X.25 Network Control Program
Packet Switching Interface

General Information

Version 3

GC30-3469-08

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Note

Before using this document, read the general information under “Notices” on page vii.

Ninth Edition, October 1998

| This is a revision of, and obsoletes, GC30-3469-07.

| This edition applies to:

| Version 3 of the IBM licensed program X.25 Network Control Program Packet Switching Interface (program number 5688-035)

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About This Book

X.25 NPSI Version 3 General Information introduces you to the basic concepts of packet switching, the X.25 protocol, and the IBM X.25 Network Control Program Packet Switching Interface (NPSI) licensed program. NPSI offers Systems Network Architecture (SNA) users the ability to use communication facilities that support the X.25 protocol as defined by the International Telegraph and Telephone Consultative Committee (CCITT), also known as the International Telecommunication Union-Telecommunication Standardization Sector (ITU-T), in Geneva in 1976, Malaga-Torremolinos in 1984, and Melbourne in 1988.

Who Should Use This Book

NPSI General Information is intended for managers, system designers, programmers, and data processing personnel involved in making data communication decisions for their respective organizations.

How to Use This Book

Read the beginning section of each chapter to familiarize yourself with information that you will need in evaluating this product.

How Numbers Are Written

In this book, numbers over four digits are represented in metric style. A space is used rather than a comma to separate groups of three digits. For example, the number ten thousand, five hundred fifty-two is written as 10 552.

How CSS, 37CS, and 3746 Model 900 Are Used

The terms *connectivity subsystem (CSS)* and *37CS* refer to the 3746 Model 900 connectivity subsystem, an expansion frame that extends the connectivity and enhances the performance of the IBM 3745 Communication Controller.

Symbols Used in This Book

Figure 0-1 on page x illustrates the symbols used throughout this book.

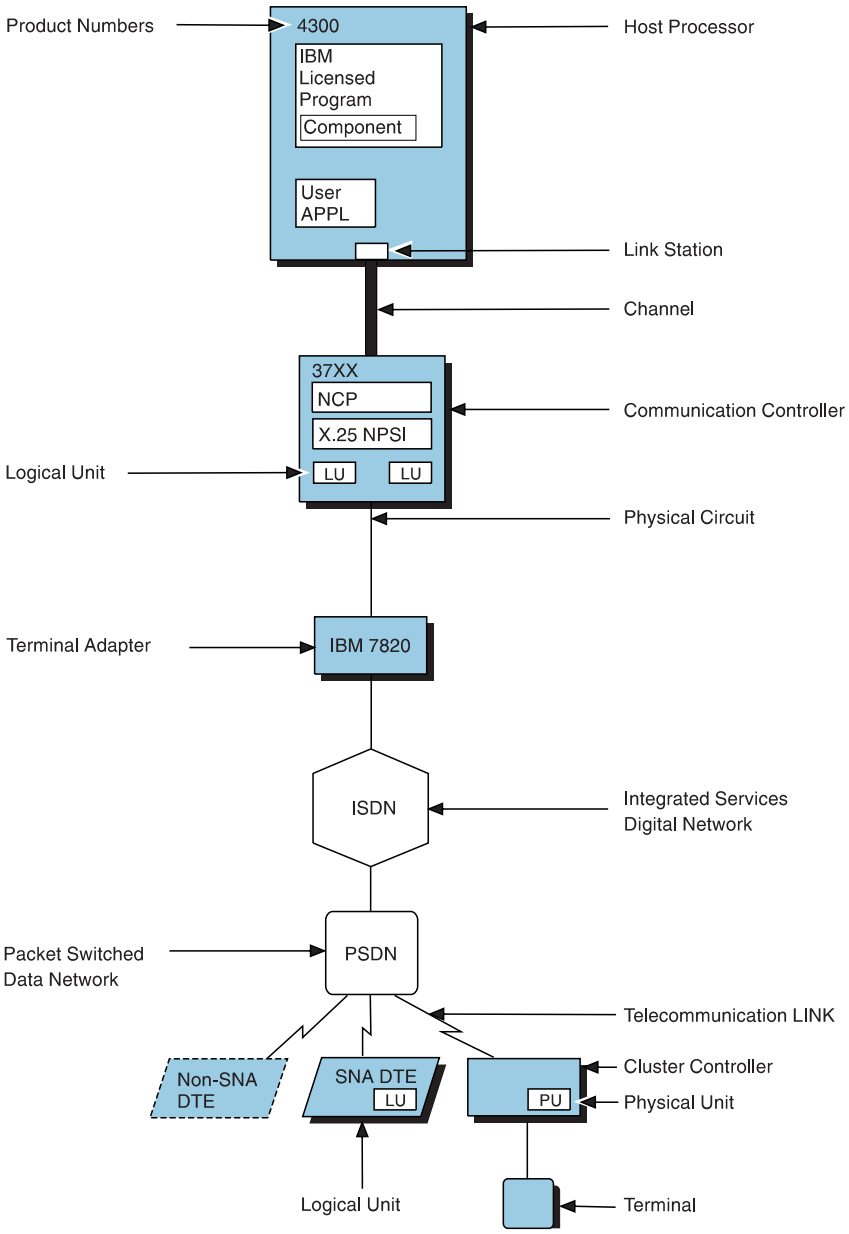

Figure 0-1. Symbols Used in This Book

Where to Find More Information

For more information on NPSI, see the information described in the following sections.

NPSI Hardcopy Library

The NPSI hardcopy library includes:

- *X.25 NPSI Version 3 Release 9 Data Areas*
- *NCP Version 7 and X.25 NPSI Version 3 Diagnosis, Customization, and Tuning*
- *X.25 NPSI Version 3 Host Programming*
- *NCP Version 7 and X.25 NPSI Version 3 Planning and Installation*

For information about related publications, see the “Bibliography” on page X-23.

NPSI Softcopy Library

Those publications available as softcopy books have cross-document search and hypertext links for speedy, online information retrieval. These softcopy books are grouped together on an electronic bookshelf and are part of the *ACF/NCP, ACF/SSP, EP, NPSI, and NTuneMON Softcopy Collection Kit*, LK2T-0414, on compact disc read-only memory (CD-ROM).

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Chapter 1. Introducing X.25 NPSI

Chapter 1. Introducing X.25 NPSI

This chapter introduces you to NPSI and provides information on:

- Data network comparison
- X.25 protocol overview
- X.25 protocol concepts
- X.25 protocol levels
- Packet assembler/disassembler (PAD) requirements

NPSI is a licensed program that allows users of IBM's Network Control Program (NCP) to attach IBM 3720, 3745, and 3746 Model 900 Communication Controllers to data transmission services. These data transmission services support interfaces complying with CCITT Recommendation X.25 and the mandatory functions of the International Organization for Standardization (ISO) 7776 and 8208. NPSI allows SNA host processors to communicate with SNA and non-SNA equipment over packet switched data networks (PSDNs) that use the X.25 protocols.

NPSI allows SNA users and non-SNA users to access an SNA host through a PSDN. Through NPSI, switched virtual circuits (SVCs) appear to the NCP and its associated host node as switched Synchronous Data Link Control (SDLC) links. Permanent virtual circuits (PVCs) appear to the NCP and host node as non-switched SDLC links.

The NPSI licensed program provides for SNA-to-SNA communication and SNA-to-non-SNA communication. This program enables communication between the following types of data terminal equipment (DTEs):

- SNA host node and SNA peripheral node
- SNA host node and SNA host node
- SNA host node and X.28 start-stop DTEs
- SNA host node and non-SNA X.25 DTEs
- SNA peripheral node and SNA peripheral node

Figure 1-1 illustrates how the X.25 interface enables data to enter and leave the network.

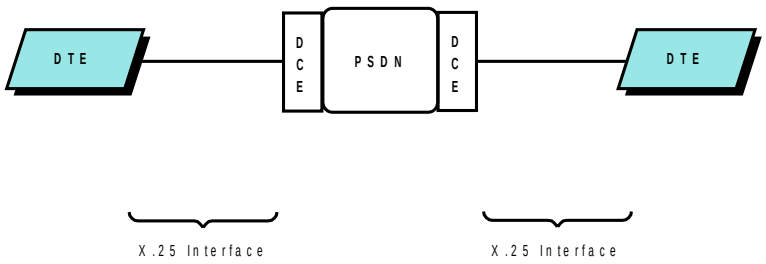

Figure 1-1. X.25 DTE and DCE Interface

In addition, NPSI provides:

- X.25 basic functions
- Support of optional user facilities
- Compatibility with other IBM licensed programs

Data Network Comparison

The two main types of data networks are circuit-switched and packet-switched. These two types of data networks are described in the following sections.

Circuit-Switched Data Network (CSDN)

CSDN provides a dedicated point-to-point circuit between two network devices. The communicating devices have exclusive use of the dedicated physical circuit while they are connected to each other over the network. Other users cannot communicate over that circuit until the devices are disconnected.

Figure 1-2 illustrates a CSDN.

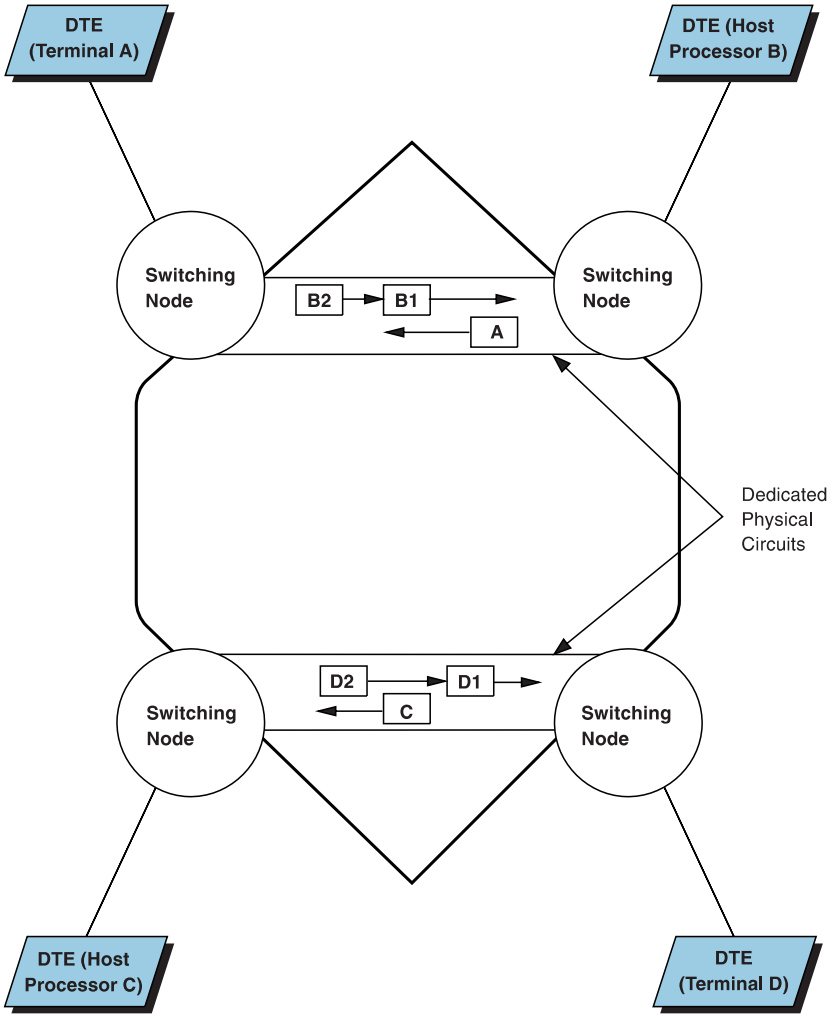

Figure 1-2. Circuit-Switched Data Network (CSDN)

Packet-Switched Data Network (PSDN)

With PSDN you do not have an exclusive right to a specific physical circuit. Instead, many network users share the same circuits to transmit their messages, which are divided into segments called packets. A packet is a sequence of binary digits, including data and call control signals, that is transmitted and switched as a whole. Packets from many users can be transmitted simultaneously. However, if a particular circuit is too crowded or is not working, data is rerouted to a different circuit.

PSDNs offer an alternative to circuit-switched or leased common carrier services. Transmitting each data packet separately across a PSDN and on different circuits reduces the cost of transmitting messages.

A PSDN consists of switching nodes and high-speed transmission lines between these nodes. DTE is the standard term used for a communication device that sends or receives network data. DTEs can be host processors, cluster controllers, or terminals. DTEs are connected to data circuit-terminating equipment (DCE). The DCE connect your equipment to the PSDN. The network supplier usually provides the DCE. The DCE and DTE can be located on the same premises.

Figure 1-3 on page 1-4 illustrates how physical circuits are shared by many DTEs in a PSDN.

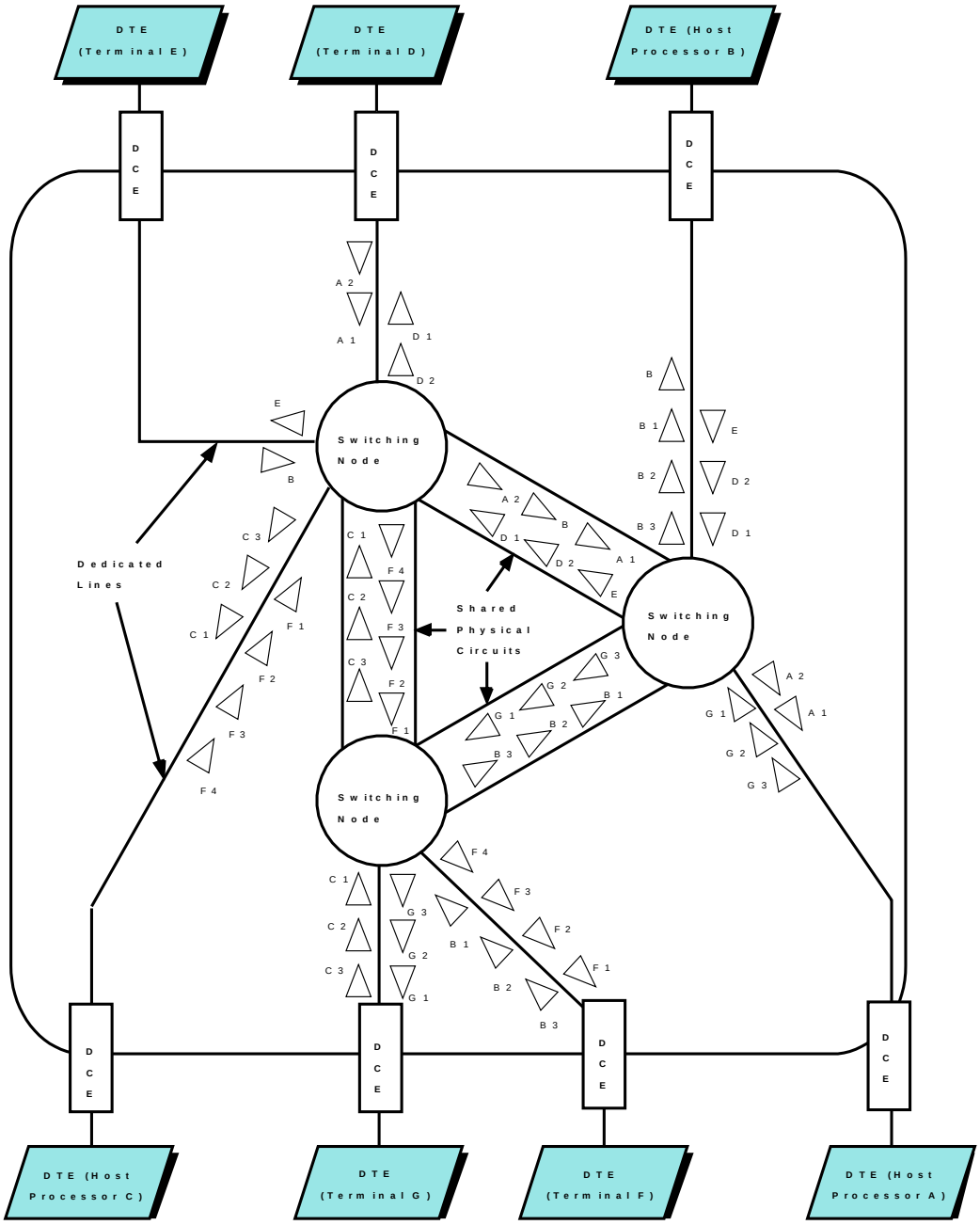

Figure 1-3. Packet-Switched Data Network (PSDN)

Function of Packet Switching

Packet switching is the data transport method used in a PSDN. All user data is segmented into packets that include both the data and a header. The header specifies the control functions and an implied destination address.

