMG
  Send maximum RU size                 512
  Receive maximum RU size              512
  Send pacing window                   1
  Receive pacing window                1
  Link name                            CLAUDLU1
  Outbound destination address (DAF)   X'02'
  Outbound origin address (OAF)        X'01'
  OAF-DAF assignor indicator (ODAI)    B'1'
  Session type                         LU-LU session
  Connection type                      Peer
  Procedure correlator ID (PCID)       X'F453930FB3D17E8C'
  PCID generator CP name               USIBMRA.CLAUDLU1
  Conversation group ID                X'00000000'
  LU name                              USIBMRA.HENRILU1
  Partner LU name                      USIBMRA.CLAUDLU1
  Pacing type                          Adaptive

3>Session ID                           X'0C128F1CD04EC432'
```

```
  Conversation ID                      X'00000000'
  LU alias                             HENRILU1
  Partner LU alias                     @I000000
  Mode name                            CPSVCMG
  Send maximum RU size                 512
  Receive maximum RU size              512
  Send pacing window                   1
  Receive pacing window                1
  Link name                            CLAUDLU1
  Outbound destination address (DAF)   X'01'
  Outbound origin address (OAF)        X'02'
  OAF-DAF assignor indicator (ODAI)    B'0'
  Session type                         LU-LU session
  Connection type                      Peer
  Procedure correlator ID (PCID)       X'E6DB8C2499634315'
  PCID generator CP name               USIBMRA.HENRILU1
  Conversation group ID                X'00000000'
  LU name                              USIBMRA.HENRILU1
  Partner LU name                      USIBMRA.CLAUDLU1
  Pacing type                          Adaptive

 4>Session ID                          X'183C8F1CE44EC432'
  Conversation ID                      X'00000000'
  LU alias                             HENRILU1
  Partner LU alias                     @I000000
  Mode name                            SNASVCMG
  Send maximum RU size                 512
  Receive maximum RU size              512
  Send pacing window                   1
  Receive pacing window                1
  Link name                            CLAUDLU1
  Outbound destination address (DAF)   X'02'
  Outbound origin address (OAF)        X'03'
  OAF-DAF assignor indicator (ODAI)    B'1'
  Session type                         LU-LU session
  Connection type                      Peer
  Procedure correlator ID (PCID)       X'F453930FB5D17E8C'
  PCID generator CP name               USIBMRA.CLAUDLU1
  Conversation group ID                X'00000000'
  LU name                              USIBMRA.HENRILU1
  Partner LU name                      USIBMRA.CLAUDLU1
  Pacing type                          Adaptive

 5>Session ID                          X'1C508F1CEA4EC432'
  Conversation ID                      X'1C6FFC36'
  LU alias                             HENRILU1
  Partner LU alias                     @I000000
  Mode name                            MODE1
  Send maximum RU size                 1024
  Receive maximum RU size              1024
  Send pacing window                   1
  Receive pacing window                3
  Link name                            CLAUDLU1
  Outbound destination address (DAF)   X'02'
  Outbound origin address (OAF)        X'04'
  OAF-DAF assignor indicator (ODAI)    B'1'
  Session type                         LU-LU session
  Connection type                      Peer
  Procedure correlator ID (PCID)       X'F453930FB6D17E8C'
```

```
  PCID generator CP name               USIBMRA.CLAUDLU1
  Conversation group ID                X'ED4EC432'
  LU name                              USIBMRA.HENRILU1
  Partner LU name                      USIBMRA.CLAUDLU1
  Pacing type                          Adaptive

6>Session ID                           X'1E588F1CF04EC432'
  Conversation ID                      X'00000000'
  LU alias                             HENRILU1
  Partner LU alias                     RALYOS2A
  Mode name                            SNASVCMG
  Send maximum RU size                 512
  Receive maximum RU size              512
  Send pacing window                   1
  Receive pacing window                1
  Link name                            RAKSA20
  Outbound destination address (DAF)   X'02'
  Outbound origin address (OAF)        X'00'
  OAF-DAF assignor indicator (ODAI)    B'0'
  Session type                         LU-LU session
  Connection type                      Host and peer
  Procedure correlator ID (PCID)       X'C1773C1F78F65D45'
  PCID generator CP name               USIBMRA.RALYOS2A
  Conversation group ID                X'00000000'
  LU name                              USIBMRA.HENRILU1
  Partner LU name                      USIBMRA.RALYOS2A
  Pacing type                          Adaptive

7>Session ID                           X'226C8F1CF64EC432'
  Conversation ID                      X'1C97022C'
  LU alias                             HENRILU1
  Partner LU alias                     RALYOS2A
  Mode name                            MODE1
  Send maximum RU size                 1024
  Receive maximum RU size              1024
  Send pacing window                   1
  Receive pacing window                3
  Link name                            RAKSA20
  Outbound destination address (DAF)   X'02'
  Outbound origin address (OAF)        X'01'
  OAF-DAF assignor indicator (ODAI)    B'0'
  Session type                         LU-LU session
  Connection type                      Host and peer
  Procedure correlator ID (PCID)       X'C1773C1F79F65D45'
  PCID generator CP name               USIBMRA.RALYOS2A
  Conversation group ID                X'F94EC432'
  LU name                              USIBMRA.HENRILU1
  Partner LU name                      USIBMRA.RALYOS2A
  Pacing type                          Adaptive
```

Gateway Information

```
**************************************
*        Gateway Information         *
**************************************
Number of configured gateway LUs       0
```

System Default Information

```
*************************************
*     System Default Information    *
*************************************
Default mode name
Default local LU name               HENRILU1
Implicit partner LU support         Yes
Maximum held alerts                 10
Conversation security required      No
Maximum logical record send size    32767
Default TP directory                *
Default TP operation                Non-queued attach manager started
Default TP program type             Background
```

Transaction Program Definitions

```
*************************************
*  Transaction Program Definitions  *
*************************************
Attach manager active               Yes
Defined transaction programs        1

1>Transaction program name          SERVEUR
  File name                         D:\LEMANS\TP2SVR.EXE
  Program parameter string
  Synchronization level none        Supported
  Synchronization level confirm     Supported
  Conversation type                 Either basic or mapped
  Incoming allocate queue limit     255
  Incoming allocate queue depth     Non-queued program
  Incoming allocate timeout         Hold forever
  Receive allocates pending         Non-queued program
  Receive allocate timeout          Hold forever
  Transaction program type          Non-queued attach manager started
  Program state                     Inactive
  Conversation security required    No
  Process ID                        Not known to attach manager
  Program type                      Full screen
  Transaction program initiated     Remotely
  Icon file
```

Active Transaction Programs

```
*************************************
*    Active Transaction Programs    *
*************************************
Active transaction programs         2

1>Transaction program name          SERVEUR
  Transaction program ID            X'1A448F1CEF4EC432'
  User ID
  Transaction program initiated     Remotely
  LU alias                          HENRILU1
  Logical unit of work name         USIBMRA.CLAUDLU1
  Logical unit of work instance     X'A38C57BB5797'
  Logical unit of work sequence     X'0001'
  Number of conversations           1

1.1>Conversation ID                 X'1C6FFC36'
```

```
    Conversation state                  Send
    Session ID                          X'1C508F1CEA4EC432'
    Synchronization level               Confirm
    Conversation type                   Mapped
    Conversation group ID               X'32C44EED'

2>Transaction program name              SERVEUR
  Transaction program ID                X'20608F1CFB4EC432'
  User ID
  Transaction program initiated         Remotely
  LU alias                              HENRILU1
  Logical unit of work name             USIBMRA.RALYOS2A
  Logical unit of work instance         X'A38C57C4EFA5'
  Logical unit of work sequence         X'0001'
  Number of conversations               1

2.1>Conversation ID                     X'1C97022C'
    Conversation state                  Send
    Session ID                          X'226C8F1CF64EC432'
    Synchronization level               Confirm
    Conversation type                   Mapped
    Conversation group ID               X'32C44EF9'
```

X.25 Physical Link Information

```
***************************************
*   X.25 Physical Link Information    *
***************************************
The X.25 Communications Subsystem is not loaded.
```

B.2 APPN

Class of Service Information

```
***************************************
*    Class of Service Information     *
***************************************
Number of class of service definitions  7

1>Class of service name                 #CONNECT
  Transmission priority                 Medium
  Number of node rows                   8
  Number of TG rows                     8

1.1>Node row weight                     5
    Congestion min                      No
    Congestion max                      No
    Route additional resistance min     0
    Route additional resistance max     31

1.2>Node row weight                     10
    Congestion min                      No
    Congestion max                      No
    Route additional resistance min     0
    Route additional resistance max     63

1.3>Node row weight                     20
    Congestion min                      No
```

```
    Congestion max                      No
    Route additional resistance min     0
    Route additional resistance max     95

1.4>Node row weight                     40
    Congestion min                      No
    Congestion max                      No
    Route additional resistance min     0
    Route additional resistance max     127

1.5>Node row weight                     60
    Congestion min                      No
    Congestion max                      No
    Route additional resistance min     0
    Route additional resistance max     159

1.6>Node row weight                     80
    Congestion min                      No
    Congestion max                      No
    Route additional resistance min     0
    Route additional resistance max     191

1.7>Node row weight                     120
    Congestion min                      No
    Congestion max                      Yes
    Route additional resistance min     0
    Route additional resistance max     223

1.8>Node row weight                     160
    Congestion min                      No
    Congestion max                      Yes
    Route additional resistance min     0
    Route additional resistance max     255

1.1>TG row weight                       30
    Cost per connect time min           0
    Cost per connect time max           0
    Cost per byte min                   0
    Cost per byte max                   0
    Security min                        Nonsecure
    Security max                        Maximum security
    Propagation delay min               0.00 seconds (minimum)
    Propagation delay max               384.00 microseconds (local area network)
    Effective capacity min              4.30 megabits per second
    Effective capacity max              603.98 gigabits per second
    User defined parameter 1 min        0
    User defined parameter 1 max        255
    User defined parameter 2 min        0
    User defined parameter 2 max        255
    User defined parameter 3 min        0
    User defined parameter 3 max        255

1.2>TG row weight                       60
    Cost per connect time min           0
    Cost per connect time max           0
    Cost per byte min                   0
    Cost per byte max                   0
    Security min                        Nonsecure
    Security max                        Maximum security
```

```
    Propagation delay min            0.00 seconds (minimum)
    Propagation delay max            9.22 milliseconds (telephone)
    Effective capacity min           57.60 kilobits per second
    Effective capacity max           603.98 gigabits per second
    User defined parameter 1 min     0
    User defined parameter 1 max     255
    User defined parameter 2 min     0
    User defined parameter 2 max     255
    User defined parameter 3 min     0
    User defined parameter 3 max     255

1.3>TG row weight                    90
    Cost per connect time min        0
    Cost per connect time max        0
    Cost per byte min                0
    Cost per byte max                0
    Security min                     Nonsecure
    Security max                     Maximum security
    Propagation delay min            0.00 seconds (minimum)
    Propagation delay max            9.22 milliseconds (telephone)
    Effective capacity min           19.20 kilobits per second
    Effective capacity max           603.98 gigabits per second
    User defined parameter 1 min     0
    User defined parameter 1 max     255
    User defined parameter 2 min     0
    User defined parameter 2 max     255
    User defined parameter 3 min     0
    User defined parameter 3 max     255

1.4>TG row weight                    120
    Cost per connect time min        0
    Cost per connect time max        0
    Cost per byte min                0
    Cost per byte max                0
    Security min                     Nonsecure
    Security max                     Maximum security
    Propagation delay min            0.00 seconds (minimum)
    Propagation delay max            9.22 milliseconds (telephone)
    Effective capacity min           9.60 kilobits per second
    Effective capacity max           603.98 gigabits per second
    User defined parameter 1 min     0
    User defined parameter 1 max     255
    User defined parameter 2 min     0
    User defined parameter 2 max     255
    User defined parameter 3 min     0
    User defined parameter 3 max     255

1.5>TG row weight                    150
    Cost per connect time min        0
    Cost per connect time max        0
    Cost per byte min                0
    Cost per byte max                0
    Security min                     Nonsecure
    Security max                     Maximum security
    Propagation delay min            0.00 seconds (minimum)
    Propagation delay max            147.46 milliseconds (packet switched network)
    Effective capacity min           19.20 kilobits per second
    Effective capacity max           603.98 gigabits per second
    User defined parameter 1 min     0
```

```
    User defined parameter 1 max        255
    User defined parameter 2 min        0
    User defined parameter 2 max        255
    User defined parameter 3 min        0
    User defined parameter 3 max        255

1.6>TG row weight                       180
    Cost per connect time min           0
    Cost per connect time max           128
    Cost per byte min                   0
    Cost per byte max                   128
    Security min                        Nonsecure
    Security max                        Maximum security
    Propagation delay min               0.00 seconds (minimum)
    Propagation delay max               147.46 milliseconds (packet switched network)
    Effective capacity min              9.60 kilobits per second
    Effective capacity max              603.98 gigabits per second
    User defined parameter 1 min        0
    User defined parameter 1 max        255
    User defined parameter 2 min        0
    User defined parameter 2 max        255
    User defined parameter 3 min        0
    User defined parameter 3 max        255

1.7>TG row weight                       210
    Cost per connect time min           0
    Cost per connect time max           196
    Cost per byte min                   0
    Cost per byte max                   196
    Security min                        Nonsecure
    Security max                        Maximum security
    Propagation delay min               0.00 seconds (minimum)
    Propagation delay max               2013.27 seconds (maximum)
    Effective capacity min              4.80 kilobits per second
    Effective capacity max              603.98 gigabits per second
    User defined parameter 1 min        0
    User defined parameter 1 max        255
    User defined parameter 2 min        0
    User defined parameter 2 max        255
    User defined parameter 3 min        0
    User defined parameter 3 max        255

1.8>TG row weight                       240
    Cost per connect time min           0
    Cost per connect time max           255
    Cost per byte min                   0
    Cost per byte max                   255
    Security min                        Nonsecure
    Security max                        Maximum security
    Propagation delay min               0.00 seconds (minimum)
    Propagation delay max               2013.27 seconds (maximum)
    Effective capacity min              0.00 bits per second
    Effective capacity max              603.98 gigabits per second
    User defined parameter 1 min        0
    User defined parameter 1 max        255
    User defined parameter 2 min        0
    User defined parameter 2 max        255
    User defined parameter 3 min        0
    User defined parameter 3 max        255
```

```
2>Class of service name               CPSVCMG
  Transmission priority               Network
  Number of node rows                 8
  Number of TG rows                   8

2.1>Node row weight                   5
    Congestion min                    No
    Congestion max                    No
    Route additional resistance min   0
    Route additional resistance max   31

2.2>Node row weight                   10
    Congestion min                    No
    Congestion max                    No
    Route additional resistance min   0
    Route additional resistance max   63

2.3>Node row weight                   20
    Congestion min                    No
    Congestion max                    No
    Route additional resistance min   0
    Route additional resistance max   95

2.4>Node row weight                   40
    Congestion min                    No
    Congestion max                    No
    Route additional resistance min   0
    Route additional resistance max   127

2.5>Node row weight                   60
    Congestion min                    No
    Congestion max                    No
    Route additional resistance min   0
    Route additional resistance max   159

2.6>Node row weight                   80
    Congestion min                    No
    Congestion max                    No
    Route additional resistance min   0
    Route additional resistance max   191

2.7>Node row weight                   120
    Congestion min                    No
    Congestion max                    Yes
    Route additional resistance min   0
    Route additional resistance max   223

2.8>Node row weight                   160
    Congestion min                    No
    Congestion max                    Yes
    Route additional resistance min   0
    Route additional resistance max   255

2.1>TG row weight                     30
    Cost per connect time min         0
    Cost per connect time max         0
    Cost per byte min                 0
    Cost per byte max                 0
```

```
    Security min                      Nonsecure
    Security max                      Maximum security
    Propagation delay min             0.00 seconds (minimum)
    Propagation delay max             384.00 microseconds (local area network)
    Effective capacity min            4.30 megabits per second
    Effective capacity max            603.98 gigabits per second
    User defined parameter 1 min      0
    User defined parameter 1 max      255
    User defined parameter 2 min      0
    User defined parameter 2 max      255
    User defined parameter 3 min      0
    User defined parameter 3 max      255

2.2>TG row weight                     60
    Cost per connect time min         0
    Cost per connect time max         0
    Cost per byte min                 0
    Cost per byte max                 0
    Security min                      Nonsecure
    Security max                      Maximum security
    Propagation delay min             0.00 seconds (minimum)
    Propagation delay max             9.22 milliseconds (telephone)
    Effective capacity min            57.60 kilobits per second
    Effective capacity max            603.98 gigabits per second
    User defined parameter 1 min      0
    User defined parameter 1 max      255
    User defined parameter 2 min      0
    User defined parameter 2 max      255
    User defined parameter 3 min      0
    User defined parameter 3 max      255

2.3>TG row weight                     90
    Cost per connect time min         0
    Cost per connect time max         0
    Cost per byte min                 0
    Cost per byte max                 0
    Security min                      Nonsecure
    Security max                      Maximum security
    Propagation delay min             0.00 seconds (minimum)
    Propagation delay max             9.22 milliseconds (telephone)
    Effective capacity min            19.20 kilobits per second
    Effective capacity max            603.98 gigabits per second
    User defined parameter 1 min      0
    User defined parameter 1 max      255
    User defined parameter 2 min      0
    User defined parameter 2 max      255
    User defined parameter 3 min      0
    User defined parameter 3 max      255

2.4>TG row weight                     120
    Cost per connect time min         0
    Cost per connect time max         0
    Cost per byte min                 0
    Cost per byte max                 0
    Security min                      Nonsecure
    Security max                      Maximum security
    Propagation delay min             0.00 seconds (minimum)
    Propagation delay max             9.22 milliseconds (telephone)
    Effective capacity min            9.60 kilobits per second
```

```
    Effective capacity max           603.98 gigabits per second
    User defined parameter 1 min     0
    User defined parameter 1 max     255
    User defined parameter 2 min     0
    User defined parameter 2 max     255
    User defined parameter 3 min     0
    User defined parameter 3 max     255

2.5>TG row weight                    150
    Cost per connect time min        0
    Cost per connect time max        0
    Cost per byte min                0
    Cost per byte max                0
    Security min                     Nonsecure
    Security max                     Maximum security
    Propagation delay min            0.00 seconds (minimum)
    Propagation delay max            147.46 milliseconds (packet switched network)
    Effective capacity min           19.20 kilobits per second
    Effective capacity max           603.98 gigabits per second
    User defined parameter 1 min     0
    User defined parameter 1 max     255
    User defined parameter 2 min     0
    User defined parameter 2 max     255
    User defined parameter 3 min     0
    User defined parameter 3 max     255

2.6>TG row weight                    180
    Cost per connect time min        0
    Cost per connect time max        128
    Cost per byte min                0
    Cost per byte max                128
    Security min                     Nonsecure
    Security max                     Maximum security
    Propagation delay min            0.00 seconds (minimum)
    Propagation delay max            147.46 milliseconds (packet switched network)
    Effective capacity min           9.60 kilobits per second
    Effective capacity max           603.98 gigabits per second
    User defined parameter 1 min     0
    User defined parameter 1 max     255
    User defined parameter 2 min     0
    User defined parameter 2 max     255
    User defined parameter 3 min     0
    User defined parameter 3 max     255

2.7>TG row weight                    210
    Cost per connect time min        0
    Cost per connect time max        196
    Cost per byte min                0
    Cost per byte max                196
    Security min                     Nonsecure
    Security max                     Maximum security
    Propagation delay min            0.00 seconds (minimum)
    Propagation delay max            2013.27 seconds (maximum)
    Effective capacity min           4.80 kilobits per second
    Effective capacity max           603.98 gigabits per second
    User defined parameter 1 min     0
    User defined parameter 1 max     255
    User defined parameter 2 min     0
    User defined parameter 2 max     255
```

```
    User defined parameter 3 min       0
    User defined parameter 3 max       255

2.8>TG row weight                      240
    Cost per connect time min          0
    Cost per connect time max          255
    Cost per byte min                  0
    Cost per byte max                  255
    Security min                       Nonsecure
    Security max                       Maximum security
    Propagation delay min              0.00 seconds (minimum)
    Propagation delay max              2013.27 seconds (maximum)
    Effective capacity min             0.00 bits per second
    Effective capacity max             603.98 gigabits per second
    User defined parameter 1 min       0
    User defined parameter 1 max       255
    User defined parameter 2 min       0
    User defined parameter 2 max       255
    User defined parameter 3 min       0
    User defined parameter 3 max       255

3>Class of service name                SNASVCMG
  Transmission priority                Network
  Number of node rows                  8
  Number of TG rows                    8

3.1>Node row weight                    5
    Congestion min                     No
    Congestion max                     No
    Route additional resistance min    0
    Route additional resistance max    31

3.2>Node row weight                    10
    Congestion min                     No
    Congestion max                     No
    Route additional resistance min    0
    Route additional resistance max    63

3.3>Node row weight                    20
    Congestion min                     No
    Congestion max                     No
    Route additional resistance min    0
    Route additional resistance max    95

3.4>Node row weight                    40
    Congestion min                     No
    Congestion max                     No
    Route additional resistance min    0
    Route additional resistance max    127

3.5>Node row weight                    60
    Congestion min                     No
    Congestion max                     No
    Route additional resistance min    0
    Route additional resistance max    159

3.6>Node row weight                    80
    Congestion min                     No
    Congestion max                     No
```

```
    Route additional resistance min     0
    Route additional resistance max     191

3.7>Node row weight                     120
    Congestion min                      No
    Congestion max                      Yes
    Route additional resistance min     0
    Route additional resistance max     223

3.8>Node row weight                     160
    Congestion min                      No
    Congestion max                      Yes
    Route additional resistance min     0
    Route additional resistance max     255

3.1>TG row weight                       30
    Cost per connect time min           0
    Cost per connect time max           0
    Cost per byte min                   0
    Cost per byte max                   0
    Security min                        Nonsecure
    Security max                        Maximum security
    Propagation delay min               0.00 seconds (minimum)
    Propagation delay max               384.00 microseconds (local area network)
    Effective capacity min              4.30 megabits per second
    Effective capacity max              603.98 gigabits per second
    User defined parameter 1 min        0
    User defined parameter 1 max        255
    User defined parameter 2 min        0
    User defined parameter 2 max        255
    User defined parameter 3 min        0
    User defined parameter 3 max        255

3.2>TG row weight                       60
    Cost per connect time min           0
    Cost per connect time max           0
    Cost per byte min                   0
    Cost per byte max                   0
    Security min                        Nonsecure
    Security max                        Maximum security
    Propagation delay min               0.00 seconds (minimum)
    Propagation delay max               9.22 milliseconds (telephone)
    Effective capacity min              57.60 kilobits per second
    Effective capacity max              603.98 gigabits per second
    User defined parameter 1 min        0
    User defined parameter 1 max        255
    User defined parameter 2 min        0
    User defined parameter 2 max        255
    User defined parameter 3 min        0
    User defined parameter 3 max        255

3.3>TG row weight                       90
    Cost per connect time min           0
    Cost per connect time max           0
    Cost per byte min                   0
    Cost per byte max                   0
    Security min                        Nonsecure
    Security max                        Maximum security
    Propagation delay min               0.00 seconds (minimum)
```

```
    Propagation delay max          9.22 milliseconds (telephone)
    Effective capacity min         19.20 kilobits per second
    Effective capacity max         603.98 gigabits per second
    User defined parameter 1 min   0
    User defined parameter 1 max   255
    User defined parameter 2 min   0
    User defined parameter 2 max   255
    User defined parameter 3 min   0
    User defined parameter 3 max   255

3.4>TG row weight                  120
    Cost per connect time min      0
    Cost per connect time max      0
    Cost per byte min              0
    Cost per byte max              0
    Security min                   Nonsecure
    Security max                   Maximum security
    Propagation delay min          0.00 seconds (minimum)
    Propagation delay max          9.22 milliseconds (telephone)
    Effective capacity min         9.60 kilobits per second
    Effective capacity max         603.98 gigabits per second
    User defined parameter 1 min   0
    User defined parameter 1 max   255
    User defined parameter 2 min   0
    User defined parameter 2 max   255
    User defined parameter 3 min   0
    User defined parameter 3 max   255

3.5>TG row weight                  150
    Cost per connect time min      0
    Cost per connect time max      0
    Cost per byte min              0
    Cost per byte max              0
    Security min                   Nonsecure
    Security max                   Maximum security
    Propagation delay min          0.00 seconds (minimum)
    Propagation delay max          147.46 milliseconds (packet switched network)
    Effective capacity min         19.20 kilobits per second
    Effective capacity max         603.98 gigabits per second
    User defined parameter 1 min   0
    User defined parameter 1 max   255
    User defined parameter 2 min   0
    User defined parameter 2 max   255
    User defined parameter 3 min   0
    User defined parameter 3 max   255

3.6>TG row weight                  180
    Cost per connect time min      0
    Cost per connect time max      128
    Cost per byte min              0
    Cost per byte max              128
    Security min                   Nonsecure
    Security max                   Maximum security
    Propagation delay min          0.00 seconds (minimum)
    Propagation delay max          147.46 milliseconds (packet switched network)
    Effective capacity min         9.60 kilobits per second
    Effective capacity max         603.98 gigabits per second
    User defined parameter 1 min   0
    User defined parameter 1 max   255
```

```
    User defined parameter 2 min       0
    User defined parameter 2 max       255
    User defined parameter 3 min       0
    User defined parameter 3 max       255

3.7>TG row weight                      210
    Cost per connect time min          0
    Cost per connect time max          196
    Cost per byte min                  0
    Cost per byte max                  196
    Security min                       Nonsecure
    Security max                       Maximum security
    Propagation delay min              0.00 seconds (minimum)
    Propagation delay max              2013.27 seconds (maximum)
    Effective capacity min             4.80 kilobits per second
    Effective capacity max             603.98 gigabits per second
    User defined parameter 1 min       0
    User defined parameter 1 max       255
    User defined parameter 2 min       0
    User defined parameter 2 max       255
    User defined parameter 3 min       0
    User defined parameter 3 max       255

3.8>TG row weight                      240
    Cost per connect time min          0
    Cost per connect time max          255
    Cost per byte min                  0
    Cost per byte max                  255
    Security min                       Nonsecure
    Security max                       Maximum security
    Propagation delay min              0.00 seconds (minimum)
    Propagation delay max              2013.27 seconds (maximum)
    Effective capacity min             0.00 bits per second
    Effective capacity max             603.98 gigabits per second
    User defined parameter 1 min       0
    User defined parameter 1 max       255
    User defined parameter 2 min       0
    User defined parameter 2 max       255
    User defined parameter 3 min       0
    User defined parameter 3 max       255

4>Class of service name                #INTER
  Transmission priority                High
  Number of node rows                  8
  Number of TG rows                    8

4.1>Node row weight                    5
    Congestion min                     No
    Congestion max                     No
    Route additional resistance min    0
    Route additional resistance max    31

4.2>Node row weight                    10
    Congestion min                     No
    Congestion max                     No
    Route additional resistance min    0
    Route additional resistance max    63

4.3>Node row weight                    20
```

```
    Congestion min                      No
    Congestion max                      No
    Route additional resistance min     0
    Route additional resistance max     95

4.4>Node row weight                     40
    Congestion min                      No
    Congestion max                      No
    Route additional resistance min     0
    Route additional resistance max     127

4.5>Node row weight                     60
    Congestion min                      No
    Congestion max                      No
    Route additional resistance min     0
    Route additional resistance max     159

4.6>Node row weight                     80
    Congestion min                      No
    Congestion max                      No
    Route additional resistance min     0
    Route additional resistance max     191

4.7>Node row weight                     120
    Congestion min                      No
    Congestion max                      Yes
    Route additional resistance min     0
    Route additional resistance max     223

4.8>Node row weight                     160
    Congestion min                      No
    Congestion max                      Yes
    Route additional resistance min     0
    Route additional resistance max     255

4.1>TG row weight                       30
    Cost per connect time min           0
    Cost per connect time max           0
    Cost per byte min                   0
    Cost per byte max                   0
    Security min                        Nonsecure
    Security max                        Maximum security
    Propagation delay min               0.00 seconds (minimum)
    Propagation delay max               384.00 microseconds (local area network)
    Effective capacity min              4.30 megabits per second
    Effective capacity max              603.98 gigabits per second
    User defined parameter 1 min        0
    User defined parameter 1 max        255
    User defined parameter 2 min        0
    User defined parameter 2 max        255
    User defined parameter 3 min        0
    User defined parameter 3 max        255