Data packets from many users are dynamically routed over shared network facilities and then sent to their destinations. When the packets reach their destinations, they are placed in the proper sequence and sent to the DTE. The DTE combines the packets into messages.

Data is sent across the network in fixed-length packets; however, packets need not be filled to the maximum length.

Comparing SNA and SDLC Links with PSDN and X.25 Links

Even though SNA SDLC connections and PSDNs share many similarities, the comparison in Table 1-1 notes several differences.

Table 1-1. Comparison of SNA and SDLC Connections and PSDNs

SNA and SDLC	PSDN
Multipoint and point-to-point	Point-to-point only
Switched physical	Switched logical
SDLC	High-level data link control (HDLC)

Figure 1-4 illustrates the comparison of SDLC and X.25 linkages in an SNA-to-SNA configuration. The LU-LU session in both occurs between an SNA host processor and an SNA cluster controller.

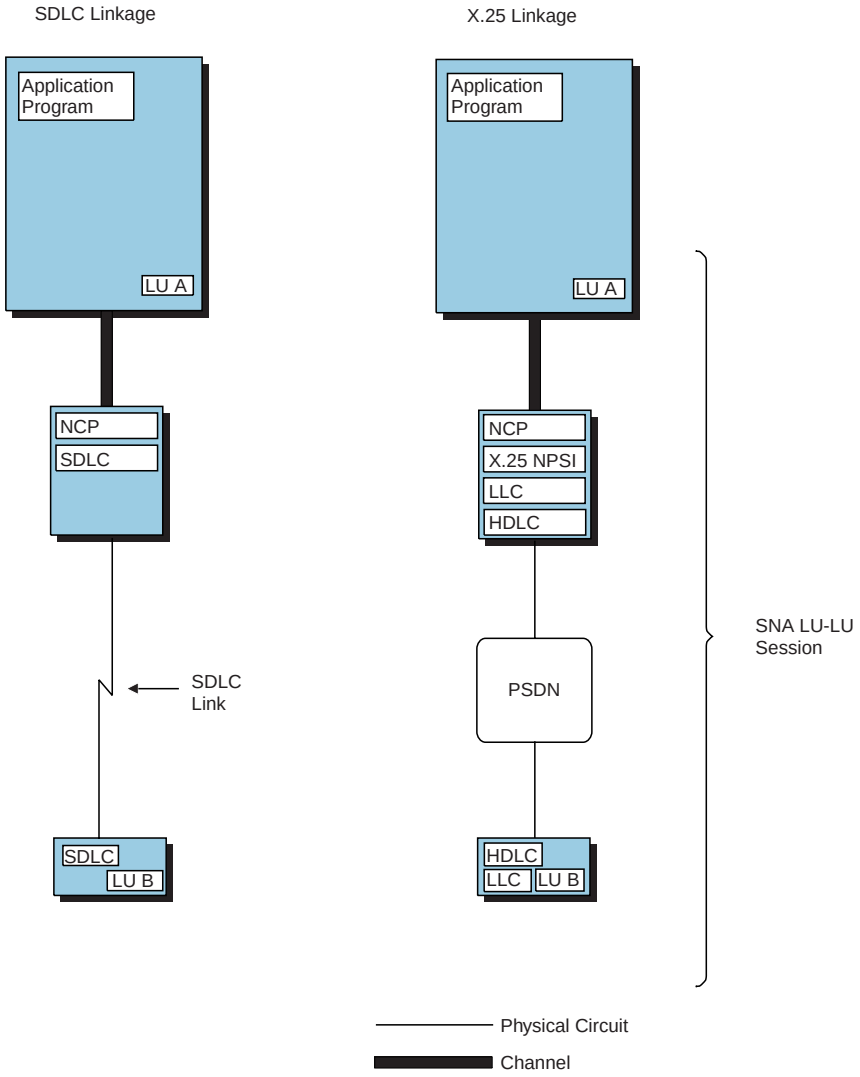

Figure 1-4. Comparison of SDLC and X.25 Linkages in an SNA-to-SNA Configuration

X.25 Protocol Overview

Recommendation X.25 of the CCITT describes the interface between the customer-provided DTE and the network DCE. This book provides you with general information about Recommendation X.25. For detailed information about this topic, see *CCITT Blue Book Volume VIII–Fascicle VIII.2–Data Communications Networks: Services and Facilities, Interfaces—Recommendations X.1–X.32 (Melbourne 1988)*.

For more information about the ISO standards related to the CCITT recommendations, see:

- *ISO 7776 Information Processing Systems—Data Communication—High-Level Data Link Control Procedures—Description of the X.25 LAPB-Compatible DTE Data Link Procedures*
- *ISO 8208 Information Processing Systems—Data Communication—X.25 Packet Level Protocol for Data Terminal Equipment*

Many telecommunication organizations that offer services to the general public have implemented, or plan to implement, PSDNs with a DTE and DCE interface that is based on CCITT Recommendation X.25. Also, several private PSDN suppliers have implemented networks using the CCITT Recommendation X.25 interface.

X.25 is a protocol used on a point-to-point line for multiple concurrent conversations between users. The original concept was to promote communication between equipment vendors. However, telecommunication services extended the X.25 protocol to include connecting two different point-to-point lines using existing telephone networks. PADs allow for more connections to other protocols, such as asynchronous ASCII. A PSDN is not required to use the X.25 protocol.

X.25 Protocol Concepts

To understand the PSDN network environment, you must be familiar with information units, logical channels, virtual circuits, and windows.

Information Units

In the X.25 environment, the information units are called *frames* and *packets*. Figure 1-5 on page 1-7 illustrates frames and packets.

Frames

A frame is the link-level vehicle for transmitting commands, responses, or packets over the physical circuit between a DTE and a DCE. A frame contains control information or user data, or both, and is delimited by flags on each end.

The three types of frames are supervisory (S frames), unnumbered (U frames), and information (I frames). Supervisory and unnumbered frames carry only link-control information. Information frames carry one packet of data or one packet of control information over the DTE and DCE circuit.

Packets

A packet is the basic information unit that is transmitted through the network. Each data packet contains a header and user data. A header includes a logical channel identifier, which is described in “Logical Channels.”

In addition to data packets, various control packets can be sent either from a DTE to the adjacent network DCE or from the adjacent network DCE to a DTE. For example, when a DCE is ready to receive data from a DTE, the DCE can send a receive ready packet to the DTE, indicating that it is ready to receive data. The DTE can then send a data packet to the DCE. The DCE sends the packet through the network. The DCE sends a receive not ready packet to the DTE if it is not ready to receive data. These same types of packets can be sent from a network DCE on the other side of the network to the DCE's adjacent DTE, which receives the data.

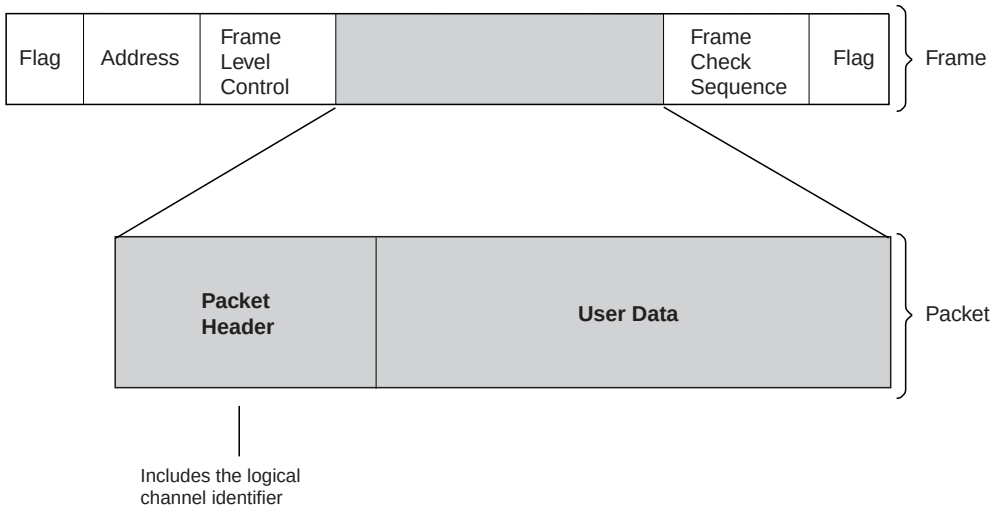

Figure 1-5. Frame and Packet

Logical Channels

A physical circuit connects DTEs to DCEs. This physical circuit is called a multi-channel link (MCH). Each physical circuit can accommodate multiple logical channels.

The logical association between two logical channels is a virtual circuit. DTEs are linked across a PSDN through virtual circuits. The packet switching nodes within the PSDN are responsible for keeping track of the endpoints and logical channel numbers of a virtual circuit connection, and for routing the packets to the correct destination.

Each X.25 packet header contains a logical channel identifier, which is used to identify the logical channel to which the packet belongs and to associate the packet with a SVC or a PVC. Recommendation X.25 allows up to 4096 logical channels to be assigned to a single physical circuit. When the DTE sends a packet to the adjacent DCE, the DTE places a logical channel identifier in the packet header. When the PSDN sends the packet to the DTE, the PSDN places the logical channel identifier in the packet header.

For example, a packet-interleaving technique, which involves assigning several logical channels to the same physical circuit, allows one DTE to communicate simultaneously with several DTEs. Figure 1-6 on page 1-8 illustrates the relationship between logical channels and virtual circuits through a PSDN.

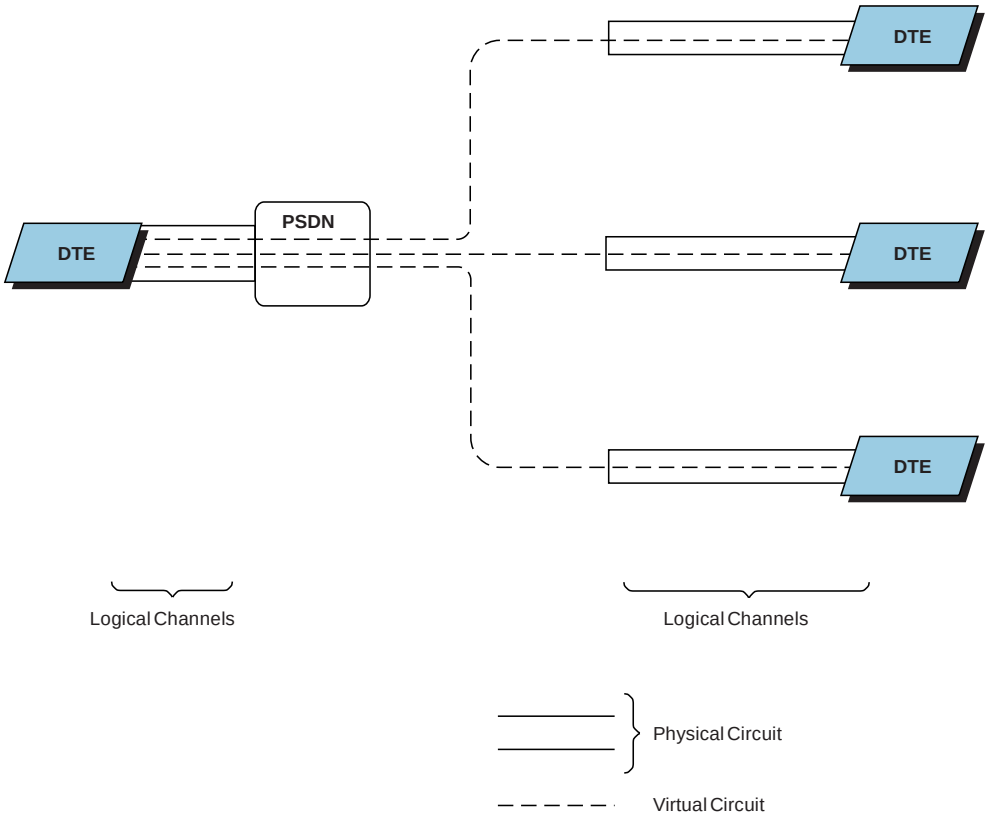

Figure 1-6. Logical Channels and Virtual Circuits through a PSDN

Virtual Circuits

A virtual circuit refers to the network facilities that give the appearance of an actual point-to-point connection. The network appears as if a dedicated point-to-point circuit exists between two communicating DTEs in a PSDN, even though such a circuit does not actually exist.

The PSDN sets up the virtual circuit between the two DTEs, which ensures an association between the source and destination addresses. Each DTE is given a logical channel identifier that it uses to access a particular virtual circuit. Logical channel identifiers at either end of the same virtual circuit are independent and, in general, the identifiers are not the same.

Both the network and the DTE share the job of controlling data flow. This control restricts the DTE from flooding either the network or the DCE with too much data.

Depending on your needs and the services offered by the network, the virtual circuit can be set up to act as either a SVC or a PVC.

Switched Virtual Circuits (SVCs)

A switched virtual circuit (SVC) is a temporary circuit between two DTEs. An SVC is initiated when one DTE makes a call request to the network. SVCs are also known as virtual calls, the term used by the CCITT.

A virtual call facility requires end-to-end transfer control of packets within the network. Data can be delivered to the network before the call setup has been completed. However, if the call setup attempt is unsuccessful, the data is not delivered to the destination address. Multiple-access DTEs can have several virtual calls in operation at the same time.

Permanent Virtual Circuits (PVCs)

A permanent virtual circuit (PVC) is similar to a point-to-point private line. A PVC represents a permanent association between two DTEs and requires no call setup, or call clearing, by the DTE.

Windows

Windows are the main mechanism for pacing or controlling the data flow. A window is an ordered set of consecutive send sequence numbers of the data units authorized to cross a DTE and DCE interface.

Frame window size is the maximum number of consecutive I frames that can be sent across the DTE and DCE interface on a physical circuit before an acknowledgment is received.

Packet window size is the maximum number of consecutive data packets that can be sent across the DTE and DCE interface on a logical channel before an acknowledgment is received. In most PSDNs, the default frame window size is 7, and the default packet window size is 2. Assuming the line is error-free, a larger window size directly correlates with a faster data transmission speed.

Larger packet window sizes consume more buffer storage space. Therefore, the choice of packet window size depends on the application, data volume, and physical access line speed. Check your network parameters before selecting the window size.

X.25 Protocol Levels

CCITT Recommendation X.25 defines three levels of the DTE and DCE interface that PSDN suppliers use as a functional design guide. These three levels are physical, link, and packet.

Physical Level

The physical level defines the electrical and mechanical characteristics of the physical circuit between the DTE and the DCE. Control functions at this level include activating, maintaining, and deactivating the physical circuit between the communicating device (DTE) and the network entry point (DCE).

Recommendations X.21 and X.21 bis define the physical level.

Link Level

The link level defines the procedure for the accurate exchange of information between the DTE and the DCE. NPSI supports the Recommendation X.25's link access protocol balanced (LAPB) procedure. You can use this procedure to transfer frames containing link-level control information or packets across the physical circuit between the DTE and the DCE. The LAPB data formatting functions and first-level recovery procedures ensure that data and control information are accurately exchanged over the DTE and DCE physical circuit. LAPB also combines the functions of primary and secondary link stations into a single link station at each link end.

Packet Level

The packet level defines how user data and control information are structured into packets that are exchanged between a DTE and a PSDN. The packet level specifies the procedure through which virtual calls between DTEs are established, maintained, and cleared. The packet level also specifies the flow control mechanisms and optional user facilities that you can use. Packet-level protocol applies to both PVCs and SVCs.

Packet Assembler/Disassembler (PAD) Requirements

Many vendors of DTEs have provided X.25 interface support as a standard interface or as an additional feature. For those devices that do not offer an X.25 interface, a packet assembler/disassembler (PAD) can be used to communicate through an X.25 PSDN.

Users of start-stop communication who wish to connect with an X.25 PSDN must use a PAD. The CCITT has defined a PAD for international usage in its Recommendations X.3, X.28, and X.29 for start-stop terminals:

Recommendation X.3
: Defines a set of parameters that you can use to select operational characteristics of the PAD service.

Recommendation X.28
: Defines the procedures used by the start-stop ASCII device that accesses the PAD. These procedures provide you with an initial set of X.3 PAD parameters, a profile, and an explanation of how these PAD parameters can be changed for each virtual call.