4.2>TG row weight                       60
    Cost per connect time min           0
    Cost per connect time max           0
    Cost per byte min                   0
    Cost per byte max                   0
    Security min                        Nonsecure
```

```
    Security max                    Maximum security
    Propagation delay min           0.00 seconds (minimum)
    Propagation delay max           9.22 milliseconds (telephone)
    Effective capacity min          57.60 kilobits per second
    Effective capacity max          603.98 gigabits per second
    User defined parameter 1 min    0
    User defined parameter 1 max    255
    User defined parameter 2 min    0
    User defined parameter 2 max    255
    User defined parameter 3 min    0
    User defined parameter 3 max    255

4.3>TG row weight                   90
    Cost per connect time min       0
    Cost per connect time max       128
    Cost per byte min               0
    Cost per byte max               128
    Security min                    Nonsecure
    Security max                    Maximum security
    Propagation delay min           0.00 seconds (minimum)
    Propagation delay max           9.22 milliseconds (telephone)
    Effective capacity min          57.60 kilobits per second
    Effective capacity max          603.98 gigabits per second
    User defined parameter 1 min    0
    User defined parameter 1 max    255
    User defined parameter 2 min    0
    User defined parameter 2 max    255
    User defined parameter 3 min    0
    User defined parameter 3 max    255

4.4>TG row weight                   120
    Cost per connect time min       0
    Cost per connect time max       0
    Cost per byte min               0
    Cost per byte max               0
    Security min                    Nonsecure
    Security max                    Maximum security
    Propagation delay min           0.00 seconds (minimum)
    Propagation delay max           9.22 milliseconds (telephone)
    Effective capacity min          19.20 kilobits per second
    Effective capacity max          603.98 gigabits per second
    User defined parameter 1 min    0
    User defined parameter 1 max    255
    User defined parameter 2 min    0
    User defined parameter 2 max    255
    User defined parameter 3 min    0
    User defined parameter 3 max    255

4.5>TG row weight                   150
    Cost per connect time min       0
    Cost per connect time max       128
    Cost per byte min               0
    Cost per byte max               128
    Security min                    Nonsecure
    Security max                    Maximum security
    Propagation delay min           0.00 seconds (minimum)
    Propagation delay max           147.46 milliseconds (packet switched network)
    Effective capacity min          19.20 kilobits per second
    Effective capacity max          603.98 gigabits per second
```

```
    User defined parameter 1 min       0
    User defined parameter 1 max       255
    User defined parameter 2 min       0
    User defined parameter 2 max       255
    User defined parameter 3 min       0
    User defined parameter 3 max       255

4.6>TG row weight                      180
    Cost per connect time min          0
    Cost per connect time max          0
    Cost per byte min                  0
    Cost per byte max                  0
    Security min                       Nonsecure
    Security max                       Maximum security
    Propagation delay min              0.00 seconds (minimum)
    Propagation delay max              147.46 milliseconds (packet switched network)
    Effective capacity min             9.60 kilobits per second
    Effective capacity max             603.98 gigabits per second
    User defined parameter 1 min       0
    User defined parameter 1 max       255
    User defined parameter 2 min       0
    User defined parameter 2 max       255
    User defined parameter 3 min       0
    User defined parameter 3 max       255

4.7>TG row weight                      210
    Cost per connect time min          0
    Cost per connect time max          196
    Cost per byte min                  0
    Cost per byte max                  196
    Security min                       Nonsecure
    Security max                       Maximum security
    Propagation delay min              0.00 seconds (minimum)
    Propagation delay max              2013.27 seconds (maximum)
    Effective capacity min             9.60 kilobits per second
    Effective capacity max             603.98 gigabits per second
    User defined parameter 1 min       0
    User defined parameter 1 max       255
    User defined parameter 2 min       0
    User defined parameter 2 max       255
    User defined parameter 3 min       0
    User defined parameter 3 max       255

4.8>TG row weight                      240
    Cost per connect time min          0
    Cost per connect time max          255
    Cost per byte min                  0
    Cost per byte max                  255
    Security min                       Nonsecure
    Security max                       Maximum security
    Propagation delay min              0.00 seconds (minimum)
    Propagation delay max              2013.27 seconds (maximum)
    Effective capacity min             0.00 bits per second
    Effective capacity max             603.98 gigabits per second
    User defined parameter 1 min       0
    User defined parameter 1 max       255
    User defined parameter 2 min       0
    User defined parameter 2 max       255
    User defined parameter 3 min       0
```

```
    User defined parameter 3 max        255

5>Class of service name                 #INTERSC
  Transmission priority                 High
  Number of node rows                   8
  Number of TG rows                     8

5.1>Node row weight                     5
    Congestion min                      No
    Congestion max                      No
    Route additional resistance min     0
    Route additional resistance max     31

5.2>Node row weight                     10
    Congestion min                      No
    Congestion max                      No
    Route additional resistance min     0
    Route additional resistance max     63

5.3>Node row weight                     20
    Congestion min                      No
    Congestion max                      No
    Route additional resistance min     0
    Route additional resistance max     95

5.4>Node row weight                     40
    Congestion min                      No
    Congestion max                      No
    Route additional resistance min     0
    Route additional resistance max     127

5.5>Node row weight                     60
    Congestion min                      No
    Congestion max                      No
    Route additional resistance min     0
    Route additional resistance max     159

5.6>Node row weight                     80
    Congestion min                      No
    Congestion max                      No
    Route additional resistance min     0
    Route additional resistance max     191

5.7>Node row weight                     120
    Congestion min                      No
    Congestion max                      Yes
    Route additional resistance min     0
    Route additional resistance max     223

5.8>Node row weight                     160
    Congestion min                      No
    Congestion max                      Yes
    Route additional resistance min     0
    Route additional resistance max     255

5.1>TG row weight                       30
    Cost per connect time min           0
    Cost per connect time max           0
    Cost per byte min                   0
```

```
    Cost per byte max                0
    Security min                     Public switched network
    Security max                     Maximum security
    Propagation delay min            0.00 seconds (minimum)
    Propagation delay max            384.00 microseconds (local area network)
    Effective capacity min           4.30 megabits per second
    Effective capacity max           603.98 gigabits per second
    User defined parameter 1 min     0
    User defined parameter 1 max     255
    User defined parameter 2 min     0
    User defined parameter 2 max     255
    User defined parameter 3 min     0
    User defined parameter 3 max     255

5.2>TG row weight                    60
    Cost per connect time min        0
    Cost per connect time max        0
    Cost per byte min                0
    Cost per byte max                0
    Security min                     Public switched network
    Security max                     Maximum security
    Propagation delay min            0.00 seconds (minimum)
    Propagation delay max            9.22 milliseconds (telephone)
    Effective capacity min           57.60 kilobits per second
    Effective capacity max           603.98 gigabits per second
    User defined parameter 1 min     0
    User defined parameter 1 max     255
    User defined parameter 2 min     0
    User defined parameter 2 max     255
    User defined parameter 3 min     0
    User defined parameter 3 max     255

5.3>TG row weight                    90
    Cost per connect time min        0
    Cost per connect time max        128
    Cost per byte min                0
    Cost per byte max                128
    Security min                     Public switched network
    Security max                     Maximum security
    Propagation delay min            0.00 seconds (minimum)
    Propagation delay max            9.22 milliseconds (telephone)
    Effective capacity min           57.60 kilobits per second
    Effective capacity max           603.98 gigabits per second
    User defined parameter 1 min     0
    User defined parameter 1 max     255
    User defined parameter 2 min     0
    User defined parameter 2 max     255
    User defined parameter 3 min     0
    User defined parameter 3 max     255

5.4>TG row weight                    120
    Cost per connect time min        0
    Cost per connect time max        0
    Cost per byte min                0
    Cost per byte max                0
    Security min                     Public switched network
    Security max                     Maximum security
    Propagation delay min            0.00 seconds (minimum)
    Propagation delay max            9.22 milliseconds (telephone)
```

```
    Effective capacity min           19.20 kilobits per second
    Effective capacity max           603.98 gigabits per second
    User defined parameter 1 min     0
    User defined parameter 1 max     255
    User defined parameter 2 min     0
    User defined parameter 2 max     255
    User defined parameter 3 min     0
    User defined parameter 3 max     255

5.5>TG row weight                    150
    Cost per connect time min        0
    Cost per connect time max        128
    Cost per byte min                0
    Cost per byte max                128
    Security min                     Public switched network
    Security max                     Maximum security
    Propagation delay min            0.00 seconds (minimum)
    Propagation delay max            147.46 milliseconds (packet switched network)
    Effective capacity min           19.20 kilobits per second
    Effective capacity max           603.98 gigabits per second
    User defined parameter 1 min     0
    User defined parameter 1 max     255
    User defined parameter 2 min     0
    User defined parameter 2 max     255
    User defined parameter 3 min     0
    User defined parameter 3 max     255

5.6>TG row weight                    180
    Cost per connect time min        0
    Cost per connect time max        0
    Cost per byte min                0
    Cost per byte max                0
    Security min                     Public switched network
    Security max                     Maximum security
    Propagation delay min            0.00 seconds (minimum)
    Propagation delay max            147.46 milliseconds (packet switched network)
    Effective capacity min           9.60 kilobits per second
    Effective capacity max           603.98 gigabits per second
    User defined parameter 1 min     0
    User defined parameter 1 max     255
    User defined parameter 2 min     0
    User defined parameter 2 max     255
    User defined parameter 3 min     0
    User defined parameter 3 max     255

5.7>TG row weight                    210
    Cost per connect time min        0
    Cost per connect time max        196
    Cost per byte min                0
    Cost per byte max                196
    Security min                     Public switched network
    Security max                     Maximum security
    Propagation delay min            0.00 seconds (minimum)
    Propagation delay max            2013.27 seconds (maximum)
    Effective capacity min           9.60 kilobits per second
    Effective capacity max           603.98 gigabits per second
    User defined parameter 1 min     0
    User defined parameter 1 max     255
    User defined parameter 2 min     0
```

```
    User defined parameter 2 max       255
    User defined parameter 3 min       0
    User defined parameter 3 max       255

5.8>TG row weight                      240
    Cost per connect time min          0
    Cost per connect time max          255
    Cost per byte min                  0
    Cost per byte max                  255
    Security min                       Public switched network
    Security max                       Maximum security
    Propagation delay min              0.00 seconds (minimum)
    Propagation delay max              2013.27 seconds (maximum)
    Effective capacity min             0.00 bits per second
    Effective capacity max             603.98 gigabits per second
    User defined parameter 1 min       0
    User defined parameter 1 max       255
    User defined parameter 2 min       0
    User defined parameter 2 max       255
    User defined parameter 3 min       0
    User defined parameter 3 max       255

6>Class of service name                #BATCH
  Transmission priority                Low
  Number of node rows                  8
  Number of TG rows                    8

6.1>Node row weight                    5
    Congestion min                     No
    Congestion max                     No
    Route additional resistance min    0
    Route additional resistance max    31

6.2>Node row weight                    10
    Congestion min                     No
    Congestion max                     No
    Route additional resistance min    0
    Route additional resistance max    63

6.3>Node row weight                    20
    Congestion min                     No
    Congestion max                     No
    Route additional resistance min    0
    Route additional resistance max    95

6.4>Node row weight                    40
    Congestion min                     No
    Congestion max                     No
    Route additional resistance min    0
    Route additional resistance max    127

6.5>Node row weight                    60
    Congestion min                     No
    Congestion max                     No
    Route additional resistance min    0
    Route additional resistance max    159

6.6>Node row weight                    80
    Congestion min                     No
```

```
    Congestion max                        No
    Route additional resistance min       0
    Route additional resistance max       191

6.7>Node row weight                       120
    Congestion min                        No
    Congestion max                        Yes
    Route additional resistance min       0
    Route additional resistance max       223

6.8>Node row weight                       160
    Congestion min                        No
    Congestion max                        Yes
    Route additional resistance min       0
    Route additional resistance max       255

6.1>TG row weight                         30
    Cost per connect time min             0
    Cost per connect time max             0
    Cost per byte min                     0
    Cost per byte max                     0
    Security min                          Nonsecure
    Security max                          Maximum security
    Propagation delay min                 0.00 seconds (minimum)
    Propagation delay max                 2013.27 seconds (maximum)
    Effective capacity min                57.60 kilobits per second
    Effective capacity max                603.98 gigabits per second
    User defined parameter 1 min          0
    User defined parameter 1 max          255
    User defined parameter 2 min          0
    User defined parameter 2 max          255
    User defined parameter 3 min          0
    User defined parameter 3 max          255

6.2>TG row weight                         60
    Cost per connect time min             0
    Cost per connect time max             0
    Cost per byte min                     0
    Cost per byte max                     0
    Security min                          Nonsecure
    Security max                          Maximum security
    Propagation delay min                 0.00 seconds (minimum)
    Propagation delay max                 2013.27 seconds (maximum)
    Effective capacity min                19.20 kilobits per second
    Effective capacity max                603.98 gigabits per second
    User defined parameter 1 min          0
    User defined parameter 1 max          255
    User defined parameter 2 min          0
    User defined parameter 2 max          255
    User defined parameter 3 min          0
    User defined parameter 3 max          255

6.3>TG row weight                         90
    Cost per connect time min             0
    Cost per connect time max             128
    Cost per byte min                     0
    Cost per byte max                     128
    Security min                          Nonsecure
    Security max                          Maximum security
```

```
    Propagation delay min          0.00 seconds (minimum)
    Propagation delay max          2013.27 seconds (maximum)
    Effective capacity min         19.20 kilobits per second
    Effective capacity max         603.98 gigabits per second
    User defined parameter 1 min   0
    User defined parameter 1 max   255
    User defined parameter 2 min   0
    User defined parameter 2 max   255
    User defined parameter 3 min   0
    User defined parameter 3 max   255

6.4>TG row weight                  120
    Cost per connect time min      0
    Cost per connect time max      0
    Cost per byte min              0
    Cost per byte max              0
    Security min                   Nonsecure
    Security max                   Maximum security
    Propagation delay min          0.00 seconds (minimum)
    Propagation delay max          2013.27 seconds (maximum)
    Effective capacity min         9.60 kilobits per second
    Effective capacity max         603.98 gigabits per second
    User defined parameter 1 min   0
    User defined parameter 1 max   255
    User defined parameter 2 min   0
    User defined parameter 2 max   255
    User defined parameter 3 min   0
    User defined parameter 3 max   255

6.5>TG row weight                  150
    Cost per connect time min      0
    Cost per connect time max      128
    Cost per byte min              0
    Cost per byte max              128
    Security min                   Nonsecure
    Security max                   Maximum security
    Propagation delay min          0.00 seconds (minimum)
    Propagation delay max          2013.27 seconds (maximum)
    Effective capacity min         9.60 kilobits per second
    Effective capacity max         603.98 gigabits per second
    User defined parameter 1 min   0
    User defined parameter 1 max   255
    User defined parameter 2 min   0
    User defined parameter 2 max   255
    User defined parameter 3 min   0
    User defined parameter 3 max   255

6.6>TG row weight                  180
    Cost per connect time min      0
    Cost per connect time max      196
    Cost per byte min              0
    Cost per byte max              196
    Security min                   Nonsecure
    Security max                   Maximum security
    Propagation delay min          0.00 seconds (minimum)
    Propagation delay max          2013.27 seconds (maximum)
    Effective capacity min         9.60 kilobits per second
    Effective capacity max         603.98 gigabits per second
    User defined parameter 1 min   0
```

```
    User defined parameter 1 max       255
    User defined parameter 2 min       0
    User defined parameter 2 max       255
    User defined parameter 3 min       0
    User defined parameter 3 max       255

6.7>TG row weight                      210
    Cost per connect time min          0
    Cost per connect time max          196
    Cost per byte min                  0
    Cost per byte max                  196
    Security min                       Nonsecure
    Security max                       Maximum security
    Propagation delay min              0.00 seconds (minimum)
    Propagation delay max              2013.27 seconds (maximum)
    Effective capacity min             4.80 kilobits per second
    Effective capacity max             603.98 gigabits per second
    User defined parameter 1 min       0
    User defined parameter 1 max       255
    User defined parameter 2 min       0
    User defined parameter 2 max       255
    User defined parameter 3 min       0
    User defined parameter 3 max       255

6.8>TG row weight                      240
    Cost per connect time min          0
    Cost per connect time max          255
    Cost per byte min                  0
    Cost per byte max                  255
    Security min                       Nonsecure
    Security max                       Maximum security
    Propagation delay min              0.00 seconds (minimum)
    Propagation delay max              2013.27 seconds (maximum)
    Effective capacity min             0.00 bits per second
    Effective capacity max             603.98 gigabits per second
    User defined parameter 1 min       0
    User defined parameter 1 max       255
    User defined parameter 2 min       0
    User defined parameter 2 max       255
    User defined parameter 3 min       0
    User defined parameter 3 max       255

7>Class of service name                #BATCHSC
  Transmission priority                Low
  Number of node rows                  8
  Number of TG rows                    8

7.1>Node row weight                    5
    Congestion min                     No
    Congestion max                     No
    Route additional resistance min    0
    Route additional resistance max    31

7.2>Node row weight                    10
    Congestion min                     No
    Congestion max                     No
    Route additional resistance min    0
    Route additional resistance max    63
```

```
7.3>Node row weight                       20
    Congestion min                        No
    Congestion max                        No
    Route additional resistance min       0
    Route additional resistance max       95

7.4>Node row weight                       40
    Congestion min                        No
    Congestion max                        No
    Route additional resistance min       0
    Route additional resistance max       127

7.5>Node row weight                       60
    Congestion min                        No
    Congestion max                        No
    Route additional resistance min       0
    Route additional resistance max       159

7.6>Node row weight                       80
    Congestion min                        No
    Congestion max                        No
    Route additional resistance min       0
    Route additional resistance max       191

7.7>Node row weight                       120
    Congestion min                        No
    Congestion max                        Yes
    Route additional resistance min       0
    Route additional resistance max       223

7.8>Node row weight                       160
    Congestion min                        No
    Congestion max                        Yes
    Route additional resistance min       0
    Route additional resistance max       255

7.1>TG row weight                         30
    Cost per connect time min             0
    Cost per connect time max             0
    Cost per byte min                     0
    Cost per byte max                     0
    Security min                          Public switched network
    Security max                          Maximum security
    Propagation delay min                 0.00 seconds (minimum)
    Propagation delay max                 2013.27 seconds (maximum)
    Effective capacity min                57.60 kilobits per second
    Effective capacity max                603.98 gigabits per second
    User defined parameter 1 min          0
    User defined parameter 1 max          255
    User defined parameter 2 min          0
    User defined parameter 2 max          255
    User defined parameter 3 min          0
    User defined parameter 3 max          255

7.2>TG row weight                         60
    Cost per connect time min             0
    Cost per connect time max             0
    Cost per byte min                     0
    Cost per byte max                     0
```

```
    Security min                    Public switched network
    Security max                    Maximum security
    Propagation delay min           0.00 seconds (minimum)
    Propagation delay max           2013.27 seconds (maximum)
    Effective capacity min          19.20 kilobits per second
    Effective capacity max          603.98 gigabits per second
    User defined parameter 1 min    0
    User defined parameter 1 max    255
    User defined parameter 2 min    0
    User defined parameter 2 max    255
    User defined parameter 3 min    0
    User defined parameter 3 max    255

7.3>TG row weight                   90
    Cost per connect time min       0
    Cost per connect time max       128
    Cost per byte min               0
    Cost per byte max               128
    Security min                    Public switched network
    Security max                    Maximum security
    Propagation delay min           0.00 seconds (minimum)
    Propagation delay max           2013.27 seconds (maximum)
    Effective capacity min          19.20 kilobits per second
    Effective capacity max          603.98 gigabits per second
    User defined parameter 1 min    0
    User defined parameter 1 max    255
    User defined parameter 2 min    0
    User defined parameter 2 max    255
    User defined parameter 3 min    0
    User defined parameter 3 max    255

7.4>TG row weight                   120
    Cost per connect time min       0
    Cost per connect time max       0
    Cost per byte min               0
    Cost per byte max               0
    Security min                    Public switched network
    Security max                    Maximum security
    Propagation delay min           0.00 seconds (minimum)
    Propagation delay max           2013.27 seconds (maximum)
    Effective capacity min          9.60 kilobits per second
    Effective capacity max          603.98 gigabits per second
    User defined parameter 1 min    0
    User defined parameter 1 max    255
    User defined parameter 2 min    0
    User defined parameter 2 max    255
    User defined parameter 3 min    0
    User defined parameter 3 max    255

7.5>TG row weight                   150
    Cost per connect time min       0
    Cost per connect time max       128
    Cost per byte min               0
    Cost per byte max               128
    Security min                    Public switched network
    Security max                    Maximum security
    Propagation delay min           0.00 seconds (minimum)
    Propagation delay max           2013.27 seconds (maximum)
    Effective capacity min          9.60 kilobits per second
```

```
    Effective capacity max             603.98 gigabits per second
    User defined parameter 1 min       0
    User defined parameter 1 max       255
    User defined parameter 2 min       0
    User defined parameter 2 max       255
    User defined parameter 3 min       0
    User defined parameter 3 max       255

7.6>TG row weight                      180
    Cost per connect time min          0
    Cost per connect time max          196
    Cost per byte min                  0
    Cost per byte max                  196
    Security min                       Public switched network
    Security max                       Maximum security
    Propagation delay min              0.00 seconds (minimum)
    Propagation delay max              2013.27 seconds (maximum)
    Effective capacity min             9.60 kilobits per second
    Effective capacity max             603.98 gigabits per second
    User defined parameter 1 min       0
    User defined parameter 1 max       255
    User defined parameter 2 min       0
    User defined parameter 2 max       255
    User defined parameter 3 min       0
    User defined parameter 3 max       255

7.7>TG row weight                      210
    Cost per connect time min          0
    Cost per connect time max          196
    Cost per byte min                  0
    Cost per byte max                  196
    Security min                       Public switched network
    Security max                       Maximum security
    Propagation delay min              0.00 seconds (minimum)
    Propagation delay max              2013.27 seconds (maximum)
    Effective capacity min             4.80 kilobits per second
    Effective capacity max             603.98 gigabits per second
    User defined parameter 1 min       0
    User defined parameter 1 max       255
    User defined parameter 2 min       0
    User defined parameter 2 max       255
    User defined parameter 3 min       0
    User defined parameter 3 max       255

7.8>TG row weight                      240
    Cost per connect time min          0
    Cost per connect time max          255
    Cost per byte min                  0
    Cost per byte max                  255
    Security min                       Public switched network
    Security max                       Maximum security
    Propagation delay min              0.00 seconds (minimum)
    Propagation delay max              2013.27 seconds (maximum)
    Effective capacity min             0.00 bits per second
    Effective capacity max             603.98 gigabits per second
    User defined parameter 1 min       0
    User defined parameter 1 max       255
    User defined parameter 2 min       0
    User defined parameter 2 max       255
```

```
   User defined parameter 3 min       0
   User defined parameter 3 max       255
```

Connection Network Information

```
**************************************
*   Connection Network Information   *
**************************************
Connection network definitions        1

1>Connection network name             USIBMRA.CONNETW1
  Effective capacity                  4000000 bits per second
  Cost per connect time               0
  Cost per byte                       0
  Propagation delay                   384.00 microseconds (local area network)
  User defined parameter 1            128
  User defined parameter 2            128
  User defined parameter 3            128
  Security                            Nonsecure
  Attached adapters                   1

1.1>DLC name                          IBMTRNET
    Adapter number                    1
```

Directory Information

```
**************************************
*       Directory Information        *
**************************************
Total directory entries               5
Network node entries                  1

1>Network node CP name                USIBMRA.HENRILU1
  Number of associated LUs            5

1.1>LU name                           USIBMRA.HENRILU1
    Owning CP name                    USIBMRA.HENRILU1
    LU entry type                     Home

1.2>LU name                           USIBMRA.RAK
    Owning CP name                    USIBMRA.RAK
    LU entry type                     Home

1.3>LU name                           * (wildcard entry)
    Owning CP name                    USIBMRA.RAK
    LU entry type                     Home

1.4>LU name                           USIBMRA.CLAUDLU1
    Owning CP name                    USIBMRA.CLAUDLU1
    LU entry type                     Register

1.5>LU name                           USIBMRA.CLAUDLU2
    Owning CP name                    USIBMRA.CLAUDLU1
    LU entry type                     Register

Local and adjacent node entries       0
```

Intermediate Sessions Information

```
**************************************
* Intermediate Sessions Information  *
**************************************
Number of intermediate sessions        1

1>Primary side adjacent CP name        USIBMRA.CLAUDLU1
  Secondary side adjacent CP name      USIBMRA.RAK
  Primary side link name               CLAUDLU1
  Secondary side link name             RAKSA20
  Procedure correlator ID (PCID)       X'F453930FB4D17E8C'
  PCID generator CP name               USIBMRA.CLAUDLU1
```

Node Information

```
**************************************
*          Node Information          *
**************************************
Route additional resistance            128
Maximum directory cache entries        255
Current directory cache entries        0
Directory save interval                20
```

Topology Information

```
**************************************
*        Topology Information        *
**************************************
Number of network nodes                1

1>Network node CP name                 USIBMRA.HENRILU1
  Route additional resistance          128
  Congested?                           No
  Quiescing?                           No
  ISR depleted?                        No
  Number of TGs                        3

1.1>TG partner CP name                 USIBMRA.CONNETW1
    Transmission group number          1
    TG partner node type               Virtual (connection network)
    Quiescing?                         No
    Topology                           Network
    Effective capacity                 3.99 megabits per second
    Cost per connect time              0
    Cost per byte                      0
    Propagation delay                  384.00 microseconds (local area network)
    User defined parameter 1           128
    User defined parameter 2           128
    User defined parameter 3           128
    Security                           Nonsecure

1.2>TG partner CP name                 USIBMRA.CLAUDLU1
    Transmission group number          21
    TG partner node type               Real
    Quiescing?                         No
    Topology                           Local
    Effective capacity                 3.99 megabits per second
    Cost per connect time              0
    Cost per byte                      0
```

```
    Propagation delay                  384.00 microseconds (local area network)
    User defined parameter 1           128
    User defined parameter 2           128
    User defined parameter 3           128
    Security                           Nonsecure