Recommendation X.29
: Defines the procedures that access the PAD service, which the DTE can use. Recommendation X.29 also includes procedures to change the X.3 PAD parameters during the virtual call, if required.

In addition to the CCITT PAD, public PSDNs can offer other types of PADs, such as those for supporting binary synchronous communication (BSC) 3270 or point-of-sale terminals. However, these PADs are generally local implementations, and are not included in the CCITT recommendations.

Chapter 2. NPSI Functions and Enhancements

Chapter 2. NPSI Functions and Enhancements

This chapter describes the functions and enhancements supported by NPSI, and is divided into the following functional areas:

- NPSI V1R4.3 base functions
- NPSI V3 base functions
- NPSI V3R3 enhancements
- NPSI V3R4 enhancements
- NPSI V3R5 enhancements
- NPSI V3R6 enhancements
- NPSI V3R7 enhancements
- NPSI V3R8 enhancements
- NPSI V3R9 enhancements

NPSI provides X.25 services that supervise all virtual circuits at the DTE and DCE interface. This interface is referred to as an MCH. NPSI establishes and ends any remote DTE connections that use SVCs. In addition, NPSI handles virtual circuit error recovery procedures. System services control point (SSCP) commands or network control packets drive NPSI functions.

NPSI Version 1 Release 4.3 Base Functions

The NPSI V1R4.3 base functions include:

- SNA configurations
- Non-SNA configurations
- Multichannel link compatibility
- Coexistence with related network programs
- Communication without a network
- Delivery confirmation support
- Support of X.21 nonswitched adapter
- Optional user facilities

SNA Configurations Supported by NPSI

NPSI supports these types of SNA communication configurations:

- Communication between subarea nodes
- Communication between an SNA host node and an SNA peripheral node

Communication between Subarea Nodes

NPSI allows communication between two subarea nodes through a PSDN in one of four configurations:

1. Connection to an SNA host node equipped with its own communication controller and NPSI
2. Connection to a remote communication controller
3. Connection to an SNA host node or another communication controller using an SDLC or PAD
4. Connection to an SNA host node with an integrated X.25 feature

Figure 2-1 illustrates configurations 1 and 2.

Notes:

1. A remote communication controller can be loaded only under certain conditions. See “Enhanced Capability to Activate Load and Dump Remote NCPs” on page 2-24 for more information about these conditions.
2. Only single-link transmission groups (TGs) can be defined for NPSI-to-NPSI communication through X.25 networks.
3. SDLC PAD implementations do not always support subarea-node-to-subarea-node connections.

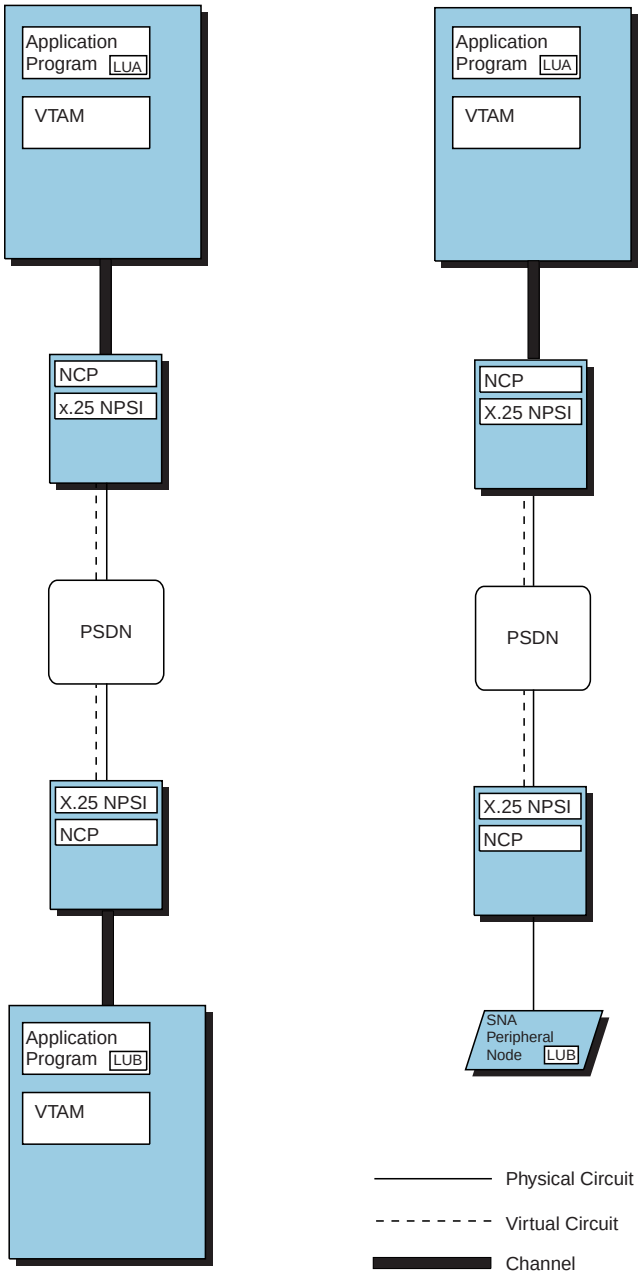

Figure 2-1. Communication between Subarea Nodes

Figure 2-2 illustrates configurations 3 and 4.

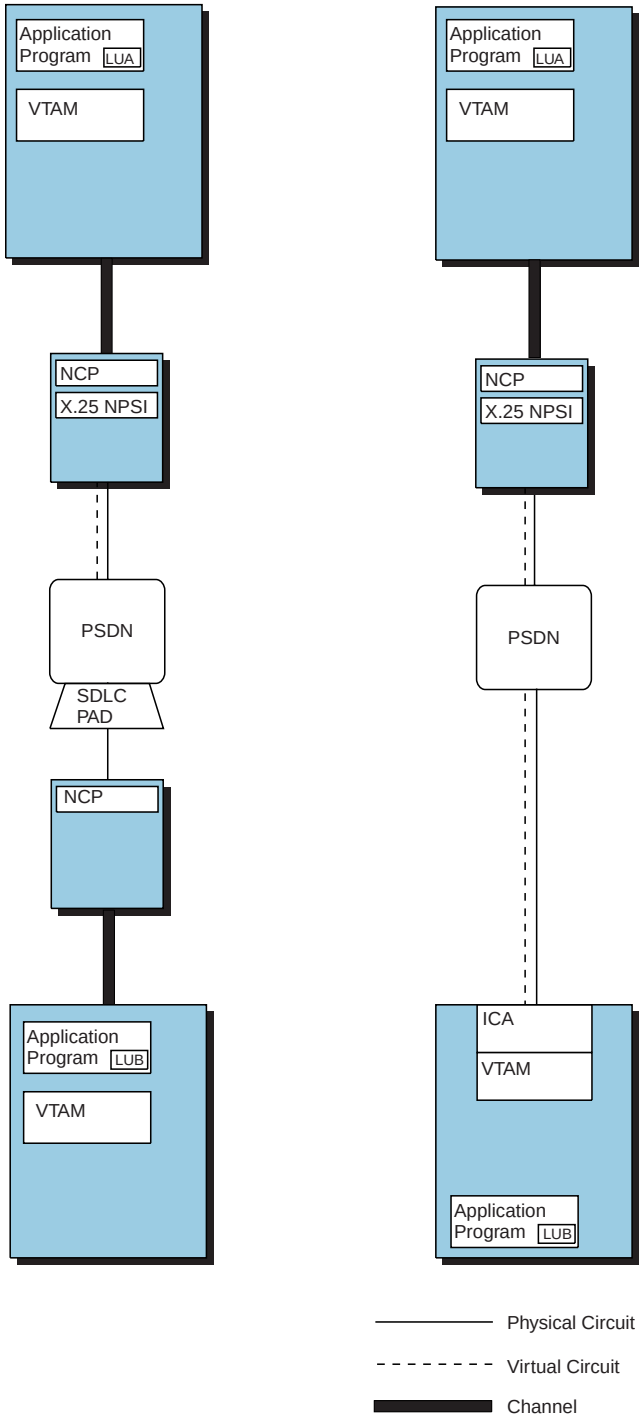

Figure 2-2. More Communication between Subarea Nodes

Communication between an SNA Host Node and an SNA Peripheral Node

You can implement communication between an SNA host node and an SNA peripheral node by installing NPSI in the NCP at the host site. At the terminal site, the SNA peripheral node is attached to the PSDN by one of the following interfaces:

- Integrated X.25 support
- SDLC PAD
- Network Interface Adapter (NIA)

Integrated X.25 support, which is contained in the SNA peripheral node, allows packets simulating SDLC commands and data to transparently pass through the PSDN. Many IBM devices have integrated X.25 support or can be customized to support the X.25 protocol.

The SDLC PAD supports high-level data link control (HDLC) to the PSDN and SDLC to the peripheral node. An SNA peripheral node can be attached to an SDLC PAD.

An NIA converts SDLC protocols to X.25 protocols or X.25 protocols to SDLC protocols. An NIA is an IBM-supplied unit.

Figure 2-3 illustrates the communication between an SNA host node and an SNA peripheral node.

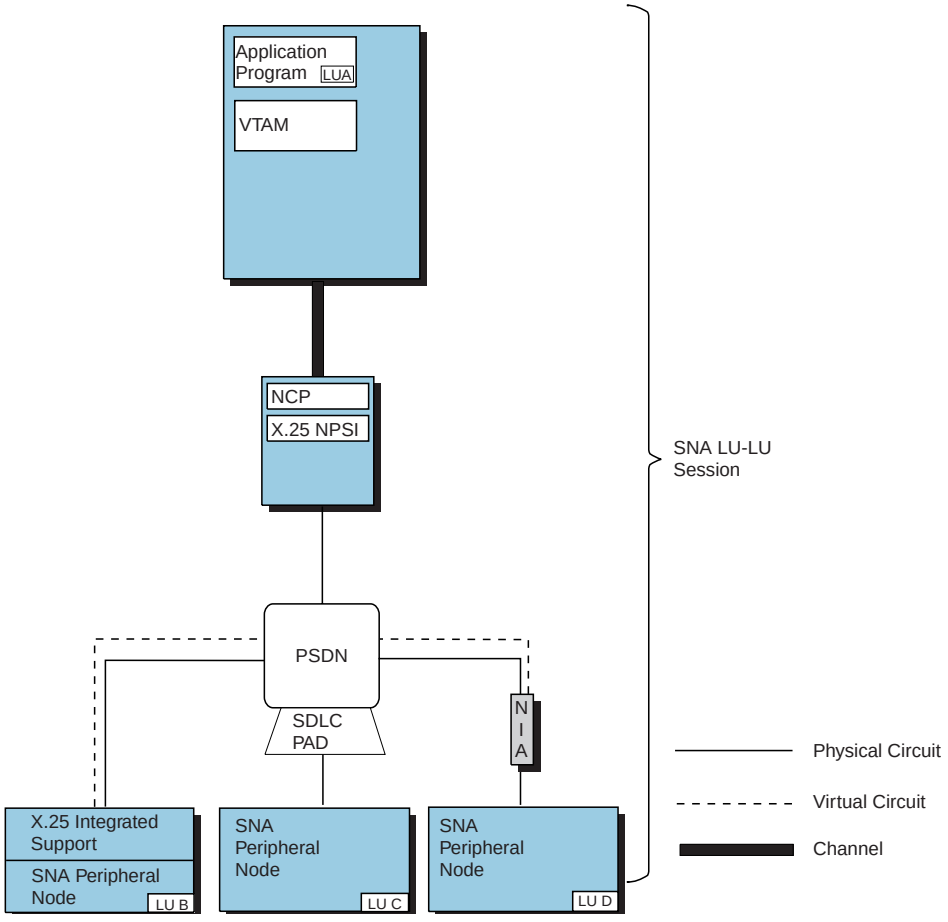

Figure 2-3. SNA Host Node to SNA Peripheral Node

Non-SNA Configurations Supported by NPSI

NPSI supports non-SNA communication between an SNA host node and a:

- Non-SNA X.25 DTE (PCNE)
- CCITT PAD (integrated PAD support)
- Nonstandard PAD (transparent PAD support)
- Non-SNA X.25 DTE (GATE)
- Remote DTE (DATE)

Communication between an SNA Host Node and a Non-SNA X.25 DTE (PCNE)

You can establish communication between an SNA host node and a non-SNA X.25 DTE by using the protocol converter for non-SNA equipment (PCNE) function of NPSI.

Figure 2-4 on page 2-6 illustrates communication using a PCNE.

The PCNE simulates a logical unit (LU) for the non-SNA device to the host, so the host LU believes that it is communicating with an SNA LU type 1, rather than with a non-SNA X.25 DTE.

For data sent from the host to the X.25 DTE, the PCNE replaces the SNA headers with packet headers. The data is then sent over the network to the X.25 DTE using X.25 protocols.

For data sent from the X.25 DTE to the host, the PCNE replaces the packet headers with SNA headers. The SNA data is then sent to the host.

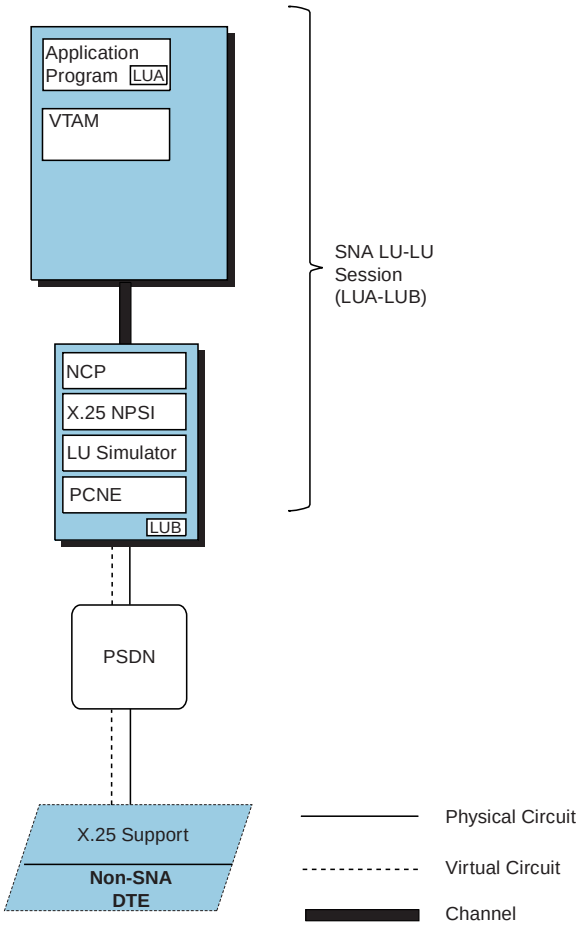

Figure 2-4. SNA Host Node to Non-SNA X.25 DTE (PCNE)

You can also establish a PCNE-to-PCNE connection for communication between SNA application programs in two subarea nodes as an alternative to using cross-domain SNA networking facilities.

Note: Because SNA formats and protocols are not employed on an end-to-end basis, you should ensure that the necessary compatible data streams and integrity mechanisms exist between the application program in the SNA host and the non-SNA X.25 DTE.

Communication between an SNA Host Node and a CCITT PAD (Integrated PAD Support)

You can establish communication between an SNA host node and a start-stop DTE that conforms to Recommendation X.28 by using the integrated PAD support function of NPSI. Figure 2-5 on page 2-7 illustrates integrated PAD support.

Integrated PAD support is an extension to the PCNE. Integrated PAD support implements a subset of CCITT Recommendation X.29 for communication with TTY 33/35 and other start-stop DTEs conforming to CCITT Recommendation X.28 that access the PSDN over a CCITT PAD.

Within the network, the PAD operates in a manner similar to an X.25 DTE by performing the PAD support on behalf of the start-stop DTE.