1.3>TG partner CP name                 USIBMRA.RAK
    Transmission group number          0
    TG partner node type               Real
    Quiescing?                         No
    Topology                           Local
    Effective capacity                 3.99 megabits per second
    Cost per connect time              0
    Cost per byte                      0
    Propagation delay                  384.00 microseconds (local area network)
    User defined parameter 1           128
    User defined parameter 2           128
    User defined parameter 3           128
    Security                           Nonsecure
```

Appendix C. Traces

In this appendix there are the following traces:

- For the end node EN:
  - Summary trace (SENDER.SUM), see Figure 77 on page 261.
- For the network node NNi:
  - Basic trace (INTER.TRC), see Figure 78 on page 262
  - Detail trace (INTER.DET), see Figure 79 on page 265
  - Summary trace (INTER.SUM), see Figure 80 on page 277.
- For the network node NN:
  - Summary trace (RECEIVER.SUM), see Figure 81 on page 278.

We took these traces using the environment shown in the Figure 76.

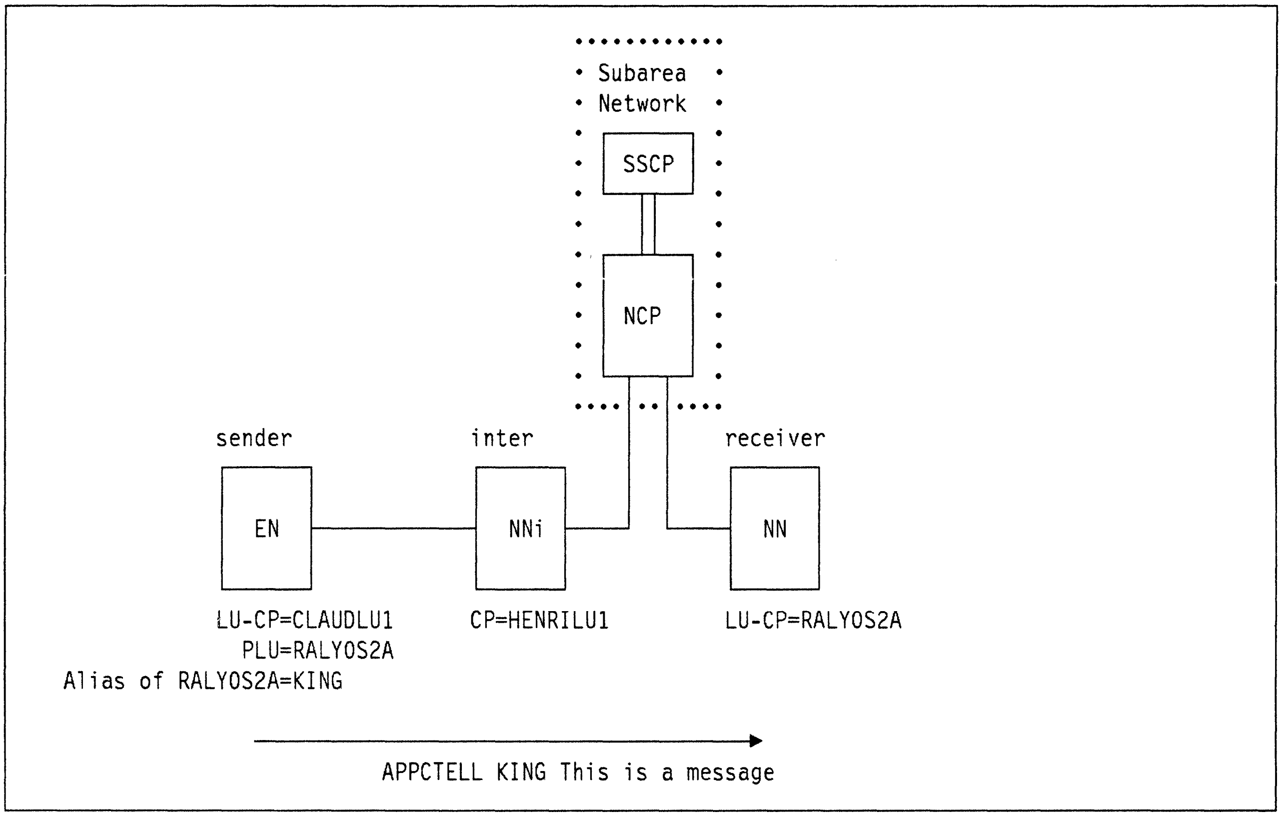


Figure 76. Topology of the Network

To obtain the same sample traces we did the following:

- Start the trace on EN (sender), NNi (inter) and NN (receiver) by issuing the following command from an OS/2 window on each system:

  `CMTRACE START /reset /api appc services /data ibmtrnet /event 5 12 /storage 3`

- On EN (sender) type `APPCTELL KING This is a message`
- Stop and format the trace for each network, doing the following:
  - On EN (sender)
    - Select the path that you want to save the files.
    - Type the following command: `CMTRACE STOP`
    - Type the following command: `CMTRACE COPY SENDER.TRC`
    - Type the following command: `FMTTRACE /D SENDER`
  - On NN (receiver)
    - Select the path that you want to save the files.
    - Type the following command: `CMTRACE STOP`
    - Type the following command: `CMTRACE COPY RECEIVER.TRC`
    - Type the following command: `FMTTRACE /D RECEIVER`
  - On NNi (inter)
    - Select the path that you want to save the files.
    - Type the following command: `CMTRACE STOP`
    - Type the following command: `CMTRACE COPY INTER.TRC`
    - Type the following command: `FMTTRACE /D INTER`

C.1 Summary Trace on an End Node Extremity of Conversation

```
 FMTTRACE
(C) Copyright IBM Corporation 1990, 1991

-Line- --TpId-- -ConvId-                              ------------------API------------------
-Line- --DLC---  # ------DA------ LFSID               ------------------Flow------------------

     2                                                ----------------Convert---------------->
     6                                                <---------------Convert-----------------
    10                                                --------TPStrted(Dflt,APPCTELL)-------->
    18                                                ----------------Convert---------------->
    22                                                <---------------Convert-----------------
    26 80bb2f19                                       <---------------TPStrted----------------
    34                                                ----------------Convert---------------->
    38                                                <---------------Convert-----------------
    42                                                ----------------Convert---------------->
    46                                                <---------------Convert-----------------
    50 80bb2f19                                       -----Allocate(KING,#INTER,APPCTELL)---->
    64 IBMTRNET 00 400032BB119A04 10102               --------FMH5,Locate,Find,CDInit-------->
    85 IBMTRNET 00 400032BB119A04 10102               <-----------Solicited IPM(1)------------
    89 IBMTRNET 00 400032BB119A04 00201               <-------FMH5,Locate,Found,CDInit--------
   106 IBMTRNET 00 400032BB119A04 00201               ------------Solicited IPM(1)----------->
   110 IBMTRNET 00 400032BB119A04 10202               ----------------BIND rq---------------->
   124 IBMTRNET 00 400032BB119A04 00100               <-----------Solicited IPM(1)------------
   128 IBMTRNET 00 400032BB119A04 10202               <--------------BIND +rsp----------------
   137 80bb2f19 1cce2f19                              <---------------Allocate----------------
   151 80bb2f19 1cce2f19                              ---------SendData(20,DealSync)--------->
   155 IBMTRNET 00 400032BB119A04 10202               ----------------FMH5,FMD--------------->
   163 IBMTRNET 00 400032BB119A04 10202               <-----------Solicited IPM(7)------------
   167 IBMTRNET 00 400032BB119A04 10202               <---------------FMD +rsp----------------
   170 80bb2f19 1cce2f19                              <---------------SendData----------------
   174 80bb2f19                                       -------------TPEnded(Soft)------------->
   178 80bb2f19                                       <---------------TPEnded-----------------
   182                                                ----------------DefTrace--------------->
   188                                                <---------------DefTrace----------------
```

Figure 77. SENDER.SUM File

C.2 Basic, Detail and Summary Trace on a Network Node Server

Basic Trace

```
===RECV====>  IBMTRNET  #01 400032BB119B04 B4ED7F1C323E6F27       15:18:29:96
      #:0124 TH:2E0001020003 RH:0B9181
    320502FF 0003D000 000422F0 F0F30019      <2........."003..>
    10E4E2C9 C2D4D9C1 4BC3D3C1 E4C4D3E4      <.USIBMRAKCLAUDLU>
    F1A37457 1C714900 010888CC 2F19A481      <1ttW.qI...h./.ua>
    54270024 12C48000 0000001B 60F45393      <T'.$.D......-4Sl>
    0FA9D57E 6010E4E2 C9C2D4D9 C14BC3D3      <.zN=-.USIBMRAKCL>
    C1E4C4D3 E4F10043 12CA0380 80143C00      <AUDLU1.C......<.>
    F4E4E2C9 C2D4D9C1 4BC3D3C1 E4C4D3E4      <4USIBMRAKCLAUDLU>
    F1143D00 F3E4E2C9 C2D4D9C1 4BC3D3C1      <1.=.3USIBMRAKCLA>
    E4C4D3E4 F1148200 F3E4E2C9 C2D4D9C1      <UDLU1.b.3USIBMRA>
    4BD9C1D3 E8D6E2F2 C1008212 C5000001      <KRALYOS2A.b.E...>
    00000008 7BC9D5E3 C5D94040 00002046      <....{INTER  .. F>
    15800110 E4E2C9C2 D4D9C14B C3D6D5D5      <....USIBMRAKCONN>
    C5E3E6F1 80098240 0032BB11 9B041647      <ETW1..b .2.....G>
    00000000 90750000 00000000 0000014C      <.....u.........L>
    00808080 17461580 1510E4E2 C9C2D4D9      <.....F....USIBMR>
    C14BC8C5 D5D9C9D3 E4F10016 47000000      <AKHENRILU1..G...>
    04807500 00000000 00000001 4C008080      <..u.........L...>
    800A2C02 067BC9D5 E3C5D9                 <..,..{INTER     >

<==SEND=====  IBMTRNET  #01 400032BB119B04 B4ED7F1C323E6F27       15:18:29:96
      #:000C TH:2F0002010000 RH:830100
    000001                                   <...             >

<==SEND=====  IBMTRNET  #01 400032BB119B04 B4ED7F1C323E6F27       15:18:30:00
      #:00E1 TH:2C0001020002 RH:0B9181
    320502FF 0003D000 000422F0 F0F30019      <2........."003..>
    10E4E2C9 C2D4D9C1 4BC8C5D5 D9C9D3E4      <.USIBMRAKHENRILU>
    F1A37485 1673D800 01081A01 971C4E3E      <1tte.sQ.....p.N>>
    6F270024 12C44000 0000001B 60F45393      <o'.$.D .....-4Sl>
    0FA9D57E 6010E4E2 C9C2D4D9 C14BC3D3      <.zN=-.USIBMRAKCL>
    C1E4C4D3 E4F1003E 12CB0380 81143C00      <AUDLU1.>....a.<.>
    F6E4E2C9 C2D4D9C1 4BC8C5D5 D9C9D3E4      <6USIBMRAKHENRILU>
    F10F3C00 F4E4E2C9 C2D4D9C1 4BD9C1D2      <1.<.4USIBMRAKRAK>
    143D00F3 E4E2C9C2 D4D9C14B D9C1D3E8      <.=.3USIBMRAKRALY>
    D6E2F2C1 004412C5 00000100 0000087B      <OS2A.D.E.......{>
    C9D5E3C5 D9404000 00252B02 00174615      <INTER  ..%+...F.>
    801510E4 E2C9C2D4 D9C14BC8 C5D5D9C9      <...USIBMRAKHENRI>
    D3E4F100 0A460880 0003D9C1 D2000A2C      <LU1..F....RAK..,>
    02067BC9 D5E3C5D9                        <..{INTER        >

===RECV====>  IBMTRNET  #01 400032BB119B04 B4ED7F1C323E6F27       15:18:30:00
      #:000C TH:2D0002010000 RH:830100
    000001                                   <...             >
```

Figure 78 (Part 1 of 3). INTER.TRC File

```
===RECV====>  IBMTRNET  #01 400032BB119B04 B4ED7F1C323E6F27        15:18:30:03
      #:00B7 TH:2F0002020005 RH:6B8100
    31001307 B0B050B7 07808787 80070602      <1.....P...gg....>
    00000000 00000010 23000010 E4E2C9C2      <........#...USIB>
    D4D9C14B C3D3C1E4 C4D3E4F1 25000702      <MRAKCLAUDLU1%...>
    7BC9D5E3 C5D90903 01815427 A8815427      <{INTER...aT'yaT'>
    1104E4E2 C9C2D4D9 C14BC3D3 C1E4C4D3      <..USIBMRAKCLAUDL>
    E4F10010 E4E2C9C2 D4D9C14B D9C1D3E8      <U1..USIBMRAKRALY>
    D6E2F2C1 6019F453 930FA9D5 7E6010E4      <OS2A-.4Sl.zN=-.U>
    E2C9C2D4 D9C14BC3 D3C1E4C4 D3E4F12C      <SIBMRAKCLAUDLU1,>
    0802067B C9D5E3C5 D92B2302 01174615      <...{INTER+#...F.>
    801510E4 E2C9C2D4 D9C14BC8 C5D5D9C9      <...USIBMRAKHENRI>
    D3E4F100 0A460880 0003D9C1 D200          <LU1..F....RAK.  >

<==SEND=====  IBMTRNET  #01 400032BB119B04 B4ED7F1C323E6F27        15:18:30:03
      #:000C TH:2D0000010000 RH:830100
    000001                                   <...             >

<==SEND=====  IBMTRNET  #00 40000124000004 A0E47F1C313E6F27        15:18:30:03
      #:00B7 TH:2F0001020005 RH:6B8000
    31001307 B0B050B7 07808787 80070602      <1.....P...gg....>
    00000000 00000010 23000010 E4E2C9C2      <........#...USIB>
    D4D9C14B C3D3C1E4 C4D3E4F1 25000702      <MRAKCLAUDLU1%...>
    7BC9D5E3 C5D90903 01815427 A8815427      <{INTER...aT'yaT'>
    1104E4E2 C9C2D4D9 C14BC3D3 C1E4C4D3      <..USIBMRAKCLAUDL>
    E4F10010 E4E2C9C2 D4D9C14B D9C1D3E8      <U1..USIBMRAKRALY>
    D6E2F2C1 6019F453 930FA9D5 7E6010E4      <OS2A-.4Sl.zN=-.U>
    E2C9C2D4 D9C14BC3 D3C1E4C4 D3E4F12C      <SIBMRAKCLAUDLU1,>
    0802067B C9D5E3C5 D92B2302 02174615      <...{INTER+#...F.>
    801510E4 E2C9C2D4 D9C14BC8 C5D5D9C9      <...USIBMRAKHENRI>
    D3E4F100 0A460880 0003D9C1 D200          <LU1..F....RAK.  >

===RECV====>  IBMTRNET  #00 40000124000004 A0E47F1C313E6F27        15:18:30:71
      #:0061 TH:2F0002010005 RH:EB8000
    31001307 B0B050B7 00808787 80000602      <1.....P...gg....>
    00000000 00000010 23000000 1E000702      <........#.......>
    7BC9D5E3 C5D90203 021105E4 E2C9C2D4      <{INTER.....USIBM>
    D9C14BD9 C1D3E8D6 E2F2C100 006019F4      <RAKRALYOS2A..-.4>
    53930FA9 D57E6010 E4E2C9C2 D4D9C14B      <Sl.zN=-.USIBMRAK>
    C3D3C1E4 C4D3E4F1                        <CLAUDLU1        >

<==SEND=====  IBMTRNET  #01 400032BB119B04 B4ED7F1C323E6F27        15:18:30:71
      #:0061 TH:2F0002020005 RH:EB8000
    31001307 B0B050B7 00808787 80000602      <1.....P...gg....>
    00000000 00000010 23000000 1E000702      <........#.......>
    7BC9D5E3 C5D90203 021105E4 E2C9C2D4      <{INTER.....USIBM>
    D9C14BD9 C1D3E8D6 E2F2C100 006019F4      <RAKRALYOS2A..-.4>
    53930FA9 D57E6010 E4E2C9C2 D4D9C14B      <Sl.zN=-.USIBMRAK>
    C3D3C1E4 C4D3E4F1                        <CLAUDLU1        >
```

Figure 78 (Part 2 of 3). INTER.TRC File

```
===RECV====>  IBMTRNET  #01 400032BB119B04 B4ED7F1C323E6F27       15:18:30:75
      #:0053 TH:2E0002020001 RH:0BA101
    360502FF 0003D000 4008C1D7 D7C3E3C5      <6....... .APPCTE>
    D3D30019 10E4E2C9 C2D4D9C1 4BC3D3C1      <LL...USIBMRAKCLA>
    E4C4D3E4 F1A37485 56A4F300 01081CCE      <UDLU1tteVu3.....>
    2F19A281 54270014 54686973 20697320      </.saT'..This is >
    61206D65 73736167 6500                   <a message.      >

<==SEND=====  IBMTRNET  #00 40000124000004 A0E47F1C313E6F27       15:18:30:75
      #:0053 TH:2E0001020001 RH:0BA501
    360502FF 0003D000 4008C1D7 D7C3E3C5      <6....... .APPCTE>
    D3D30019 10E4E2C9 C2D4D9C1 4BC3D3C1      <LL...USIBMRAKCLA>
    E4C4D3E4 F1A37485 56A4F300 01081CCE      <UDLU1tteVu3.....>
    2F19A281 54270014 54686973 20697320      </.saT'..This is >
    61206D65 73736167 6500                   <a message.      >

<==SEND=====  IBMTRNET  #01 400032BB119B04 B4ED7F1C323E6F27       15:18:30:75
      #:000C TH:2F0002020000 RH:830100
    000007                                   <...             >

===RECV====>  IBMTRNET  #00 40000124000004 A0E47F1C313E6F27       15:18:30:78
      #:000C TH:2F0002010000 RH:830100
    000008                                   <...             >

===RECV====>  IBMTRNET  #00 40000124000004 A0E47F1C313E6F27       15:18:31:84
      #:0009 TH:2E0002018000 RH:83A000

<==SEND=====  IBMTRNET  #01 400032BB119B04 B4ED7F1C323E6F27       15:18:31:84
      #:0009 TH:2E0002028000 RH:83A000

API REQUEST   SERVICES  0107:03A8                                 15:20:54:37
    1D000000 00000000 00002020 20202020      <..........      >
    202000FF FFFFFFFF FFFFFFFF FFFFFFFF      <  .............>
    FFFFFFFF FF000000 00000000 00000000      <................>
    000000                                   <...             >

API RETURN    SERVICES  0107:03A8                                 15:20:54:40
    1D000000 00000000 00002020 20202020      <..........      >
    202000FA D8E0C0C0 C0C0E0C0 C080F8C0      <  ..Q.........8.>
    C0C0E0C0 C0000000 00000000 00000000      <................>
    000000                                   <...             >
```

Figure 78 (Part 3 of 3). INTER.TRC File

Detail Trace

```
FMTTRACE
(C) Copyright IBM Corporation 1990, 1991

Line:      2 Recv MU
Time stamp: 15:18:29:96
DLC type: IBMTRNET
Adapter number: 01
Destination address: 400032BB119B04
ALS ID: B4ED7F1C323E6F27
TH: FID2, OIS, LFSID=0x10201, SNF=0x0003
RH: RQ, FMD, FI, OIC, RQE1, PI, BB, CEBI
FMH-5
   Command code = Attach
   User ID already verified = No
   PIP present = No
   Conversation type = Basic
   Synchronization level = None
   Transaction program name = ?003 (APPN Receive network search)
   Logical unit of work identifier:
      LU name = USIBMRA.CLAUDLU1
      Instance number = 0xa374571c7149
      Sequence number = 0x0001
   Conversation correlator = 0x88cc2f19a4815427
Locate
   Chain status = Keep
   Search status = Request
   Fully qualified PCID control vector:
      PCID = 0xf453930fa9d57e60
      Network qualified CP name = USIBMRA.CLAUDLU1
Find
   Command parameters control vector:
      Origin information present = Yes
   Associated resource entry control vector:
      Resource type = ENCP
      Resource name = USIBMRA.CLAUDLU1
   Directory entry control vector:
      Resource type = LU
      Resource name = USIBMRA.CLAUDLU1
   Search argument directory entry control vector:
      Resource type = LU
      Resource name = USIBMRA.RALYOS2A
CDInit
   Format = 0
   Session polarity = OLU is PLU
   Mode name = #INTER
   TG descriptor control vector
      TG identifier control vector
         TG number = 1
         Partner name = USIBMRA.CONNETW1
         Partner node type = Virtual
      DLC signalling information control vector
         DLC signalling information = 0x400032bb119b04
```

Figure 79 (Part 1 of 12). INTER.DET File

```
   TG Characteristics control vector
      Operational = Yes
      Quiescing = No
      CP-CP sessions supported = No
      Effective capacity = 0x75
      Connect cost = 0x00
      Byte cost = 0x00
      Security = 0x01
      Propagation delay = 0x4c
      Modem class = 0x00
      User defined 1 = 0x80
      User defined 2 = 0x80
      User defined 3 = 0x80
   TG descriptor control vector
      TG identifier control vector
         TG number = 21
         Partner name = USIBMRA.HENRILU1
         Partner node type = Real
   TG Characteristics control vector
      Operational = Yes
      Quiescing = No
      CP-CP sessions supported = Yes
      Effective capacity = 0x75
      Connect cost = 0x00
      Byte cost = 0x00
      Security = 0x01
      Propagation delay = 0x4c
      Modem class = 0x00
      User defined 1 = 0x80
      User defined 2 = 0x80
      User defined 3 = 0x80
   COS/TPF control vector:
      Transmission priority = High
      COS name = #INTER

Line:     23 Send MU
Time stamp: 15:18:29:96
DLC type: IBMTRNET
Adapter number: 01
Destination address: 400032BB119B04
ALS ID: B4ED7F1C323E6F27
TH: FID2, Exp, OIS, LFSID=0x10201, SNF=0x0000
RH: +RSP, FMD, RQN, PI
Solicited IPM:
   Reset window = No
   Next window size = 1

Line:     27 Send MU
Time stamp: 15:18:30:00
DLC type: IBMTRNET
Adapter number: 01
Destination address: 400032BB119B04
ALS ID: B4ED7F1C323E6F27
TH: FID2, OIS, LFSID=0x00102, SNF=0x0002
RH: RQ, FMD, FI, OIC, RQE1, PI, BB, CEBI
```

Figure 79 (Part 2 of 12). INTER.DET File

```
FMH-5
   Command code = Attach
   User ID already verified = No
   PIP present = No
   Conversation type = Basic
   Synchronization level = None
   Transaction program name = ?003 (APPN Receive network search)
   Logical unit of work identifier:
      LU name = USIBMRA.HENRILU1
      Instance number = 0xa374851673d8
      Sequence number = 0x0001
   Conversation correlator = 0x1a01971c4e3e6f27
Locate
   Chain status = Discard
   Search status = Complete reply
   Fully qualified PCID control vector:
      PCID = 0xf453930fa9d57e60
      Network qualified CP name = USIBMRA.CLAUDLU1
Found
   Command parameters control vector:
      Target information present = Yes
      Explicit entry = No
   Associated resource entry control vector:
      Resource type = NNCP
      Resource name = USIBMRA.HENRILU1
   Associated resource entry control vector:
      Resource type = ENCP
      Resource name = USIBMRA.RAK
   Directory entry control vector:
      Resource type = LU
      Resource name = USIBMRA.RALYOS2A
CDInit
   Format = 0
   Session polarity = OLU is PLU
   Mode name = #INTER
   Route selection control vector:
      Maximum hop count = 2
      Current hop count = 0
      TG descriptor control vector
         TG identifier control vector
            TG number = 21
            Partner name = USIBMRA.HENRILU1
            Partner node type = Real
      TG descriptor control vector
         TG identifier control vector
            TG number = 0
            Partner name = RAK
            Partner node type = Real
   COS/TPF control vector:
      Transmission priority = High
      COS name = #INTER
```

Figure 79 (Part 3 of 12). INTER.DET File

```
Line:     44 Recv MU
Time stamp: 15:18:30:00
DLC type: IBMTRNET
Adapter number: 01
Destination address: 400032BB119B04
ALS ID: B4ED7F1C323E6F27
TH: FID2, Exp, OIS, LFSID=0x00102, SNF=0x0000
RH: +RSP, FMD, RQN, PI
Solicited IPM:
   Reset window = No
   Next window size = 1

Line:     48 Recv MU
Time stamp: 15:18:30:03
DLC type: IBMTRNET
Adapter number: 01
Destination address: 400032BB119B04
ALS ID: B4ED7F1C323E6F27
TH: FID2, Exp, OIS, LFSID=0x10202, SNF=0x0005
RH: RQ, SC, FI, OIC, RQD1, PI
BIND rq
   Type = Negotiable
   FM profile = 19
   TS profile = 7
   FM usage - primary:
      Chaining use = Multiple-RU chains allowed
      Request control mode = Immediate request mode
      Chain response protocol = Definite or exception response
      Two-phase commit = Not supported
      Compression = Will not be used
      Send end bracket = Will not send
   FM usage - secondary:
      Chaining use = Multiple-RU chains allowed
      Request control mode = Immediate request mode
      Chain response protocol = Definite or exception response
      Two-phase commit = Not supported
      Compression = Will not be used
      Send end bracket = Will not send
   FM Usage - common:
      Whole BIUs required = No
      FM header usage = Allowed
      Bracket usage and reset state = Brackets are used and reset state is INB
      Alternate code set allowed = No
      BIND queueing allowed = No
      Normal-flow send/receive mode = Half-duplex flip-flop
      Recovery responsibility = Symmetric
      Contention winner = Primary
      Alternate code set = ASCII-8
      Control vectors included = Yes
      Half-duplex flip-flop primary reset state = Send
```

Figure 79 (Part 4 of 12). INTER.DET File

```
TS usage:
   Secondary to primary pacing stages = One
   Secondary send window size = 7
   Adaptive pacing = Supported
   Secondary receive window size = 0
   Secondary maximum send RU size = 1024
   Primary maximum send RU size = 1024
   Primary to secondary pacing stages = One
   Primary send window size = 0
   Primary receive window size = 7
PS profile:
   LU type = 6
   LU-6 level = 2
   Conversation-level security = Accepted
   Already-verified indicator = Not accepted
   Synchronization level supported = Confirm
   Session reinitiation responsibility = Operator controlled
   Parallel sessions supported = Yes
   CNOS supported = Yes
   Limited resource = No
Cryptography options:
   Private cryptography support = No
   Session-level cryptography support = No
Primary LU name = USIBMRA.CLAUDLU1
Structured user data:
   Mode name = #INTER
   Session instance identifier = 0x01815427a8815427
   Network-qualified PLU name = USIBMRA.CLAUDLU1
Secondary LU name = USIBMRA.RALYOS2A
Fully qualified PCID control vector:
   PCID = 0xf453930fa9d57e60
   Network qualified CP name = USIBMRA.CLAUDLU1
COS/TPF control vector:
   Transmission priority = High
   COS name = #INTER
Route selection control vector:
   Maximum hop count = 2
   Current hop count = 1
   TG descriptor control vector
      TG identifier control vector
         TG number = 21
         Partner name = USIBMRA.HENRILU1
         Partner node type = Real
   TG descriptor control vector
      TG identifier control vector
         TG number = 0
         Partner name = RAK
         Partner node type = Real
```

Figure 79 (Part 5 of 12). INTER.DET File

```
Line:     62 Send MU
Time stamp: 15:18:30:03
DLC type: IBMTRNET
Adapter number: 01
Destination address: 400032BB119B04
ALS ID: B4ED7F1C323E6F27
TH: FID2, Exp, OIS, LFSID=0x00001, SNF=0x0000
RH: +RSP, FMD, RQN, PI
Solicited IPM:
   Reset window = No
   Next window size = 1

Line:     66 Send MU
Time stamp: 15:18:30:03
DLC type: IBMTRNET
Adapter number: 00
Destination address: 40000124000004
ALS ID: A0E47F1C313E6F27
TH: FID2, Exp, OIS, LFSID=0x10102, SNF=0x0005
RH: RQ, SC, FI, OIC, RQD1
BIND rq
   Type = Negotiable
   FM profile = 19
   TS profile = 7
   FM usage - primary:
      Chaining use = Multiple-RU chains allowed
      Request control mode = Immediate request mode
      Chain response protocol = Definite or exception response
      Two-phase commit = Not supported
      Compression = Will not be used
      Send end bracket = Will not send
   FM usage - secondary:
      Chaining use = Multiple-RU chains allowed
      Request control mode = Immediate request mode
      Chain response protocol = Definite or exception response
      Two-phase commit = Not supported
      Compression = Will not be used
      Send end bracket = Will not send
   FM Usage - common:
      Whole BIUs required = No
      FM header usage = Allowed
      Bracket usage and reset state = Brackets are used and reset state is INB
      Alternate code set allowed = No
      BIND queueing allowed = No
      Normal-flow send/receive mode = Half-duplex flip-flop
      Recovery responsibility = Symmetric
      Contention winner = Primary
      Alternate code set = ASCII-8
      Control vectors included = Yes
      Half-duplex flip-flop primary reset state = Send
```

Figure 79 (Part 6 of 12). INTER.DET File

```
TS usage:
   Secondary to primary pacing stages = One
   Secondary send window size = 7
   Adaptive pacing = Supported
   Secondary receive window size = 0
   Secondary maximum send RU size = 1024
   Primary maximum send RU size = 1024
   Primary to secondary pacing stages = One
   Primary send window size = 0
   Primary receive window size = 7
PS profile:
   LU type = 6
   LU-6 level = 2
   Conversation-level security = Accepted
   Already-verified indicator = Not accepted
   Synchronization level supported = Confirm
   Session reinitiation responsibility = Operator controlled
   Parallel sessions supported = Yes
   CNOS supported = Yes
   Limited resource = No
Cryptography options:
   Private cryptography support = No
   Session-level cryptography support = No
Primary LU name = USIBMRA.CLAUDLU1
Structured user data:
   Mode name = #INTER
   Session instance identifier = 0x01815427a8815427
   Network-qualified PLU name = USIBMRA.CLAUDLU1
Secondary LU name = USIBMRA.RALYOS2A
Fully qualified PCID control vector:
   PCID = 0xf453930fa9d57e60
   Network qualified CP name = USIBMRA.CLAUDLU1
COS/TPF control vector:
   Transmission priority = High
   COS name = #INTER
Route selection control vector:
   Maximum hop count = 2
   Current hop count = 2
   TG descriptor control vector
      TG identifier control vector
         TG number = 21
         Partner name = USIBMRA.HENRILU1
         Partner node type = Real
   TG descriptor control vector
      TG identifier control vector
         TG number = 0
         Partner name = RAK
         Partner node type = Real
```

Figure 79 (Part 7 of 12). INTER.DET File