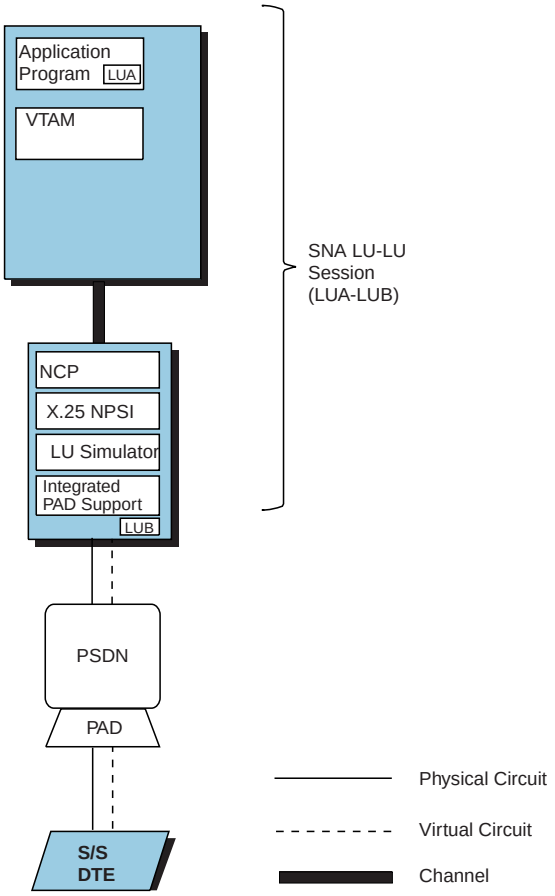

Figure 2-5. SNA Host Node to Non-SNA X.25 DTE (Integrated PAD Support)

Note: Because SNA formats and protocols are not employed on an end-to-end basis, you should ensure that the necessary compatible data streams and integrity mechanisms exist between the application program in the SNA host and the non-SNA X.25 DTE.

See “Packet Assembler/Disassembler (PAD) Requirements” on page 1-10 for more information about CCITT recommendations that relate to PADs.

Communication between an SNA Host Node and a Nonstandard PAD (Transparent PAD Support)

Transparent PAD support allows an application program in the host to control a remote PAD associated with a DTE. Figure 2-6 on page 2-9 illustrates transparent PAD support. This support allows control of PADs that do not conform to CCITT recommendations and allows greater control over PAD operation than is provided with the integrated PAD support.

Like integrated PAD support, transparent PAD support is an extension of the PCNE function. Transparent PAD support identifies the packet type that is sent to or received from the host through the use of a packet type identifier that occupies the first byte of the message.

When the host sends data, the transparent PAD support function replaces the SNA header with the appropriate packet header, which was identified by the host application in the first byte of the request unit.

When the network PAD sends packets, the transparent PAD support function replaces the X.25 packet header with an SNA header and identifies, in the first byte of the request unit, the packet type received by the transparent PAD support function.

NPSI and the application program identify four packet types:

- Data packets
- Qualified data packets
- Interrupt packets
- Reset packets

Data Packet
A data packet transmits user data from end to end on a virtual circuit.

Qualified data packets
A qualified data packet has a qualified bit (Q bit) turned on in the packet header. This type of packet is generally used to carry PAD commands and control information.

Interrupt packet
An interrupt packet transmits priority information *out of sequence* across the virtual circuit.

Reset packet
A reset packet resets virtual circuits at the DTE or DCE interface.

Note: Because SNA formats and protocols are not employed on an end-to-end basis, you should ensure that the necessary compatible data streams and integrity mechanisms exist between the application program in the SNA host and the non-SNA X.25 DTE.

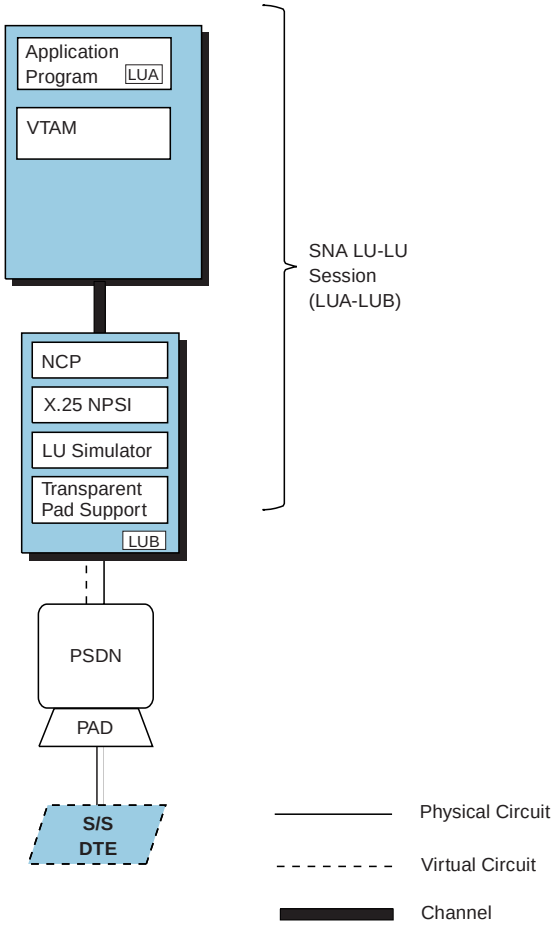

Figure 2-6. Host Node to Non-SNA X.25 DTE (Transparent PAD Support)

Communication between an SNA Host Node and a Non-SNA X.25 DTE (GATE)

The general access to X.25 transport extension (GATE) function of NPSI allows a host user application program, called the communication and transmission control program (CTCP), to monitor virtual circuits to non-SNA X.25 DTEs by processing the contents of these packets:

- Data packets
- Qualified data packets
- Interrupt packets
- Call-and-clear packets
- Reset packets
- Diagnostic packets

Call-and-clear packets activate and deactivate SVCs respectively. Both control (interrupt, call-and-clear, reset, and diagnostic packets) and data packets (data and qualified data packets) are sent and received through the CTCP.

Figure 2-7 on page 2-10 illustrates the GATE function.

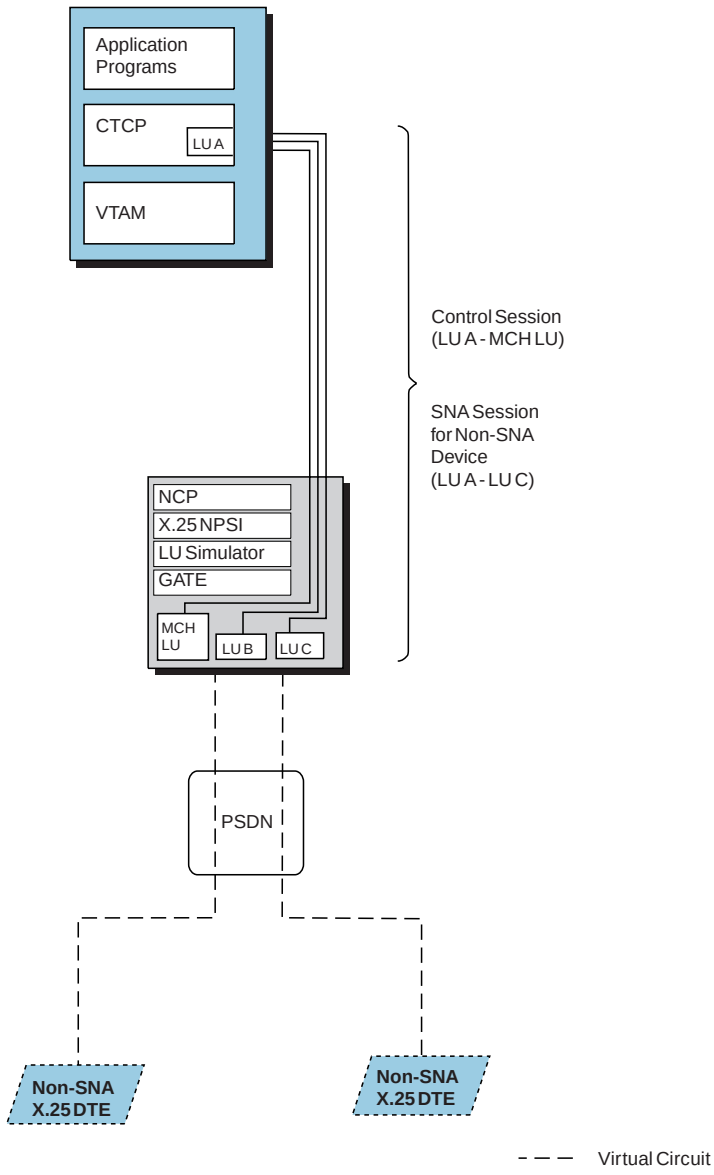

Figure 2-7. Host Node to Non-SNA X.25 DTE (GATE)

Control and qualified data packets flow on the CTCP-LU-to-VC-LU session if that session is active. If the session is not active, the packets flow on the CTCP-LU-to-MCH-LU session. Nonqualified data packets are sent on the LU-LU session between the CTCP and the simulated virtual circuit LU (LU A to LU B and LU A to LU C).

In addition to managing the virtual circuits, GATE CTCPs can be used as a relay program to subsystems, such as CICS, IMS, and TSO.

V3 and Later: NPSI provides a fast connect function, which is an extension of the GATE function. The fast connect function substantially reduces the connection time for each X.25 call setup. This speed is possible because the CTCP-LU-to-VC-LU session is established only once, rather than a session being dynamically established for each X.25 connection.

V3R4 and Later: NPSI supports a Fast Transaction Processing Interface (FTPI) which is a protocol of CTCP and an extension of the GATE interface of NPSI. FTPI has multiplexing and blocking mechanisms that increase traffic performance. All virtual circuit traffic associated with FTPI MCHs flow over one or more sessions (up to 28) between the CTCP and NPSI. With FTPI, all commands to or from several virtual circuits associated with several MCHs can be blocked within a single path information unit (PIU). An FTPI CTCP controls the session establishment and the termination of all virtual circuits on the MCH. The FTPI CTCP also processes the data flowing over these FTPI virtual circuits.

IBM provides CTCPs that you can use with the GATE function. Some examples are the Open Systems Interconnection Communication System (OSICS) and the Communication Subsystem for Interconnection (CSFI).

V3R4 and Later: NPSI provides an example of how to code a GATE FTPI CTCP in the sample library on the product tape.

Note: Because SNA formats and protocols are not employed on an end-to-end basis, you should ensure that the necessary compatible data streams and integrity mechanisms exist between the application program in the SNA host and the non-SNA X.25 DTE.

Communication between an SNA Host Node and a Remote DTE (DATE)

The dedicated access to the X.25 transport extension (DATE) function of NPSI allows the CTCP to manage the virtual circuits to SNA and non-SNA X.25 DTEs by processing the contents of the following packets:

- Qualified data packets
- Interrupt packets
- Call-and-clear packets
- Reset packets

With the DATE function, the contents of the data packets are transferred between the virtual circuit LU and the application program LU. The control packets are transferred between the MCH LU and the CTCP LU that performs virtual circuit management.

The DATE and GATE functions have the following differences:

- The DATE function supports both SNA and non-SNA X.25 DTEs. NPSI and the DATE CTCP exchange only control information; however, NPSI exchanges user data directly with the application program.
- The GATE function supports only non-SNA X.25 DTEs. NPSI and the GATE CTCP exchange both control information and user data.

Figure 2-8 illustrates the DATE function.

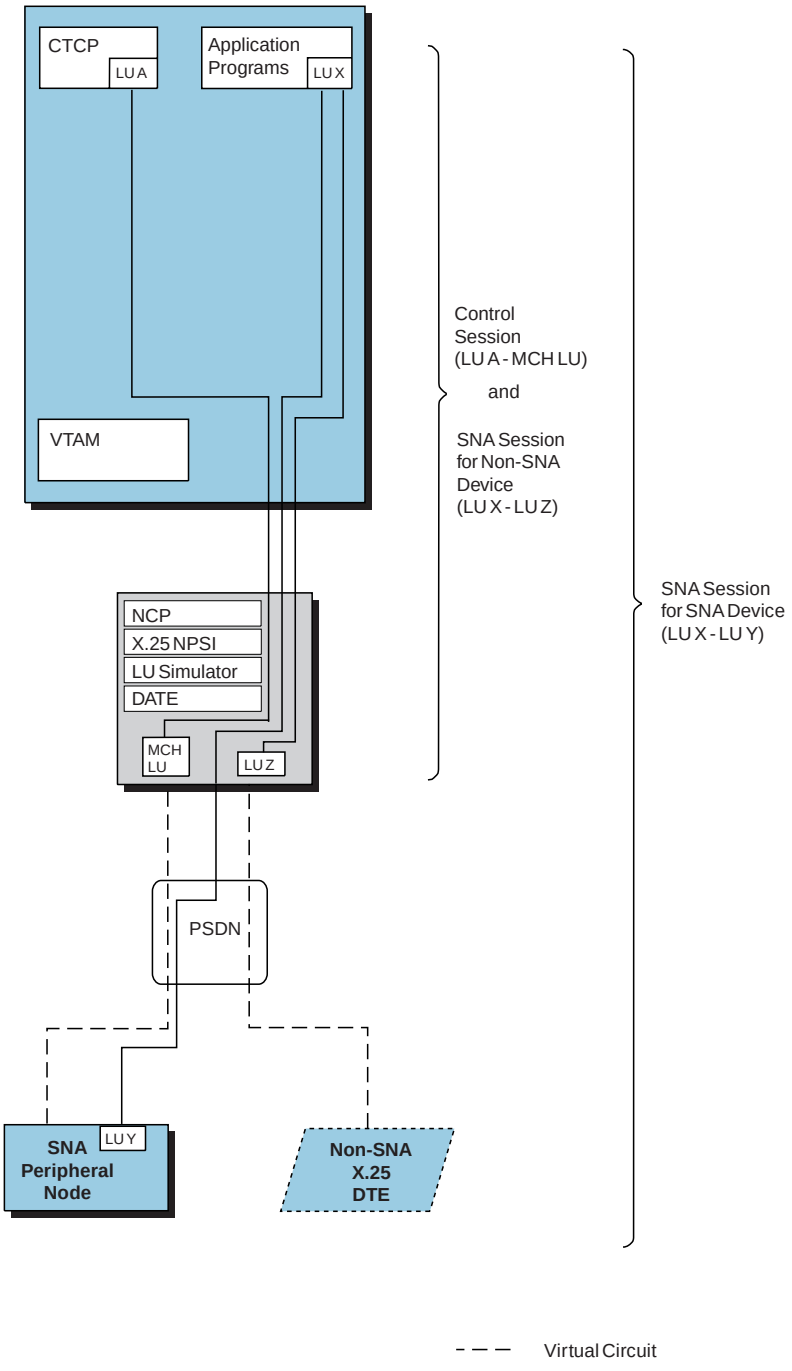

Figure 2-8. SNA Host Node to SNA Peripheral Node or to Non-SNA X.25 DTE (DATE)

Multichannel Link (MCH) Compatibility

Table 2-1 shows the compatibility of the GATE and DATE functions, integrated PAD support, transparent PAD support, and PCNE on the same multichannel link.

Table 2-1. Multichannel Link Compatibility

	GATE	DATE	Integrated PAD Support	Transparent PAD Support	PCNE
GATE	N/A	No	Yes	Yes	Yes
DATE	No	N/A	Yes	Yes	Yes
Integrated PAD Support	Yes	Yes	N/A	No	Yes
Transparent PAD Support	Yes	Yes	No	N/A	Yes
PCNE	Yes	Yes	Yes	Yes	N/A

Coexistence with Related Network Programs

NPSI can coexist with the Network Routing Facility (NRF) licensed program, the Non-SNA Interconnection (NSI) licensed program, the Network Terminal Option (NTO) licensed program, the SNA network interconnect (SNI), and the X.25 SNA Interconnection (XI) licensed program.

Network Routing Facility (NRF)

The NRF licensed program resides with the NCP in the communication controller. NRF provides a path for messages between terminals and routes messages over this path without going through the host processor.

Non-SNA Interconnection (NSI)

The NSI licensed program extends NCP capabilities to provide SNA transport support for BSC remote job entry data from selected non-SNA facilities.

Network Terminal Option (NTO)

The NTO licensed program extends NCP capabilities to allow access to certain non-SNA terminals through the record mode application program interface in VTAM and TCAM. NTO also provides an SNA interface for a select group of start-stop and BSC devices that emulate the SDLC 3767 communication terminal to VTAM and TCAM.

NTO preserves the non-SNA data stream, which minimizes changes to existing application programs.

SNA Network Interconnection (SNI)

SNI allows separate SNA networks to interconnect through a gateway NCP. The gateway NCP, with assistance from a gateway SSCP, performs name and address conversions to permit interconnection. NPSI fully supports SNI connections across subarea link virtual circuits.

X.25 SNA Interconnection (XI) and NPSI Bridge

The XI licensed program allows the SNA network to transport X.25 packets from one DTE to another DTE. The NPSI bridge function of XI allows NPSI and XI to exchange packets directly at the packet layer, bypassing the lower layers of the X.25 protocol.