```
Line:     80 Recv MU
Time stamp: 15:18:30:71
DLC type: IBMTRNET
Adapter number: 00
Destination address: 40000124000004
ALS ID: A0E47F1C313E6F27
TH: FID2, Exp, OIS, LFSID=0x10102, SNF=0x0005
RH: +RSP, SC, FI, RQD1
BIND +rsp
   Type = Negotiable
   FM profile = 19
   TS profile = 7
   FM usage - primary:
      Chaining use = Multiple-RU chains allowed
      Request control mode = Immediate request mode
      Chain response protocol = Definite or exception response
      Two-phase commit = Not supported
      Compression = Will not be used
      Send end bracket = Will not send
   FM usage - secondary:
      Chaining use = Multiple-RU chains allowed
      Request control mode = Immediate request mode
      Chain response protocol = Definite or exception response
      Two-phase commit = Not supported
      Compression = Will not be used
      Send end bracket = Will not send
   FM Usage - common:
      Whole BIUs required = No
      FM header usage = Allowed
      Bracket usage and reset state = Brackets are used and reset state is INB
      Alternate code set allowed = No
      BIND queueing allowed = No
      Normal-flow send/receive mode = Half-duplex flip-flop
      Recovery responsibility = Symmetric
      Contention winner = Primary
      Alternate code set = ASCII-8
      Control vectors included = Yes
      Half-duplex flip-flop primary reset state = Send
   TS usage:
      Secondary to primary pacing stages = One
      Secondary send window size = 0
      Adaptive pacing = Supported
      Secondary receive window size = 0
      Secondary maximum send RU size = 1024
      Primary maximum send RU size = 1024
      Primary to secondary pacing stages = One
      Primary send window size = 0
      Primary receive window size = 0
```

Figure 79 (Part 8 of 12). INTER.DET File

```
   PS profile:
      LU type = 6
      LU-6 level = 2
      Conversation-level security = Accepted
      Already-verified indicator = Not accepted
      Synchronization level supported = Confirm
      Session reinitiation responsibility = Operator controlled
      Parallel sessions supported = Yes
      CNOS supported = Yes
      Limited resource = No
   Cryptography options:
      Private cryptography support = No
      Session-level cryptography support = No
   Primary LU name =
   Structured user data:
      Mode name = #INTER
      Session instance identifier = 0x02
      Network-qualified SLU name = USIBMRA.RALYOS2A
   Fully qualified PCID control vector:
      PCID = 0xf453930fa9d57e60
      Network qualified CP name = USIBMRA.CLAUDLU1

Line:     89 Send MU
Time stamp: 15:18:30:71
DLC type: IBMTRNET
Adapter number: 01
Destination address: 400032BB119B04
ALS ID: B4ED7F1C323E6F27
TH: FID2, Exp, OIS, LFSID=0x10202, SNF=0x0005
RH: +RSP, SC, FI, RQD1
BIND +rsp
   Type = Negotiable
   FM profile = 19
   TS profile = 7
   FM usage - primary:
      Chaining use = Multiple-RU chains allowed
      Request control mode = Immediate request mode
      Chain response protocol = Definite or exception response
      Two-phase commit = Not supported
      Compression = Will not be used
      Send end bracket = Will not send
   FM usage - secondary:
      Chaining use = Multiple-RU chains allowed
      Request control mode = Immediate request mode
      Chain response protocol = Definite or exception response
      Two-phase commit = Not supported
      Compression = Will not be used
      Send end bracket = Will not send
```

Figure 79 (Part 9 of 12). INTER.DET File

```
   FM Usage - common:
      Whole BIUs required = No
      FM header usage = Allowed
      Bracket usage and reset state = Brackets are used and reset state is INB
      Alternate code set allowed = No
      BIND queueing allowed = No
      Normal-flow send/receive mode = Half-duplex flip-flop
      Recovery responsibility = Symmetric
      Contention winner = Primary
      Alternate code set = ASCII-8
      Control vectors included = Yes
      Half-duplex flip-flop primary reset state = Send
   TS usage:
      Secondary to primary pacing stages = One
      Secondary send window size = 0
      Adaptive pacing = Supported
      Secondary receive window size = 0
      Secondary maximum send RU size = 1024
      Primary maximum send RU size = 1024
      Primary to secondary pacing stages = One
      Primary send window size = 0
      Primary receive window size = 0
   PS profile:
      LU type = 6
      LU-6 level = 2
      Conversation-level security = Accepted
      Already-verified indicator = Not accepted
      Synchronization level supported = Confirm
      Session reinitiation responsibility = Operator controlled
      Parallel sessions supported = Yes
      CNOS supported = Yes
      Limited resource = No
   Cryptography options:
      Private cryptography support = No
      Session-level cryptography support = No
   Primary LU name =
   Structured user data:
      Mode name = #INTER
      Session instance identifier = 0x02
      Network-qualified SLU name = USIBMRA.RALYOS2A
   Fully qualified PCID control vector:
      PCID = 0xf453930fa9d57e60
      Network qualified CP name = USIBMRA.CLAUDLU1

Line:     98 Recv MU
Time stamp: 15:18:30:75
DLC type: IBMTRNET
Adapter number: 01
Destination address: 400032BB119B04
ALS ID: B4ED7F1C323E6F27
TH: FID2, OIS, LFSID=0x10202, SNF=0x0001
RH: RQ, FMD, FI, OIC, RQD3, PI, CEBI
```

Figure 79 (Part 10 of 12). INTER.DET File

```
FMH-5
   Command code = Attach
   User ID already verified = No
   PIP present = No
   Conversation type = Basic
   Synchronization level = Confirm
   Transaction program name = APPCTELL
   Logical unit of work identifier:
      LU name = USIBMRA.CLAUDLU1
      Instance number = 0xa3748556a4f3
      Sequence number = 0x0001
   Conversation correlator = 0x1cce2f19a2815427
Unrecognized data - remainder of RU follows:
   Hex dump:
      00145468 69732069 73206120 6d657373     <..This is a mess>
      61676500                                <age.            >

Line:    106 Send MU
Time stamp: 15:18:30:75
DLC type: IBMTRNET
Adapter number: 00
Destination address: 40000124000004
ALS ID: A0E47F1C313E6F27
TH: FID2, OIS, LFSID=0x10102, SNF=0x0001
RH: RQ, FMD, FI, OIC, RQD3, RLWI, PI, CEBI
FMH-5
   Command code = Attach
   User ID already verified = No
   PIP present = No
   Conversation type = Basic
   Synchronization level = Confirm
   Transaction program name = APPCTELL
   Logical unit of work identifier:
      LU name = USIBMRA.CLAUDLU1
      Instance number = 0xa3748556a4f3
      Sequence number = 0x0001
   Conversation correlator = 0x1cce2f19a2815427
Unrecognized data - remainder of RU follows:
   Hex dump:
      00145468 69732069 73206120 6d657373     <..This is a mess>
      61676500                                <age.            >

Line:    114 Send MU
Time stamp: 15:18:30:75
DLC type: IBMTRNET
Adapter number: 01
Destination address: 400032BB119B04
ALS ID: B4ED7F1C323E6F27
TH: FID2, Exp, OIS, LFSID=0x10202, SNF=0x0000
RH: +RSP, FMD, RQN, PI
Solicited IPM:
   Reset window = No
   Next window size = 7
```

Figure 79 (Part 11 of 12). INTER.DET File

```
Line:    118 Recv MU
Time stamp: 15:18:30:78
DLC type: IBMTRNET
Adapter number: 00
Destination address: 40000124000004
ALS ID: A0E47F1C313E6F27
TH: FID2, Exp, OIS, LFSID=0x10102, SNF=0x0000
RH: +RSP, FMD, RQN, PI
Solicited IPM:
   Reset window = No
   Next window size = 8

Line:    122 Recv MU
Time stamp: 15:18:31:84
DLC type: IBMTRNET
Adapter number: 00
Destination address: 40000124000004
ALS ID: A0E47F1C313E6F27
TH: FID2, OIS, LFSID=0x10102, SNF=0x8000
RH: +RSP, FMD, RQD3
FMD +rsp

Line:    125 Send MU
Time stamp: 15:18:31:84
DLC type: IBMTRNET
Adapter number: 01
Destination address: 400032BB119B04
ALS ID: B4ED7F1C323E6F27
TH: FID2, OIS, LFSID=0x10202, SNF=0x8000
RH: +RSP, FMD, RQD3
FMD +rsp

Line:    128 API request
Time stamp: 15:20:54:37
DefineTrace
   Hex dump:
      1d000000 00000000 00002020 20202020     <..........      >
      202000ff ffffffff ffffffff ffffffff     <  ..............>
      ffffffff ff000000 00000000 00000000     <................>
      000000                                  <...             >

Line:    134 API return
Time stamp: 15:20:54:40
DefineTrace
   Primary return code = OK
   Secondary return code = OK
   Hex dump:
      1d000000 00000000 00002020 20202020     <..........      >
      202000fa d8e0c0c0 c0c0e0c0 c080f8c0     <  ..Q\{{{{\{{.8{>
      c0c0e0c0 c0000000 00000000 00000000     <{{\{{...........>
      000000                                  <...             >
```

Figure 79 (Part 12 of 12). INTER.DET File

Summary Trace

```
 FMTTRACE
(C) Copyright IBM Corporation 1990, 1991

-Line- --TpId-- -ConvId-                                  ------------------API------------------
-Line- --DLC---  # ------DA------ LFSID
                                                          ------------------Flow------------------

     2 IBMTRNET 01 400032BB119B04 10201                   <-------FMH5,Locate,Find,CDInit---------
    23 IBMTRNET 01 400032BB119B04 10201                   ------------Solicited IPM(1)----------->
    27 IBMTRNET 01 400032BB119B04 00102                   --------FMH5,Locate,Found,CDInit------->
    44 IBMTRNET 01 400032BB119B04 00102                   <-----------Solicited IPM(1)------------
    48 IBMTRNET 01 400032BB119B04 10202                   <---------------BIND rq-----------------
    62 IBMTRNET 01 400032BB119B04 00001                   ------------Solicited IPM(1)----------->
    66 IBMTRNET 00 40000124000004 10102                   ----------------BIND rq---------------->
    80 IBMTRNET 00 40000124000004 10102                   <--------------BIND +rsp----------------
    89 IBMTRNET 01 400032BB119B04 10202                   ---------------BIND +rsp--------------->
    98 IBMTRNET 01 400032BB119B04 10202                   <---------------FMH5,FMD----------------
   106 IBMTRNET 00 40000124000004 10102                   ----------------FMH5,FMD--------------->
   114 IBMTRNET 01 400032BB119B04 10202                   ------------Solicited IPM(7)----------->
   118 IBMTRNET 00 40000124000004 10102                   <-----------Solicited IPM(8)------------
   122 IBMTRNET 00 40000124000004 10102                   <---------------FMD +rsp----------------
   125 IBMTRNET 01 400032BB119B04 10202                   ----------------FMD +rsp--------------->
   128                                                    ----------------DefTrace--------------->
   134                                                    <---------------DefTrace----------------
```

Figure 80. INTER.SUM File

C.3 Summary Trace on a Network Node Extremity of Conversation

```
 FMTTRACE
(C) Copyright IBM Corporation 1990, 1991

-Line- --TpId-- -ConvId-                            ------------------API-------------------
-Line- --DLC---  # ------DA------ LFSID             ------------------Flow------------------

     2 IBMTRNET 00 40000124000004 00200             <---------------BIND rq-----------------
    14 IBMTRNET 00 40000124000004 00200             ---------------BIND +rsp--------------->
    23 IBMTRNET 00 40000124000004 00200             <---------------CINIT rq----------------
    31                                              ----------------Convert---------------->
    35                                              <---------------Convert-----------------
    39                                              ----------------Convert---------------->
    43                                              <---------------Convert-----------------
    47                                              ----------------Convert---------------->
    51                                              <---------------Convert-----------------
    55                                              -----------RcvAlloc(APPCTELL)---------->
    67 08009f18 96fd7f18                            <--RcvAlloc(RALYOS2A,CLAUDIO,#INTER)----
    79 08009f18 96fd7f18                            ------------RcvWait(LL,1024)----------->
    84 IBMTRNET 00 40000124000004 00200             ------------Solicited IPM(7)----------->
    88 08009f18 96fd7f18                            <----RcvWait(ConfDeal,DataCmpl,20)------
    93 08009f18 96fd7f18                            ----------------Confirmd--------------->
    97 IBMTRNET 00 40000124000004 00200             ----------------FMD +rsp--------------->
   100 08009f18 96fd7f18                            <---------------Confirmd----------------
   104 08009f18                                     -------------TPEnded(Soft)------------->
   108 08009f18                                     <---------------TPEnded-----------------
   112                                              ----------------DefTrace--------------->
   118                                              <---------------DefTrace----------------
```

Figure 81. RECEIVE.SUM File

Appendix D. Benchmark Performance Configuration Files

This appendix is included to provide the configuration files used for the APPC performance benchmark TPs.

By no means should the configuration used for the performance benchmarks be construed to be recommended settings for your environment. In addition, no claims are made as to the performance gains to be expected by configuring your environment to match the benchmark configuration.

As is often the case, you may need to trade off program size, memory costs, usability, and simplicity to gain performance. Consider those aspects when making any of the changes suggested here.

D.1 OS/2 EE 1.2 Communications Manager Configuration (.CFG)

This section details the specifics of the OS/2 EE 1.2 Communications Manager configuration files used in performance benchmark testing. These definitions are used by Communications Manager software and token-ring LAN device drivers.

There are three relevant Communications Manager profiles:

- IEEE 802.2 token-ring profile
- IBM token-ring network DLC adapter profile
- Transmission Service Mode Profile.

These profiles can only be modified through the Advanced Configuration option of the Communications Manager. Refer to the *OS/2 Extended Edition Version 1.x System Administrator's Guide* for detailed information about the contents of this file.

IEEE 802.2 Token-Ring Profile

This profile describes the token-ring interface. This profile was configured on each adapter for all testing.