Communicating without a Network

NPSI can communicate directly with an X.25 DTE using a link connection. In this case, NPSI functions as a DCE at link level. This is used for testing, or for local X.25 devices. NPSI can also function as a DCE when it is connected directly to another NPSI defined as a DTE.

Delivery Confirmation Support

For communication with non-SNA DTEs, use the PCNE function, as defined under "Communication between an SNA Host Node and a Non-SNA X.25 DTE (PCNE)" on page 2-5. You can specify that NPSI use the delivery confirmation bit (D bit) to map the definite response mode. If the D bit is off (set to 0), the packet acknowledgment comes from the adjacent DCE rather than from the destination DTE.

For SNA-to-SNA communication, SNA provides an end-to-end mechanism for delivery confirmation; the D bit is not used.

Support of X.21 Nonswitched Adapter

NPSI allows you to communicate over an X.25 network using the X.21 nonswitched adapter.

Optional User Facilities

CCITT defines optional user facilities. If the GATE or DATE function is used, NPSI allows all facilities to be supported by the CTCP. If the GATE or DATE function is not used, NPSI supports the following facilities.

Flow Control Parameter Negotiation: This facility permits negotiation on a per-call basis of the flow control parameters. The flow control parameters are the packet and window sizes for each direction of data transmission. If the packet or window sizes are not specified in the call request packet, the DCE assumes the default sizes. If the packet and window sizes requested by the DCE are the same in both directions, NPSI always accepts and uses these sizes.

Modulo 8 and Modulo 128 Packet Sequence Numbering: Modulo 128 support provides modulo 128 packet sequence numbering on all the virtual circuits of a given DTE or DCE interface. In the absence of this facility, modulo 8 sequence numbering is performed.

Nonstandard Default Packet Sizes: This facility allows you to select default packet sizes from the list of packet sizes supported by the X.25 PSDN. In the absence of this facility, the default packet size is 128 bytes.

Nonstandard Default Packet Window Sizes: This facility allows you to select default window sizes from the list of window sizes supported by the X.25 PSDN. In the absence of this facility, the default window size is 2.

One-Way Logical Channel: This facility restricts logical channel use to either incoming or outgoing calls. However, one-way logical channels retain their duplex nature during data transfer.

Other Facilities: The following describes how NPSI supports other X.25 optional user facilities, such as reverse charging and closed user group.

- Facilities can be specified in the outgoing call request packet.
- Facilities are always accepted in the incoming call and the call connected packets.

A complete list of the X.25 optional user facilities and a description of the corresponding NPSI support are described in *X.25 NPSI Version 3 General Information*.

NPSI Version 3 Base Functions

The NPSI V3 base functions, as well as enhancements include:

- 3745 support
- Fast connect
- Multiple GATE CTCPs
- SNA type 2.1 node support
- Switched virtual circuit subarea communication (SVCSC)
- Switched virtual circuit short hold mode (SVCSHM)
- Port swapping
- Common NCP and NPSI generation
- Performance improvement
- Improved availability
- Virtual circuit trace
- CTCP and LLC selection
- DATE message to unbound LU
- PAD selection
- Password protection
- Remote PU type 4 activation
- SHUTD processing
- Enhanced availability during loss of SSCP ownership
- Retry of clear, reset, and restart requests
- Choice of diagnostic codes
- Ability to reject incoming calls that specify certain optional facilities
- Choice of clearing or not clearing SVC after reset
- Improved resource naming
- Virtual circuit trace

3745 Support

NPSI V3 runs on the IBM 3745 Communication Controller, as well as on the IBM 3720 Communication Controller. The 3745 Communication Controller allows NPSI to use additional line addresses.

Fast Connect

The fast connect[1] function provides a quick way of establishing connections for non-SNA X.25 terminals communicating over SVCs using the GATE function. Because fast connect is based on the GATE function, it requires the use of a CTCP.

Fast connect preestablishes SNA sessions between the CTCP LU and the simulated NPSI LUs. These sessions are permanently established to allow processing to continue despite virtual circuit CLEAR commands. Therefore, you do not have to reestablish the SNA session for each call request.

You can choose fast connect for individual X.25 physical circuits. When chosen, the entire physical circuit is dedicated to fast connect. Up to 28 CTCPs can communicate with the virtual circuits of a given physical circuit. A CTCP is selected according to the first byte of the call user data (CUD) field or the last subaddressing digit.

The SNA lines that map the virtual circuits appear as nonswitched lines to the NCP and the host access method. For a given X.25 physical circuit, the total number of nonswitched lines declared to the NCP and to the access method can exceed the defined number of SVCs. This allows a given CTCP to absorb peak traffic if the usage of other CTCPs on the shared physical circuit is low. Conversely, virtual circuits of different physical circuits can connect to the same CTCP to absorb peak traffic.

Multiple GATE CTCPs

This NPSI enhancement allows up to 28 GATE CTCPs to be in session with one physical circuit. This significant increase allows 26 more CTCPs for each physical circuit than in NPSI V1R4.3.

SNA Type 2.1 Node Support

NPSI, in conjunction with VTAM V3R2, allows SNA type 2.1 peripheral nodes to communicate through a PSDN. Two peer systems can communicate using the SNA backbone network without the participation of a host application program for relay purposes. NPSI also provides SNA LU 6.2 protocol multiple-session support for the LUs residing on the SNA type 2.1 node.

Switched Virtual Circuit Subarea Communication (SVCSC)

Switched virtual circuit subarea communication (SVCSC) allows two subarea nodes to be connected by an SVC. This connection is used primarily for the following circumstances:

- Connecting two subarea nodes in different PSDNs

  When the PSDNs support only SVC interconnection, you can connect two subarea nodes in different PSDNs.

- Adding transfer capacity

---

[1] The Fast Connect PRPQ (ZD9700), formerly available only in certain countries, is integrated as a part of NPSI. The interface between the fast connect function of NPSI and the CTCP is changed slightly from the interface of the Fast Connect PRPQ.

You can add capacity to subarea node connections. Though the NPSI link cannot be part of a multilink TG, you can use it to increase the number of available links needed for transferring information between subarea nodes. This technique is possible when you start new applications.

- Connecting to a subarea node

  You can connect to another subarea node dynamically by way of an SVC through a PSDN.

SVCSC allows NPSI to communicate with either another communication controller running NPSI or a host computer with the X.25 ICA running VTAM V3R2. In addition, this function is fully compatible with SNI, allowing these remote subarea nodes to be in different SNA networks.

Both the access method and the NCP are aware that an SVC is being used. All connection parameters, such as the dial number, virtual circuit connection parameter table (VCCPT) index, and the optional user facility table (OUFT) index, are defined to the access method. A VTAM operator or an automated operator facility, such as a NetView program command list, must initiate the dial connection.

SVCSC does not require a dedicated MCH. Switched peripheral links and switched subarea links can coexist on the same MCH. You cannot activate the remote NCP over a switched subarea link virtual circuit using NPSI.

Switched Virtual Circuit Short Hold Mode (SVCSHM)

NPSI's switched virtual circuit subarea communication (SVCSC) provides an optional function known as short hold mode (SHM). The SHM function applies only when NPSI communicates with another NPSI program.

SHM allows for a virtual connection to be cleared when traffic does not occur for a user-defined amount of time. NPSI does not report this clearing to the NCP or the access method, enabling the cross-domain sessions and the cross-domain manager to remain active. When traffic resumes from either side, NPSI automatically reestablishes the connection. This function can provide a significant saving in network fees, especially if you use international connections.

Port Swapping

NPSI allows the physical circuit to be swapped to a controller port reserved for that support.

Common NCP and NPSI Generation

NPSI and NCP generations are integrated. You can define the NPSI and NCP network in the same input stream and generate it simultaneously in a single job step under the network (NCP/EP) definition facility (NDF).

Performance Improvement

The path length for packet transmission was significantly reduced by NPSI V3. At the same central control unit (CCU) utilization, this enhancement to NPSI V3 increases throughput in packets per second by approximately 40 percent over V1R4.3. However, your actual improvement will vary depending on your particular hardware and software configuration.

This improvement applies to communication with SNA peripheral nodes, non-SNA X.25 DTEs, and subarea-to-subarea communication.

Improved Availability

In NPSI V3, an SVC is no longer tied to a specific SNA resource. Instead, the association is made during call setup.

The dynamic relationship between the SVCs and the SNA resources allows NPSI to bypass unusable SNA resources. However, this relationship makes it more difficult to relate a virtual circuit number to a specific SNA resource name.

To assist in problem diagnosis, NPSI sends the virtual circuit number and the SNA resource address to the NetView program. The NetView program displays this information when a problem occurs.

Virtual Circuit Trace

The NCP can perform a line trace on a specific physical circuit that includes one or more virtual circuits. The SSP V3 trace analysis program (TAP) formats, interprets, and prints the trace for NPSI V3 virtual circuits. (This formatting is not performed for NPSI V1 virtual circuits.) For enhanced problem determination, the traffic for each virtual circuit can be printed separately, even if you select several virtual circuits. If you request a trace for all the virtual circuits or a physical circuit, the data is interleaved, but still formatted and interpreted.

CTCP and Logical Link Control (LLC) Selection

This function allows you to create a correspondence table enabling NPSI to select a LLC or GATE CTCP as a function of any value of the first byte of the CUD field. The correspondence table is used for both incoming and outgoing calls. If the correspondence table is not used, NPSI V3 selects the LLC and the CTCP, as it did in previous releases.

DATE Message to Unbound LU

This function allows you to send a message on the CTCP-LU-to-MCH-LU session. It is similar to the SNA unformatted system services (USS) message 10 facility, because it allows a message to be sent to the remote terminal while the SSCP activates the application-LU to virtual circuit-LU session.

For example, the DATE message can notify the remote terminal that the connection is proceeding. This is advantageous during peak hours when session setup can take an extended period of time.

Optional Inbound Queuing

This function allows NPSI to queue inbound data coming from non-SNA X.25 DTEs until the LU-LU session is established between the application program and the virtual circuit. NPSI's ability to queue inbound data prevents the inbound data from being erroneously interpreted as a logon request.

PAD Selection

Versions of NPSI before V3 allowed you to select a type 5 virtual circuit for PAD for an incoming call that contained X'01', X'41', and X'81' in the first byte of the CUD field. However, NPSI V3 allows you to select a type 5 virtual circuit for PAD for an incoming call that contains X'51' in the first byte of the CUD field. Conversely, NPSI V3 puts X'51' in the first byte of the outgoing CUD field if you request the DIALNO parameter of the switched major node.

Password Protection

Use of NPSI X.3 integrated PAD support allows you to specify that commands to control the ECHO function of the PAD should be sent to the PAD whenever the outgoing data stream contains SNA inhibit presentation (INP) or enable presentation (ENP) characters. You can use password protection to prevent the display of some data, such as passwords. For example, if you use a typewriter-like communication terminal, an area of the terminal's print line is darkened by overstrikes when NPSI detects the INP character in the data stream. Data typed thereafter (for example, a password) cannot be read.

TSO users require VTAM V3R2 to use this NPSI function. The VTAM V3R2 DCODE parameter allows the INP and ENP characters to be present, where appropriate, in the data stream.

Remote PU Type 4 Activation

The 3720 and 3745 Communication Controllers allow the NCP and NPSI load modules to be loaded from the controller's disk. In NPSI, the X25.MNLNK function allows the MCH to be activated remotely. Remote activation allows the remote NCP to be activated over a subarea link PVC. This activation does not require an SDLC connection.

SHUTD Processing

You can optionally specify that when the NPSI LU simulator receives a shutdown data flow control (SHUTD) request unit from the host LU, the LU simulator should not send an invitation to clear on the virtual circuit to the PAD. Some host application programs send a shutdown request in conjunction with a VTAM CLSDST OPTCD=PASS command. If you specify this option, NPSI does not clear the virtual circuit upon receipt of a shutdown request.

Enhanced Availability during Loss of SSCP Ownership

This function ensures the continuation of active cross-domain LU-LU sessions for SNA and non-SNA devices after the owning SSCP is lost. NPSI allows a PVC or SVC to remain active as long as the session partners can still be reached. In other words, enhanced availability during loss of SSCP ownership allows another SSCP to establish ownership during the disruption period. Upon reactivation, the original SSCP can reestablish ownership.

Retry of Clear, Reset, and Restart Requests

Previous releases of NPSI did not retry the clear, reset, or restart requests when the corresponding timer expired. Currently, NPSI retries these requests one or more times, as specified during NPSI generation. NPSI also allows you to define a timer value other than the interval specified by the CCITT Recommendation X.25.

Choice of Diagnostic Codes

NPSI allows you to specify that either CCITT (1984)-specified or IBM-specified diagnostic codes be inserted in Clear, Reset, and Restart packets.

Ability to Reject Incoming Calls that Specify Certain Optional Facilities

NPSI allows you to reject incoming call packets that specify certain optional facilities. This function can be used, for example, to prevent NPSI from accepting calls that specify reverse charging, fast select, or call redirection. You can specify up to nine optional facilities to be rejected. However, you cannot reject negotiation of packet and window sizes, and the use of high-priority class of service.

Choice of Clearing or Not Clearing SVC after Reset

Previous releases of NPSI always cleared an SVC upon receipt of a reset indication packet. Currently, NPSI allows you to specify whether the SVC is to be maintained or cleared after receipt of a reset indication packet.

Improved Resource Naming

Optional keywords on the X25.VC and X25.FCG definition statements make it easier to name resources.

Virtual Circuit Trace

In previous releases of NPSI, when a line trace was requested, all physical circuits were traced. Currently, NPSI provides you with the option to perform a line trace on specified physical circuits. Because a trace can be performed for individual physical circuits, processing takes less time and performance can be improved.

NPSI Version 3 Release 3 Enhancements

The following list describes the NPSI V3R3 base functions, including:

- Enhanced multichannel link compatibility
- Ability to establish link session priority
- Enhanced SNA type 2.1 boundary function support (casual connection)
- RU chaining support for long non-SNA messages
- Improved connection capabilities
- Enhanced PAD support
- Enhanced conformance to international organization for standardization 7776 and 8208
- X.21 switched connections support for DTE-to-DTE communication across ISDN
- Enhanced capability to activate load and dump remote NCPs
- Ability to clear an SVC based on inactivity time-out
- Ability to use billing units as statistics
- Improved inbound flow control
- Improved flow control negotiation in GATE and DATE

- Improved integrated PAD support with DATE
- Improved reset processing
- Line speeds up to 256 Kbps
- Enablement of multiple SVCs for X.21 support
- Additional CTCP selection option
- Support of called line address modified notification

Enhanced Multichannel Link Compatibility

Table 2-2 shows the enhanced compatibility of GATE, DATE, integrated PAD, transparent PAD, and PCNE on the same multichannel link for NPSI V3R3. NPSI V3R3 allows both integrated PAD and DATE to coexist on the same multichannel link.

Table 2-2. Enhanced Multichannel Link Compatibility

	GATE	**DATE**	**Integrated PAD Support**	**Transparent PAD Support**	**PCNE**
GATE	N/A	No	Yes	Yes	Yes
DATE	No	N/A	Yes	Yes	Yes
Integrated PAD Support	Yes	Yes	N/A	No	Yes
Transparent PAD Support	Yes	Yes	No	N/A	Yes
PCNE	Yes	Yes	Yes	Yes	N/A

Ability to Establish Link Session Priority

NPSI V3R3 provides the ability to use the network expansion option (NEO) user link session priority function of NCP. This ability provides you with a method to obtain more consistent turnaround time for interactive sessions on peripheral links. Priority is given to the transmission order of the LUs on the link.

Enhanced SNA Type 2.1 Boundary Function Support (Casual Connection)

The enhanced SNA type 2.1 boundary function support provided by the NCP, in conjunction with VTAM V3R2, extends the boundary node support by allowing primary SNA type 2.1 peripheral nodes to be attached to an NCP that is acting as a secondary partner. This support, which allows subarea nodes to connect to SNA type 2.1 nodes, is referred to as a casual connection. A casual connection allows VTAM and one or two NCPs to be connected to an SNA type 2.1 node.

The enhanced SNA type 2.1 support provided in NPSI V3R3 similarly extends the NCP's X.25 boundary node support, by allowing a primary SNA type 2.1 peripheral node to be attached to an NCP through an NPSI that is acting as a secondary partner.

RU Chaining Support for Long Non-SNA Messages

NPSI V3R3 supports SNA request and response unit (RU) chaining for communication to non-SNA devices that use either the integrated PAD or the PCNE function of NPSI. With the RU chaining support for long non-SNA messages option, which you specify at system generation time, outbound RU chains are treated as complete packet sequences and inbound messages are treated as an RU chain. This allows more efficient handling of long messages to and from non-SNA devices. It can enhance operations (such as file transfer) with non-SNA devices that send or receive long messages.

If you use either the GATE or transparent PAD function of NPSI, RU chaining allows inbound messages to be divided and carried in multiple only-in-chain (OIC) PIUs. The CTCP or the host application controls reassembly of the message carried in the OIC PIUs.

Improved Connection Capabilities

NPSI uses the IDNUM and IDBLK keywords for call-in and call-out definition.

The structure of the IDNUM and IDBLK keywords is improved for NPSI, and provides you with the ability to:

- Have a maximum of 32 768 SVCs connected to one NPSI
- Have more than 16 NCPs and NPSIs defined under one host
- Have both PAD and GATE SVCs existing concurrently on the same MCH
- Support the NCP anonymous caller function

Enhanced PAD Support

The enhancements to NPSI V3R3 PAD support provide you with the ability to:

- Define PAD parameter settings for each individual MCH during NPSI generation
- Designate two additional translation tables that can be selected during NPSI generation
- Create and select two translate tables using the NPSI generation process

Enhanced Conformance to ISO Standards 7776 and 8208

NPSI V3R3 implements changes to improve conformance to ISO 7776 and ISO 8208 for DTE-to-DTE communication. DTE-to-DTE communication is defined as one X.25 DTE communicating with another X.25 DTE without the use of an X.25 network. In this environment, one of the DTEs must perform the functions of both a DTE and DCE.

ISO 7776 and 8208 are standards that are related to the operation of the X.25 protocol at the frame and packet level, respectively. NPSI must meet the mandatory requirements of the two standards to operate in the DTE-to-DTE environment. These standards define how the DTE operates when it acts as a DTE or DCE. NPSI satisfies some of the requirements of the two standards by having its role as a DTE or DCE predefined through system generation options.

One of the more important benefits of this added support is the reduced potential for call collisions during DTE-to-DTE virtual circuit establishment.

X.21 Switched Connections Support for DTE-to-DTE Communication across ISDN

NPSI V3R3 provides support for X.21 switched connections for DTE-to-DTE communication across an integrated services digital network (ISDN). Cross-domain networking facilities are not supported. The X.21 switched support has the following characteristics:

- The support exists with GATE only
- The support must have a dedicated MCH
- There must be at least one CTCP for each MCH
- A maximum of 15 digits is reserved for X.21 dialing
- LAPB and packet-level processor (PLP) parameters are predefined; no DTE or DCE negotiation occurs
- MCH is predefined as a DCE or DTE
- X.21 incoming call packets are accepted only when the CTCP receiving the call is in session with NPSI
- X.21 calling and called line identification is not supported
- X.21 SHM and multiple port sharing is not supported

Figure 2-9 on page 2-24 illustrates an X.21 switched connection using an IBM 7820 terminal adapter (TA).

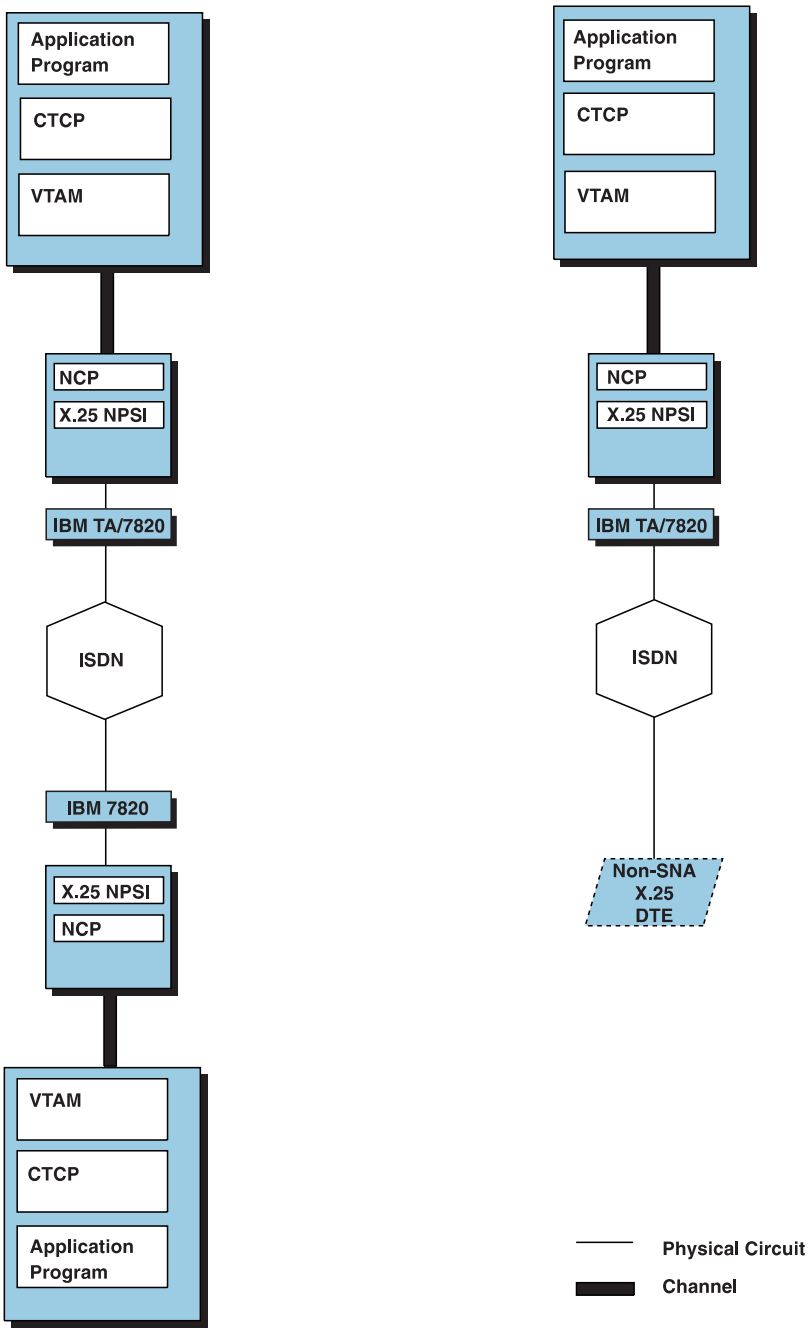

Figure 2-9. SNA Host to ISDN (X.21 Switched Connection)

Enhanced Capability to Activate Load and Dump Remote NCPs

NPSI V3R3 provides enhanced support for remote IBM 3720 or 3745 Communication Controllers attached to X.25 virtual circuits.

NPSI V3R3 supports activation of a remote communication controller across an SVC. Previous releases of NPSI supported activation across PVCs only. You must initially load the remote communication controller using an existing method.

After the remote communication controller has been activated, you can use an SVC or PVC to transmit a load module from the host to the disk of an IBM 3720 or 3745

Communication Controller. After the load module has been loaded onto the disk, it can be loaded into the CCU.

An additional enhancement for remote IBM 3720 or 3745 Communication Controllers is the capability for the host to initiate a dump-to-disk using a host-initiated forced abend in conjunction with VTAM V3R3. The abend causes a dump-to-disk and re-IPLs the load module. After the remote IBM 3720 or 3745 Communication Controller has been activated, a PVC or SVC can transmit the dump from disk to host.

Ability to Clear an SVC Based on Inactivity Time Out

If an SVC has had no data activity for a user-specified period of time, NPSI V3R3 can clear that SVC. This prevents you from being charged for an unused SVC.

Ability to Use Billing Units as Statistics

NPSI V3R3 gives you the option of having record formatted maintenance statistics (RECFMS) report the number of billing units, rather than the number of packets, sent across a PSDN.

This enhancement allows you to compare NPSI statistics to the subscription costs of the PSDN.

Improved Inbound Flow Control

When host applications, such as IMS and CICS, do not accept large numbers of RUs from non-SNA DTEs at the same rate as the NCP sends them, the NCP can enter a slowdown state.

A flow control mechanism has been developed that allows NPSI V3R3 to stop accepting packets when a specified number of packets have been received. This mechanism helps prevent the NCP from entering the slowdown state.

Improved Flow Control Negotiation in GATE and DATE

For the GATE and DATE functions, NPSI has been enhanced to recognize the flow control parameters contained within the Call Connected packets.

Improved Integrated PAD Support with DATE

A generation option of NPSI V3R3 allows the support of integrated PAD with DATE. Table 2-2 on page 2-21 illustrates this option. This support allows you to specify that interrupt, reset, and qualified (indication of break) packets, received from the PSDN are no longer sent to the DATE CTCP. These packets are converted into SIGNAL commands, which are sent to the host application.

Improved Reset Processing

This enhancement allows NPSI to selectively cause the PU to become inoperative (INOP) when a reset packet is sent or received for the virtual circuit that is associated with the PU. The INOP processing is based on the cause and diagnostic codes contained in the reset indication packet.

You can unconditionally or selectively suppress the INOP processing.

Additional NPSI V3R3 Enhancements

The following enhancements have been incorporated as program temporary fixes (PTFs) to NPSI V3R3 for MVS and VM. These enhancements are available in the base of NPSI V3R3 for VSE.

Line Speeds up to 256 Kbps

IBM communication controllers can be attached to data transmission services supporting interfaces complying with CCITT Recommendation X.25 (Melbourne 1988, Malaga-Torremolinos 1984, or Geneva 1980) at speeds of up to 256 000 bits per second on the IBM 3745 low speed scanner.

Enablement of Multiple SVCs for X.21 Support

Multiple SVC support is provided for X.21 switched connections for DTE-to-DTE communication over ISDN circuit-switched connections. This support was initially limited to a single SVC. Support is now provided for multiple SVCs.

Additional CTCP Selection Option

Two methods to select the GATE CTCP are provided:

- Using the CUD field or subaddressing
- Routing to the appropriate CTCP based on an address found in the called address extension facility (AEF)

Support of Called Line Address Modified Notification

NPSI V3R3 supports the called line address modified notification facility. Users are no longer required to specify, by means of a system generation parameter, whether this facility is accepted.

This function allows a call destined for one DTE to be redirected to another DTE. When a Call Request packet sent by NPSI to a DTE is redirected to another DTE, the Call Connected packet contains both the address of the alternative DTE and the reason why the called address is different from the one originally requested.

NPSI Version 3 Release 4 Enhancements

The following list describes the enhancements to NPSI V3R4:

- Support for NetView Performance Monitor (NPM) performance data
- Support for NPM accounting data
- Support for CCITT 1988 conformance
- European standard ENV 41 104 conformance
- U.S. GOSIP conformance
- Support for quality of service (QOS) facility
- Increased load module size limit
- Dynamic network ID (NETID) processing
- Migration aid
- Fast Transaction Processing Interface (FTPI)
- T3 timer
- T25 timer

Support for NetView Performance Monitor (NPM) Performance Data

NPSI V3R4 can report performance data to NPM using the Network Performance Analyzer interface of NCP. NPM solicits NPSI to start, stop, and transmit the performance data for any eligible resource. You must define, at system generation time, the resources that are eligible for network performance data collection. Network performance data can be collected on the following resources:

- MCH-Link, for performance data at the frame level (frame and byte counters)
- MCH-PU, for performance data at the packet level (connection information and packet counters)
- VC-PU, for performance data for the individual virtual circuit, at the packet level (packet and byte counters)

Support for NPM Accounting Data

NPSI V3R4 can report accounting data at the packet level to NPM using the Network Performance Analyzer interface of NCP. You specify, at system generation time, the type of virtual circuits for which accounting data will be reported. You can also specify, at system generation time, the thresholds for accounting counters (for example, total segments inbound or outbound or total packets). NPSI collects accounting data:

- Each time an X.25 connection is established on a virtual circuit for which accounting data is being collected
- Each time an X.25 connection is freed on a virtual circuit for which accounting data is being collected
- When one of the accounting counters reaches the threshold specified at system generation time, or on request from NPM

NPSI sends NPM information on connection (time stamp and addresses) and traffic counters (segments, bytes, and packets) for each virtual circuit.

Support for CCITT 1988 Conformance

NPSI V3R4 supports the mandatory functions of the CCITT 1988 standards (Melbourne 1988). This exhibits NPSI's continued support of the CCITT standards and ensures connectivity to other products and networks that support the standards.

The NPSI link level supports a new T3 timer, which starts when NPSI is operating as a DCE. Expiration of this timer initiates a poll to the DTE to determine whether there is any activity on the link. Changes have also been made to the NPSI packet level to support new CCITT diagnostic codes for both clear and reset packets. In addition, NPSI differentiates between call setup and clearing packets using a type-of-address subfield/numbering-plan-identification subfield (TOA/NPI) address format.

For additional information on the T3 timer, see "T3 Timer" on page 2-29.

European Standard ENV 41 104 Conformance

NPSI V3R4 conforms to the European Functional Standard ENV 41 104 Part 2 (CCITT X.25, ISO 7776 and 8208).

ENV 41 104 Part 2 defines the provisions of the OSI connection-mode transport service for end systems connected to PSDNs using telephone networks or to CSDNs using permanent circuits.

A Supplier's Declaration of Conformity (SDOC) has been prepared in accordance with ENV 41 104 to substantiate this claim. This conformance declaration is based on actual sample testing.

U.S. GOSIP Conformance

NPSI V3R4 has been registered with the United States Government Open Systems Interconnection Profile (GOSIP) Wide Area Network (WAN) Register, and meets all the requirements specified in FIPS 146, GOSIP Version 1 for DTEs supporting the CCITT X.25 (1984), ISO 7776, and ISO 8208 protocols.

Support for Quality of Service (QOS) Facility

NPSI V3R4 supports the priority facility of the CCITT-defined QOS facilities. Within the priority facility, this release supports the priority of data on a connection. Connection is determined during the virtual circuit establishment or at system generation time, and is used to prioritize the data flowing to the PSDN. This support allows you to determine the proper sharing of transmission resources, allowing for dissimilar traffic patterns, such as interactive or batch traffic.

Increased Load Module Size Limit

NPSI V3R4, in association with ACF/NCP V5R4 and the 3745 with enhancements, allows the generation and use of load modules up to 6 megabytes. The previous load module size limit was 4 megabytes. The increase in load module size allows you to define additional X.25 resources for each 3745 load module.

Dynamic Network ID (NETID) Processing

NPSI V3R4, in association with ACF/NCP V5R4, allows the NETID to be dynamic, allowing more connectivity and backup configuration flexibility. This support allows an NCP and NPSI program to communicate with another SNA network without having the network defined by means of system generation keywords. This enhancement also allows a single NCP and NPSI program to back up several NCP and NPSI programs that have different NETIDs, without performing a new system generation or reloading the backup communication controller. This dynamic capability provides flexibility for backup scenarios.

Migration Aid

The system generation facility of NPSI V3R4, in association with ACF/SSP V3R6, provides a new capability to assist in migrating from one release of NPSI Version 3 to another. The migration aid:

- Deletes obsolete keywords
- Changes the value specified for a keyword when it is not valid for the targeted release

- Adds required keywords

Fast Transaction Processing Interface (FTPI)

FTPI, a protocol of CTCP and NPSI, is a new function of NPSI V3R4. From one to 28 CTCPs can be in session with NPSI. Each of these sessions contains the multiplexed traffic between the CTCP and NPSI.

FTPI enhances the performance of the system with:

- Reduction of session setup time
- Increased FTPI GATE traffic performance
- Quick recovery after failure of a network component
- Quick response time for connection establishment
- Handling of unusually large MCH and virtual circuit numbers

In a network environment, if many non-SNA terminals are connected to a host server, communication must be optimized. To accomplish this, FTPI reduces the number of:

- PIUs flowing in the network
- LU-LU sessions required

A multiplex timer is used with FTPI to prevent poor response time in the case of low data traffic. FTPI inbound blocking waits for the reception of several packets until the PIU is filled. When traffic is low, the packets that are blocked by FTPI can stay in the queue for an extended amount of time, resulting in poor response time. To avoid this, a timer covers the blocking period. When the timer elapses, the PIU is forwarded, regardless of whether it is full.