```
                                         4Mbps LAN      16Mbps LAN
                                         ---------      ----------
Adapter number and version:              0 - 16/4 /A    0 - 16/4 /A
Load LAN support:                        Yes            Yes
Use universally administered address:    Yes            Yes
Maximum number SAPs:                     3              3
Maximum link stations:                   8              8
Maximum number group SAPs:               0              0
Maximum members per group SAPs:          0              0
Maximum number of users:                 3              3
Transmit buffer size:                    2072           4120
Number of transmit buffers:              2              2
Receive buffer size:                     96             96
Minimum receive buffers:                 49             95
Adapter "Open" options
  Wrap interface:                        No             No
  Contender:                             No             No
```

```
  Override token release default:        No             No
Group 1 response timer (T1):             015x40 ms.     015x40 ms.
Group 1 acknowledge timer (T2):          003x40 ms.     003x40 ms.
Group 1 inactivity timer (Ti):           255x40 ms.     255x40 ms.
Group 2 response timer (T1):             025x40 ms.     025x40 ms.
Group 2 acknowledge timer (T2):          010x40 ms.     010x40 ms.
Group 2 inactivity timer (Ti):           255x40 ms.     255x40 ms.
Number of queue elements:                600            600
Number Global Descriptor Table selectors: 30            30
```

IBM Token-Ring Network DLC Adapter Profile

This profile describes the token-ring interface. This profile was configured on each adapter for all testing.

	4Mbps LAN	16Mbps LAN
Adapter number:	0	0
Load DLC:	Yes	Yes
Maximum number of link stations:	5	5
Percent of incoming calls:	050%	050%
Free unused link:	No	No
Congestion tolerance:	080%	080%
Maximum RU size:	2048	4096
Send window count:	4	4
Receive window count:	4	4
C&SM LAN ID:	RISLAN	RISLAN
Send alert for beaconing:	No	No

Transmission Service Mode Profile

This profile describes the mode definitions. These mode definitions are relevant for only the base OS/2 EE 1.2 Communications Manager testing. For Networking Services/2, these mode definitions are implicitly defined.

This profile was configured on each node for all base OS/2 EE 1.2 Communications Manager testing.

	4Mbps LAN	16Mbps LAN
Mode Name	#BATCH	#BATCH
Minimum RU size	2048	4096
Maximum RU size	2048	4096
Receive pacing limit	8	8
Session limit	10	10
Mode Name	#INTER	#INTER
Minimum RU size	2048	4096
Maximum RU size	2048	4096
Receive pacing limit	8	8
Session limit	10	10

D.2 Networking Services/2 Configuration (.NDF)

This section details the configuration files used in Networking Services/2 benchmark testing.

Refer to the *IBM SAA Networking Services/2 Installation and Networking Administrator Guide* and *IBM SAA Networking Services/2 System Management Programming Reference* for detailed information concerning the contents of these files.

Server Node

This Networking Services/2 configuration file was used to define the server node for all Networking Services/2 testing.

```
DEFINE_LOCAL_CP       fq_cp_name(APPN.NN1)
                      node_type(NN)
                      cp_alias(NN1)
                      nau_address(independent_lu)
                      node_id(x'00001')
                      host_fp_support(NO)
                      ;

DEFINE_DEFAULTS       default_mode_name(#BATCH)
                      implicit_inbound_plu_support(yes)
                      max_mc_ll_send_size(32767)
                      directory_for_inbound_attaches (c:\siddall\)
                      default_tp_operation(queued_operator_preloaded)
                      default_tp_program_type(background)
                      default_tp_conv_security_rqd(no)
                      max_held_alerts(100)
                      ;

DEFINE_LOGICAL_LINK   link_name(NN2)
                      adapter_number(0)
                      dlc_name(IBMTRNET)
                      destination_address(x'10005a8a75a5')
                      activate_at_startup(no)
                      cp_cp_session_support(yes)
                      adjacent_node_type(learn)
                      limited_resource(no)
                      link_station_role(use_adapter_definition)
                      ;

START_ATTACH_MANAGER;
```

Client Node (2 Node Config) and Intermediate NN (3 Node Config)

This Networking Services/2 configuration file was used to define the client node for the two node Networking Services/2 configuration. This configuration also defines the intermediate network node for the three node Networking Services/2 configuration.

```
DEFINE_LOCAL_CP       fq_cp_name(APPN.NN2)
                      node_type(NN)
                      cp_alias(NN2)
                      nau_address(independent_lu)
                      node_id(x'00002')
                      host_fp_support(NO)
                      ;

DEFINE_DEFAULTS       default_mode_name(#BATCH)
                      implicit_inbound_plu_support(yes)
                      max_mc_ll_send_size(32767)
                      directory_for_inbound_attaches (c:\siddall\)
                      default_tp_operation(queued_operator_preloaded)
                      default_tp_program_type(background)
                      default_tp_conv_security_rqd(no)
                      max_held_alerts(100)
                      ;

DEFINE_LOGICAL_LINK   link_name(NN1)
                      adapter_number(0)
                      dlc_name(IBMTRNET)
                      destination_address(x'10005a884b7b')
                      activate_at_startup(no)
                      cp_cp_session_support(yes)
                      adjacent_node_type(learn)
                      limited_resource(no)
                      link_station_role(use_adapter_definition)
                      ;

DEFINE_LOGICAL_LINK   link_name(NN3)
                      adapter_number(1)
                      dlc_name(IBMTRNET)
                      destination_address(x'10005a8921ed')
                      activate_at_startup(no)
                      cp_cp_session_support(yes)
                      adjacent_node_type(learn)
                      limited_resource(no)
                      link_station_role(use_adapter_definition)
                      ;

DEFINE_CPIC_SIDE_INFO  SYMBOLIC_DESTINATION_NAME(BCRDTSVC)
                       FQ_PARTNER_LU_NAME(APPN.NN1          )
                       MODE_NAME(#INTER  )
                       TP_NAME(BCRDTSVC);

DEFINE_CPIC_SIDE_INFO  SYMBOLIC_DESTINATION_NAME(BINQUSVC)
                       FQ_PARTNER_LU_NAME(APPN.NN1          )
                       MODE_NAME(#INTER  )
                       TP_NAME(BINQUSVC);

DEFINE_CPIC_SIDE_INFO  SYMBOLIC_DESTINATION_NAME(BPIPESVC)
                       FQ_PARTNER_LU_NAME(APPN.NN1          )
                       MODE_NAME(#BATCH  )
```

```
                        TP_NAME(BPIPESVC);

DEFINE_CPIC_SIDE_INFO   SYMBOLIC_DESTINATION_NAME(BUPDTSVC)
                        FQ_PARTNER_LU_NAME(APPN.NN1          )
                        MODE_NAME(#INTER  )
                        TP_NAME(BUPDTSVC);

DEFINE_CPIC_SIDE_INFO   SYMBOLIC_DESTINATION_NAME(BFILESVC)
                        FQ_PARTNER_LU_NAME(APPN.NN1          )
                        MODE_NAME(#BATCH  )
                        TP_NAME(BFILESVC);

START_ATTACH_MANAGER;
```

Client Node (3 Node Configuration)

This Networking Services/2 configuration file was used to define the client node for the three node Networking Services/2 testing.

```
DEFINE_LOCAL_CP       fq_cp_name(APPN.NN3)
                      node_type(NN)
                      cp_alias(NN3)
                      nau_address(independent_lu)
                      node_id(x'00003')
                      host_fp_support(NO)
                      ;

DEFINE_DEFAULTS       default_mode_name(#BATCH)
                      implicit_inbound_plu_support(yes)
                      max_mc_ll_send_size(32767)
                      directory_for_inbound_attaches (c:\siddall\)
                      default_tp_operation(queued_operator_preloaded)
                      default_tp_program_type(background)
                      default_tp_conv_security_rqd(no)
                      max_held_alerts(100)
                      ;

DEFINE_LOGICAL_LINK   link_name(NN2)
                      adapter_number(0)
                      dlc_name(IBMTRNET)
                      destination_address(x'10005a88152c')
                      activate_at_startup(no)
                      cp_cp_session_support(yes)
                      adjacent_node_type(learn)
                      limited_resource(no)
                      link_station_role(use_adapter_definition)
                      ;

DEFINE_CPIC_SIDE_INFO  SYMBOLIC_DESTINATION_NAME(BCRDTSVC)
                       FQ_PARTNER_LU_NAME(APPN.NN1          )
                       MODE_NAME(#INTER  )
                       TP_NAME(BCRDTSVC);

DEFINE_CPIC_SIDE_INFO  SYMBOLIC_DESTINATION_NAME(BINQUSVC)
                       FQ_PARTNER_LU_NAME(APPN.NN1          )
                       MODE_NAME(#INTER  )
                       TP_NAME(BINQUSVC);

DEFINE_CPIC_SIDE_INFO  SYMBOLIC_DESTINATION_NAME(BPIPESVC)
                       FQ_PARTNER_LU_NAME(APPN.NN1          )
                       MODE_NAME(#BATCH  )
                       TP_NAME(BPIPESVC);

DEFINE_CPIC_SIDE_INFO  SYMBOLIC_DESTINATION_NAME(BUPDTSVC)
                       FQ_PARTNER_LU_NAME(APPN.NN1          )
                       MODE_NAME(#INTER  )
                       TP_NAME(BUPDTSVC);

DEFINE_CPIC_SIDE_INFO  SYMBOLIC_DESTINATION_NAME(BFILESVC)
                       FQ_PARTNER_LU_NAME(APPN.NN1          )
                       MODE_NAME(#BATCH  )
                       TP_NAME(BFILESVC);

START_ATTACH_MANAGER;
```

Index

D

N

O

P

Q

R

S

T

U

V

W

X

Numerics

Special Characters

Title: **Networking Services/2**
Installation, Customization,
and Operation
APPN for OS/2

GG24-3662-00

READER'S COMMENT FORM

IBM Corporation, International Technical Support Center

You may use this form to communicate your comments about this publication, its organization, or subject matter with the understanding that IBM may use or distribute whatever information you supply in any way it believes appropriate without incurring any obligation to you.

Note: Copies of IBM publications are not stocked at the location to which this form is addressed. Please direct any requests for copies of publications, or for assistance in using your IBM system, to your IBM representative or to the IBM branch office serving your locality.

Comments:

If you would like a reply, please provide your name and address:

____

____

____

____

Thank you for your cooperation. No postage stamp is necessary if mailed in the U.S.A. (Elsewhere, an IBM office or representative will be happy to forward your comments or you may mail them directly to the address on the back of this page.)

Reader's Comment Form

Fold and Tape | Please Do Not Staple | Fold and Tape

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY MAIL

FIRST CLASS PERMIT NO. 40 ARMONK, N.Y.

POSTAGE WILL BE PAID BY ADDRESSEE:
IBM International Technical Support Center
Department 985, Building 657
P.O. Box 12195
Research Triangle Park, NC 27709
U.S.A.

Fold | Fold

GG24-3662-00

Networking Services/2

PRINTED IN THE U.S.A.

Title: **Networking Services/2**
Installation, Customization,
and Operation
APPN for OS/2

GG24-3662-00

READER'S COMMENT FORM

IBM Corporation, International Technical Support Center

You may use this form to communicate your comments about this publication, its organization, or subject matter with the understanding that IBM may use or distribute whatever information you supply in any way it believes appropriate without incurring any obligation to you.

Note: Copies of IBM publications are not stocked at the location to which this form is addressed. Please direct any requests for copies of publications, or for assistance in using your IBM system, to your IBM representative or to the IBM branch office serving your locality.

Comments:

If you would like a reply, please provide your name and address:

Thank you for your cooperation. No postage stamp is necessary if mailed in the U.S.A. (Elsewhere, an IBM office or representative will be happy to forward your comments or you may mail them directly to the address on the back of this page.)

Reader's Comment Form

Fold and Tape   Please Do Not Staple   Fold and Tape

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY MAIL

FIRST CLASS   PERMIT NO. 40   ARMONK, N.Y.

POSTAGE WILL BE PAID BY ADDRESSEE:
IBM International Technical Support Center
Department 985, Building 657
P.O. Box 12195
Research Triangle Park, NC 27709
U.S.A.

Fold   Fold

IBM ®

GG24-3662-00

Networking Services/2

PRINTED IN THE U.S.A.

Title: **Networking Services/2**
Installation, Customization,
and Operation
APPN for OS/2

GG24-3662-00

READER'S COMMENT FORM

IBM Corporation, International Technical Support Center

You may use this form to communicate your comments about this publication, its organization, or subject matter with the understanding that IBM may use or distribute whatever information you supply in any way it believes appropriate without incurring any obligation to you.

Note: Copies of IBM publications are not stocked at the location to which this form is addressed. Please direct any requests for copies of publications, or for assistance in using your IBM system, to your IBM representative or to the IBM branch office serving your locality.

Comments:

If you would like a reply, please provide your name and address:

____

____

____

____

Thank you for your cooperation. No postage stamp is necessary if mailed in the U.S.A. (Elsewhere, an IBM office or representative will be happy to forward your comments or you may mail them directly to the address on the back of this page.)

Reader's Comment Form

Fold and Tape　　Please Do Not Staple　　Fold and Tape

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY MAIL

FIRST CLASS　　PERMIT NO. 40　　ARMONK, N.Y.

POSTAGE WILL BE PAID BY ADDRESSEE:
IBM International Technical Support Center
Department 985, Building 657
P.O. Box 12195
Research Triangle Park, NC 27709
U.S.A.

Fold　　Fold

IBM®

GG24-3662-00

Networking Services/2

PRINTED IN THE U.S.A.

GG24-3662-00

Networking Services/2 Installation, Customization, and Operation APPN for OS/2

GG24-3662-00

PRINTED IN THE U.S.A.

IBM®

GG24-3662-00