FTPI is an extension of the GATE interface of NPSI. In this role, an FTPI CTCP controls the session establishment and termination of all virtual circuits on the MCH. The FTPI CTCP also processes all of the data flowing over these FTPI virtual circuits.

T3 Timer

NPSI V3R4, when defined as a DCE, supports an optional T3 timer system parameter. The T3 timer parameter specifies the amount of time for which there can be no activity on the line before polling is resumed for a DCE station in the data phase. The parameter for the T3 timer is defined in seconds.

The T3 timer is defined on the X25.MCH statement. The T3 timer is valid only if the keyword STATION=DCE has been defined for the application MCH. This keyword is optional.

T25 Timer

NPSI V3R4 supports an optional T25 packet level timer. The T25 timer is defined on the X25.NET statement and is valid only if the keyword STATION=DTE has been defined for the applicable MCH. T25 specifies a value for the window rotation timer (the data packet acknowledgment timer).

The T25 timer is started for each data packet transmission and reset each time the packet window is opened or the packet layer is reset. When the T25 timer expires,

the virtual circuit is reset with the appropriate cause and diagnostic code, and an alert RECFMS report is generated.

NPSI Version 3 Release 5 Enhancements

The following list describes the enhancements to NPSI V3R5:

- NCP Version 6 Release 1 currency
- High-Performance Transmission Subsystem (HPTSS) support
- Calling (DTE) address verification
- Enhanced conformance to ISO standards 7776 and 8208

NCP Version 6 Release 1 Currency

NCP V6R1 supports logical link delayed activation, which allows VTAM to understand the relationship between physical and logical links. Currently, VTAM processes NPSI VCs and MCHs as independent resources. Now, when an MCH is activated, VTAM activates the associated virtual circuits, and when a virtual circuit is displayed, VTAM shows the associated MCH.

High Performance Transmission Subsystem (HPTSS)

NPSI V3R5 supports a duplex SDLC adapter called the HPTSS which is dedicated to controlling one of two high-speed telecommunication lines (up to 2.048 Mbps). The HPTSS line adapter provides a high-speed connection for the IBM primary ISDN gateway.

HPTSS is controlled as a standard transmission subsystem (TSS) using Input/Output Halfword (IOH) and Input/Output Halfword Immediate (IOHI) instructions. IOH instructions are used to initiate the operations using a PSA control block. After the IOH instruction has been issued to the scanner, direct memory access (DMA) is used to transfer data between the CCU and the HPTSS internal storage at high speed. The X.21 switched interface is not supported. Although two lines can be defined on an HPTSS, only one can be activated at a time.

Calling DTE Address Verification

In NPSI V3R5, the calling DTE address, set by the network in incoming call packets, can be compared to a list of authorized addresses for security verifications. Verification is done by VTAM through the VERID keyword coded on the PATH statement of the resource in the switched major node (SMN). VTAM verifies remote DTEs that provide their identification to NPSI (SNA DTEs and some non-SNA DTEs). Verification sometimes cannot be performed because of an unknown calling DTE address or an unknown identifier (either an incorrect identifier received from the DTE or a default identifier set by NPSI for other non-SNA DTEs). In these cases, an additional verification can be performed by VTAM's configuration services installation user exit routine (offered in VTAM V3R4). The incoming call packet's calling DTE address is set in a control vector (CV25), which is appended to the REQCONT RU and then sent to VTAM. This process allows identification of non-SNA terminals.

Enhanced Conformance to ISO Standards 7776 and 8208

NPSI V3R5 has implemented additional changes to improve conformance to the ISO 7776 and 8208 to further enhance DTE-to-DTE communication.

NPSI Version 3 Release 6 Enhancements

The following list describes the enhancements to NPSI V3R6:

- X.25 and ISDN interworking
- NCP V6 R2 currency
  - Advanced Peer-to-Peer Networking* (APPN*) support
  - enhanced CCU support for greater than 64KB buffer counts
- MCH LU name command
- Diagnostic Code Indicator (DCI) bit support
- SNAP enhancements
- FTPI outbound flow control
- Receive Not Ready packet sending
- New APPN keywords

X.25 and ISDN Interworking

X.25 and ISDN interworking supports connections through ISDN to access a PSDN offering an X.32 service for unidentified DTEs.

Therefore, a host application can communicate with a remote terminal by establishing an X.25 virtual circuit session through an ISDN B channel and the PSDN. Both incoming connections, initiated from a remote terminal (X.25 network subscriber), and outgoing connections, initiated by NPSI (DTE), are provided.

The IBM 7820 Terminal Adapter (TA) is used to perform B-channel establishment through the ISDN network. The only speed available on this connection is 64 Kbps.

NCP Version 6 Release 2 Currency

NCP V6R2 provides the following enhancements for NPSI V3R6:

- APPN

  VTAM and the NCPs owned by VTAM can be combined to appear as one large APPN node to all attached PU type 2.1 nodes.

  This enhancement allows VTAM and NCP to coexist as participating individual subareas in a subarea network, and also allows them to work together as one node in the APPN network.

- Enhanced CCU support for greater than 64KB buffer counts

MCH LU Name Command

In current GATE and DATE MCH processing, the BIND that flows over the LU-LU control session should carry the secondary logical unit (SLU) name (the MCH LU name) in its user data field. When an X.25 SVC is established, NPSI uses that MCH LU name in a pseudo-logon. This allows an application to relate the virtual resource to its physical owner.

When the BIND user data field does not carry the MCH LU name, the CTCP can issue a new command, MLUNAME, on the LU-LU control session. This new command carries the MCH LU name.

DCI Bit Support

NPSI now supports the diagnostic code indicator DCI bit in the protocol identifier of the CUD field byte 0 (CUD0) of X.25 call packets.

SNAP Enhancements

The usability of NPSI's SNAP trace facility has been improved by eliminating non-significant SNAP trace entries and adding information, enabling you to use the trace more efficiently.

FTPI Outbound Flow Control

To enhance the flow of traffic in FTPI when outbound traffic is heavy, an outbound flow control has been adopted. This control prevents a shortage of buffer space.

When the number of packets waiting in the virtual circuit outbound queues reaches a critical threshold, NPSI V3R6 suspends processing of new PIUs until the number of packets in the outbound queues falls below the critical threshold. At that point, processing of new PIUs resumes.

RNR Packet Sending

To prevent the controller from reaching the threshold of buffer availability, the NPSI packet level protocol (PLP-IN) acknowledges inbound data packets with Receive Not Ready RNR packets whenever the number of available buffers is too low.

New APPN Keywords

New VTAM-only keywords have been added for defining the APPN resources.

NPSI Version 3 Release 7 Enhancements

The following list describes the enhancements to NPSI V3R7:

- Expanded dial information
- Modulo 128 at frame level
- PLP enhancements
- CTCP/GATE interface
- Logical unit dynamic reconfiguration (LU DR)
- NCP version 7 release 1 currency
- X.21 switched access to ISDN enhancement

Expanded Dial Information

For X.25 connectivity, additional addressing-type information is required for the existing addressing information specified by the DIALNO keyword on the PATH statement in a SMN. The new information does not fit the existing information within the DIALNO statement because of the 32-character limitation of DIALNO. NPSI V3R7 has expanded the capabilities of DIALNO through the DLCADDR keyword. You code DLCADDR on the VTAM SMN PATH statement.

Modulo 128 at Frame Level

Modulo 128 is supported at the frame level on all NPSI physical links (multichannel links [MCH]). For each MCH, you can select modulo 8 or 128 at system generation. If you select modulo 128, the numbering of frames is in the range of 0 to 127.

You can continue to use modulo 8 (the default) at system generation. For modulo 8, the range remains 0 to 7.

Packet Level Protocol (PLP) Enhancements

PLP enhancements are available through new keywords you can code at system generation. Enhancements include:

- Resetting virtual circuits :
  - When PVCs are started and the physical line (MCH) is activated or reactivated
  - When a RNR packet is not compensated by a receive ready RR packet
- Transmits an RNR packet when inbound data packets are received while the virtual route (VR) over which they should be routed is held

These enhancements help you to avoid an endless system hang and prevent buffer shortage.

CTCP and GATE Interface

NPSI can determine the flow control values to use at the packet level for a virtual call if they are not specified in the call setup command from the CTCP.

LU Dynamic Reconfiguration (LU DR)

You can now dynamically add or delete LUs. A LU DR is allowed only for resources connected by qualified logical link control (QLLC) PVCs, because it is the only type of connection in which one PU can have several LUs.

NCP Version 7 Release 1 Currency

The following items have been addressed in NPSI V3R7 to provide currency with NCP V7R1 and V7R2 :

- Expanded dial information capabilities
- Line and scanner addresses are set in the box error record (BER) that is generated after abend 703 occurs during the remote loading process

X.21 Switched Access to ISDN Enhancement

ISDN enhancements are available as follows:

- A delimiter digit can separate the X.21 and ISDN addresses from the X.21 and ISDN subaddresses in the called DTE address digits specified in the X'8B' CALL REQUEST command of the GATE X.21 command interface
- Dynamic frame level role (DTE or DCE) setting at X.21 and ISDN switched connection establishment (T70 CCITT recommendation support)

- Dynamic packet level role (DTE or DCE) setting at X.25 packet level establishment (restart exchange as in ISO 8208)
- Elimination of disconnect phase at DTE link setup

NPSI Version 3 Release 8 Enhancements

The following list describes the enhancements to NPSI V3R8:

- X.25 support for the 3746 Model 900
- Support for GMF keywords
- Relationship between the logical channel group number (LCGN) and the VTAM identification block (IDBLK)
- FTPI PVC
- Support for two digit subaddressing
- Virtual circuit to MCH correlation
- NCP V7R3 through V7R6 currency

X.25 Support for the 3746 Model 900

Capability and configuration flexibility are now improved with access to the 3746 Model 900 to support X.25 traffic over a CSS port.

Graphics Monitor Facility (GMF) Keywords

NPSI offers support for two GMF keywords, NGFINC and NGFTEXT. These keywords specify whether the NetView status monitor is being used for a resource.

Relationship between LCGN and VTAM IDBLK

NPSI allows (optionally and for non-SNA types of X.25 connections like PCNE, GATE, and PAD) a relationship between the LCG and the identifier block that NPSI sets in the XID sent to VTAM.

You can now invoke various applications according to the X.25 LCG.

FTPI PVC Support

NPSI allows a FTPI MCH when only PVCs are generated.

Two-Digit Subaddressing

Two-digit subaddressing instead of one-digit subaddressing can be used to select a fast connect or FTPI CTCP.

Virtual Circuit to MCH Correlation

NPSI builds and appends a CV57 (DLC connection data control vector) containing the physical PU name to the REQCONT for a virtual circuit PU. This allows VTAM and NetView to correlate an X.25 virtual circuit to its MCH at connection establishment time.

NCP V7R3 Through V7R6 Currency

NPSI Version 3 Release 9 Enhancements

The following list describes the enhancements to NPSI V3R9:

- X.25 APPN Inbound Data Flow Control
- LLC0 PVC Reset Support
- New Use of the Gate Error/Information Report
- Enhanced Flow Control for FTPI Connections

X.25 APPN Inbound Data Flow Control

APAR IR34209 has been incorporated into the base release of V3R9.

NPSI now monitors inbound PIU accumulation to detect a simulated "VR Held" condition and transmits an outbound RNR packet during this condition. Refer to the RNRPKT keyword on the X25.MCH statement in the Virtual Route Hold section in *NCP Version 7 and X.25 NPSI Version 3 Diagnosis, Customization, and Tuning* for more information.

LLC0 PVC Reset Support

APAR IR37825 has been incorporated into the base release of V3R9.

NPSI now transmits a RESET during session BIND and UNBIND events. Refer to the RESETUNB keyword on the X25.LINE, X25.MCH, X25.NET, and X25.VC statements in *NCP Version 7 and X.25 NPSI Version 3 Planning and Installation* for more information.

New Use of the GATE Error/Information Report

APAR IR30911 has been incorporated into the base release of V3R9.

This new function prevents NPSI from transmitting a negative sense response to the host (CTCP) application by sending a "Gate Error/Information Report" instead. Refer to the GATEINFO keyword on the X25.MCH statement in *NCP Version 7 and X.25 NPSI Version 3 Planning and Installation* for more information.

Enhanced Flow Control for FTPI Connections

APAR IR32271 has been incorporated into the base release of V3R9.

NPSI implements two new keywords (FTPITH and FTPITHTO) on the X25.MCH statement that allows you the capability to reset a virtual circuit when outbound traffic threshold limits are exceeded. Refer to the FTPITH and FTPITHTO keywords on the X25.MCH statement in *NCP Version 7 and X.25 NPSI Version 3 Planning and Installation* for more information.

NCP V7R7 Currency

Chapter 3. Planning for NPSI

Chapter 3. Planning for NPSI

Before you install the NPSI licensed program, you need to know the hardware, software, and storage requirements. This chapter describes these requirements, as well as performance and migration considerations.

Hardware Supported by NPSI

NPSI supports the DTE and communication controllers listed in this section.

DTEs

NPSI supports the following SNA and non-SNA DTEs:

- SNA host nodes connected to X.25 networks through a communication controller or through an ICA supporting X.25 subarea-to-subarea connections
- SNA peripheral nodes with integrated X.25 support connected to X.25 networks
- SNA peripheral nodes connected to X.25 networks through an SDLC PAD
- SNA peripheral nodes connected to X.25 networks through the IBM 5973-L02 NIA
- Non-SNA X.25 DTEs connected directly to the X.25 network
- X.28 start-stop DTEs connected to X.25 networks through a PAD
- Non-X.28 network PADs connected by transparent PAD, GATE, or DATE functions

Communication Controllers

V3R3 and V3R4: NPSI runs on IBM 3720 or IBM 3745 Communication Controllers.

V3R5: Only the IBM 3745 Communication Controller is supported.

V3R6 and later: NPSI V3R6 and later support the following equipment:

- 3745 Model 130
- 3745 Model 150
- 3745 Model 160
- 3745 Model 170
- 3745 Model 17A (with or without 3746 Model 900)
- 3745 Model 210
- 3745 Model 21A (with or without 3746 Model 900)
- 3745 Model 310
- 3745 Model 31A (with or without 3746 Model 900)
- 3745 Model 410
- 3745 Model 41A (with or without 3746 Model 900)
- 3745 Model 610
- 3745 Model 61A (with or without 3746 Model 900)

Notes:

1. NPSI supports physical links (MCHs) on the 3746 Model 900 in V3R8 and later.
2. NPSI supports physical links (MCHs) on HPTSS in V3R5 and later.

Each release of NPSI supports V.24 or RS-232-C (X.21 bis) or V.35 adapters. NPSI supports the X.21 nonswitched adapter and the X.21 switched adapter.

Use one of the following connections:

- Line interface coupler type 1 (V.24 or RS-232-C [X.21 bis])
- Line interface coupler type 2
- Line interface coupler type 3 (V.35)
- Line interface coupler type 4A
- Line interface coupler type 4B
- Line interface coupler type 5 (3745 has low-speed integrated modem)
- Line interface coupler type 6 (3745 has high-speed integrated modem)
- HPTSS line (V.35 or leased X.21)

Line interface coupler type 2, line interface coupler type 3 (V.35), and line interface coupler type 4B (X.21) can operate at speeds of up to 128 kilobits per second (Kbps) with NPSI.

Line interface coupler type 2, line interface coupler type 3, and line interface coupler type 4B (except with the X.21 switched adapter) can operate at speeds up to 256 Kbps with NPSI V3R4. For line interface coupler type 4B (when the X.21 connection is made through ISDN by means of a 7820 ISDN Terminal Adapter), line speeds up to 64 Kbps are supported with NPSI V3R4. HPTSS lines can operate at speeds up to 2.048 megabits per second (Mbps) with NPSI V3R5.

The following books contain more information about communication scanner type and line set specifications:

- *3720/3721 Communication Controllers Introduction*
- *IBM 3745 Communication Controller Introduction*

Software Supported by NPSI

This section describes the software and network environments that support NPSI along with the operating systems, network control and system support programs, VTAM application programs, and IBM host-resident programs.

Operating Systems

NPSI runs under the control of the NCP with the following operating systems:

- MVS/ESA, OS/390
- VM/ESA
- VSE/ESA

Network Control Program and System Support Program

Table 3-1 shows the NCP and SSP programs associated with each release of NPSI.

Table 3-1. NPSI NCP and SSP Programs

For this NPSI release:	Use these NCP and SSP programs:
NPSI V3R3	NCP V5R3 with SSP V3R5 or NCP V5R3.1 with SSP V3R5.1 or Later
NPSI V3R4	NCP V5R4 with SSP V3R6 or Later
NPSI V3R5	NCP V6R1 with SSP V3R7 or Later
NPSI V3R6	NCP V6R2 or NCP V6R3 with SSP V3R8 or Later
NPSI V3R7	NCP V7R1 with SSP V4R1 or NCP V7R2 with SSP V4R2 or Later
NPSI V3R8	NCP V7R3 to V7R6 with SSP V4R3 or Later
NPSI V3R9	NCP V7R7 with SSP V4R7

Note: You can find information on earlier releases of NPSI in previous editions of the NPSI library.

Access Methods

NPSI runs with the same access methods as the corequisite NCP versions and releases. See *Planning for NetView, NCP, and VTAM* to determine the VTAM and NPSI versions and releases that run under the NCP.

Application Licensed Programs

The following IBM licensed programs, which support SNA and SDLC communication, can use NPSI without modification:

- Customer Information Control System/Virtual Storage (CICS/VS)
- Information Management System/Virtual Storage (IMS/VS)
- TSO
- NetView program

These programs, used in conjunction with the IBM 5973-LO2 NIA or with integrated X.25 features, can provide SNA support for specified cluster controllers and terminals using X.25 PSDNs.

IBM Cryptographic Subsystem and Access Method Support

NPSI is compatible with the following IBM cryptographic subsystem and access method programs:

- Programmed cryptographic facility licensed program (5740-XY5).
- Cryptographic unit support licensed program (5740-XY6).
- VTAM Version 3 for MVS/SP (5665-313).

- VTAM Version 3 for MVS/XA (5665-289). In a VM/SP environment, NPSI uses the security features of VM/SP.

Note: The IBM line bracketing cryptographic licensed programs (IBM 3845 and IBM 3846 Data Encryption Devices) cannot be used with the NPSI program.

Planning for NPSI Installation

Consider the following items when installing the NPSI licensed program:

- NPSI source statements
- NDF generation
- Access method

NPSI Source Statements

Code a set of NPSI source statements to define the NPSI module for your particular network configuration. Determine the type of X.25 PSDN with which you are communicating and define the communicating devices and their links. You can find instructions for coding these statements in *NCP Version 7 and X.25 NPSI Version 3 Planning and Installation*.

NDF Generation

The NPSI source statements are combined with the NCP source statements. This common generation source input is then processed by NDF. NDF creates the NCP load module containing the NCP and NPSI.

Access Method

When NDF creates access method statements, they are placed in the access method source library. The access method uses these statements to communicate with the network resources and to determine the resource network addresses.

NPSI Version 3 and Systems Application Architecture (SAA)

NPSI is part of IBM SAA because it supports CCITT Recommendation X.25, which is a part of the common communication support.

SAA is a collection of selected software interfaces, conventions, and protocols, and is the framework for the development of future communication applications in the major IBM computing environments: System/370, Application System/400, and personal computers. SAA consists of four related elements: CUA, common programming interface, common communication support, and common applications.

IBM uses common communication support to interconnect SAA application systems, communication networks, and devices. Interconnection is achieved by consistent implementation of designated communication architectures in each of the SAA environments. NPSI provides System/370 processors with an interface to X.25 environments, which is a part of the common communication support element of IBM SAA.

Storage Estimates for NPSI

The functions provided by NPSI increase the NCP storage requirements. Add the numbers shown in Table 3-2 to your NCP storage requirements.

Table 3-2. NCP Storage Requirements

NPSI Release	Executable Program Requires:	Each Virtual Circuit Requires:	Each Physical Circuit Requires:
V3R3	70K to 140K bytes	1.2K bytes	2K bytes
V3R4	90K to 280K bytes	1.3K bytes	2.1K bytes
V3R5	93K to 283K bytes	1.3K bytes	2.1K bytes
V3R6	98K to 290K bytes	1.4K bytes	2.1K bytes
V3R7	103K to 295K bytes	1.4K bytes	2.1K bytes
V3R8 and V3R9	118K to 327K bytes	1.4K bytes	2.2K bytes

Performance Considerations for NPSI

Actual performance levels will vary depending upon your particular hardware and software configuration. To evaluate performance capability, use IBM tools such as the IBM 3745 configurator (CF3745).

To demonstrate performance considerations for NPSI in various communication environments, case scenarios are presented for the following connections:

- Between SNA host nodes
- Between an SNA host and an SNA peripheral node
- Between an SNA host and a non-SNA X.25 DTE

Connection between SNA Host Nodes

The following sections describe an example of a connection between SNA host nodes.

Definition of Cycles

The additional cycles are defined as:

- The processor cycles from the point at which the NCP passes the PIU to NPSI, until the point at which NPSI does one of the following:
  - Splits the PIU into packets
  - Sends these packets to the network
  - Receives the required acknowledgments
- The processor cycles from the point where NPSI receives the first frame related to a PIU, until the point at which NPSI does one of the following:
  - Assembles all the packets constituting this PIU
  - Makes all the required acknowledgments
  - Passes the PIU to the NCP

Assumption

The PIU to be transmitted or received is contained in a single packet. Consequently, the maximum RU size must be:

- 99 bytes for a packet size of 128
- 227 bytes for a packet size of 256
- 483 bytes for a packet size of 512

A 29-byte difference exists between the packet size and the RU size. The 29 bytes are used by the format identifier (FID4), which contains 26 bytes in the transmission header (TH) and 3 bytes in the request/response header (RH).

Consideration

For a transmitted PIU, additional cycles are needed to:

- Build a packet containing the PIU
- Receive a RR packet
- Send a RR frame
- Receive a RR frame

For a received PIU, additional cycles are needed to:

- Receive a packet containing the PIU
- Send a RR packet
- Send a RR frame
- Receive a RR frame

Rather than sending a separate RR frame, NPSI can piggyback this acknowledgment on the next I frame. Similarly, rather than sending a separate RR packet, NPSI can piggyback this acknowledgment on the next Data packet. NPSI's ability to use piggybacking saves processor cycles.

Connection between an SNA Host and an SNA Peripheral Node

The following sections describe an example of a connection between an SNA host and an SNA peripheral node.

Definition of Cycles

The additional cycles are defined as:

- The processor cycles from the point at which the NCP passes the PIU or segment to NPSI, until the point at which NPSI does one of the following:
  - Splits the PIU or segment into packets
  - Sends these packets to the network
  - Receives the required acknowledgments
- The processor cycles from the point at which NPSI receives the first frame related to a PIU, until the point at which NPSI does one of the following:
  - Assembles all the packets constituting this PIU
  - Makes all the required acknowledgments
  - Passes the PIU to the NCP

First Case

Assumption: The PIU to be transmitted or received (including the TH, RH, and RU) does not exceed the packet size, and the LLC3 communicates with the remote SNA peripheral node.

Consideration: For a transmitted PIU, additional cycles are needed to:

- Build a packet containing the PIU
- Receive a RR packet
- Send a RR frame
- Receive a RR frame

For a received PIU, additional cycles are needed to:

- Receive a packet containing the PIU
- Send a RR packet
- Send a RR frame
- Receive a RR frame

Second Case

Assumption: The PIU to be transmitted or received includes an RU of 256 bytes. The maximum packet size is 128 bytes. Consequently, the PIU is converted to three packets.

Consideration: For a transmitted PIU, additional cycles are needed to:

- Build three packets containing the PIU
- Receive up to three RR packets
- Send up to three RR frames
- Receive up to three RR frames

For a received PIU, additional cycles are needed to:

- Receive three packets containing the PIU
- Send up to three RR packets
- Send up to three RR frames
- Receive up to three RR frames

Rather than sending a separate RR frame, NPSI can piggyback this acknowledgment on the next I frame. Similarly, rather than sending a separate RR packet, NPSI can piggyback this acknowledgment on the next Data packet. NPSI's ability to use piggybacking saves processor cycles.

Connection between an SNA Host and a Non-SNA X.25 DTE

The following sections describe an example of a connection between an SNA host and a non-SNA X.25 DTE.

Definition of Cycles

The additional cycles are defined as:

- The processor cycles from the point at which the NCP passes the PIU to NPSI, until the point at which NPSI does one of the following:
  - Splits the PIU into packets
  - Sends these packets to the network
  - Receives the required acknowledgments

- The processor cycles from the point at which NPSI receives the first frame related to a PIU until the point at which NPSI does one of the following:
  - Assembles all the packets constituting this PIU
  - Makes all the required acknowledgments
  - Passes the PIU to the NCP

First Case

Assumption: The RU size is equal to or less than the packet size.

Consideration: For a transmitted PIU, additional cycles are needed to:

- Build a packet containing the PIU
- Receive a RR packet
- Send a RR frame
- Receive a RR frame

For a received PIU, additional cycles are needed to:

- Receive a packet containing the PIU
- Send a RR packet
- Send a RR frame
- Receive a RR frame

Second Case

Assumption: The RU size is three times the packet size.

Consideration: For a transmitted PIU, additional cycles are needed to:

- Build three packets containing the PIU
- Receive up to three RR packets
- Send up to three RR frames
- Receive up to three RR frames

For a received PIU, additional cycles are needed to:

- Receive three packets containing the PIU
- Send up to three RR packets
- Send up to three RR frames
- Receive up to three RR frames

Rather than sending a separate receive ready frame, NPSI can piggyback this acknowledgment on the next information frame. Similarly, rather than sending a separate RR packet, NPSI can piggyback this acknowledgment on the next data packet. NPSI's ability to use piggybacking saves processor cycles.

Evaluating Communication Control Unit Utilization

Another performance consideration concerns evaluating the CCU utilization. To evaluate average CCU utilization for a given configuration, use the CF3720 configurator for the IBM 3720 and the CF3745 configurator for the IBM 3745.

For every packet sent, the results are based on the assumption that the following sequence occurred:

```
NPSI                    Network

---------------------->  Packet out
<----------------------   RR frame in
<----------------------   RR packet in
---------------------->  RR frame out
```

For every packet received, results depend upon the assumption that the following sequence occurred:

```
NPSI                    Network

<----------------------   Packet in
---------------------->  RR frame out
---------------------->  RR packet out
<----------------------   RR frame in
```

If a packet carries acknowledgments going in the opposite direction, fewer frames flow on the lines, and the CCU shows a lower average utilization. The average CCU utilization shown is the limit reached if data packets do not carry acknowledgments.

Performance of NPSI has been improved by optimizing the code and increasing the degree of piggybacking at the LAP and PLP levels. For example, if the LAP or PLP window size exceeds 2, piggybacking optionally allows NPSI to send fewer RR frames and packets to the network.

Migrating to NPSI Version 3

The following sections describe the migration process from:

- NPSI V1 to NPSI V3
- NPSI V3R2 to NPSI V3R3
- NPSI V3R3 to NPSI V3R4
- NPSI V3R4 to NPSI V3R5
- NPSI V3R5 to NPSI V3R6
- NPSI V3R6 to NPSI V3R7
- NPSI V3R7 to NPSI V3R8
- NPSI V3R8 to NPSI V3R9

Migrating from NPSI Version 1 to Version 3

Users of NPSI V1 can migrate to NPSI V3.

Generation Change

To speed up and simplify the process you can generate NPSI and NCP in a single job step under NDF. NPSI preprocessing is no longer required; however, you need to make minor changes in the NPSI source statements.

The NCP OPTION statement enables NPSI statements to be prepared for VTAM. To do this, code NEWDEFN=YES. This statement indicates to the NDF that it must build a new generation definition to be used for VTAM input.

VTAM requires that the X25 portion of the NPSI statements be separated from the suffix through the use of a period. For example, the X25MCH macro becomes the X25.MCH statement.

Relationship between SVCs and SNA Resources

NPSI V3 has been restructured to allow the bypassing of a *hung* SNA resource and the support of SVC subarea communication (SVCSC), including SHM. In NPSI V3, when diagnosing a problem with a virtual circuit, use the NetView program's detail screen to determine the name of the virtual circuit corresponding to the SNA resource.

Migrating from NPSI V3R2 to V3R3

Users of NPSI V3R2 can migrate to NPSI V3R3. The following sections describe the necessary migration adjustments.

Improved Connection Capabilities

A new range of IDBLK keyword variables are assigned to NPSI V3R3. Consequently, all VTAM SMNs using IDBLK=X'003' must be changed so that the VTAM IDBLK definition corresponds to the NPSI user-defined IDBLK number.

In addition, the VTAM SMN IDNUM statement definition, which interfaces with NPSI, must be redefined during generation so that the IDNUMH becomes the first digit of the IDNUM keyword.

Improved Conformance to ISO 7776 and 8208

If your network does not support duplicate facilities, you must code NETTYPE=4 on the X25.NET statement during NPSI generation.

Migrating from NPSI V3R3 to V3R4

Users of NPSI V3R3 can migrate to NPSI V3R4. If you are migrating from V3R3 and want to use GATE FTPI, add code to your CTCP to provide the following GATE FTPI processing:

- Demultiplex multiple packets that arrive in a single PIU
- Provide correlation between the correlation ID passed in multiple packets and the LU that sent the multiple packets

For users migrating from R3 to R4, mandatory keywords are not necessary. Users migrating from other releases should refer to those sections providing intermediate migration adjustments.

Migrating from NPSI V3R4 to V3R5

Only users of NPSI V3R4 who use 3745 Communication Controllers can migrate to NPSI V3R5. The following sections describe the necessary migration adjustments.

Calling DTE Address Verification

If your current VTAM level does not perform verification, or if VERID is not coded in your system, the CV25 control vector appended by NPSI V3R5 to the request contact PIU is either discarded by VTAM or passed to the configuration services installation user exit routine, if coded.

NCP V6 Currency

For delayed logical link activation, the virtual circuits can be activated before the MCH, if you are either using an early level of VTAM, or the option is not selected, or the MCH is owned by a different SSCP than the virtual circuits.

For users migrating from V3R4 to V3R5, mandatory keywords are not necessary. Users migrating from other releases should refer to those sections giving intermediate migration adjustments.

Migrating from NPSI V3R5 to V3R6

Only users of NPSI V3R5 who use the 3745 Communications Controllers can migrate to NPSI V3R6. The following sections describe the necessary migration adjustments.

X.25 and ISDN Interworking

In NPSI, you can dedicate several MCHs to interworking connections using the INTWLINK keyword on the X.25 MCH statement. After an MCH is dedicated to interworking connections, you cannot define another type of connection for that MCH.

GATE and DATE MCH LU Processing

V3R5 and earlier: GATE and DATE CTCPs that issue the new CTCP command MLUNAME receive a negative response (X'080C', function not supported).

Migrating from NPSI V3R6 to V3R7

Users of NPSI V3R6 who use 3745 Communication Controllers can migrate to NPSI V3R7. The following sections describe the necessary migration adjustments.

Expanded Dial Information

To avoid coexistence problems, it is recommended that you also code the DIALNO keywords when coding the DLCADDR keywords. This ensures that CONNOUT is always possible, regardless of the NCP and X.25 NPSI level.

PLP Enhancements

When you select the PLP enhancements at system generation, remote DTEs must be ready to receive, recognize, and appropriately react to the new X'94' and X'A1' diagnostic codes in the reset packets.

GATE CTCPs must be ready to receive and understand the new reset code with a CAUSE=00 and DIAGNOSTIC=94.

CTCP and GATE Interface

You can modify GATE CTCPs to let NPSI determine the flow control values to be used at packet level for a virtual call.

Logical Unit Dynamic Reconfiguration (LU DR)

The DR facility is authorized for LUs connected through QLLC PVCs.

Migrating from NPSI V3R7 to V3R8

Users of NPSI V3R7 who use 3745 Communication Controllers can migrate to NPSI V3R8. The following section describes the necessary migration adjustments.

Data Link Control (DLC) Connection Data Control Vector

NPSI appends a CV57 (DLC Connection Data Control Vector) containing the physical PU name to the REQCONT for a virtual circuit PU. This allows VTAM and the NetView program to correlate a X.25 virtual circuit co establishment time.

Migrating from NPSI V3R8 to V3R9

Users of NPSI V3R8 who use 3745 Communication Controllers can migrate to NPSI V3R9. The following section identifies new keywords for consideration.

X.25 APPN Inbound Data Flow Control

If you are using non-SNA LUs in an APPN network where the host LU is a type 2.1 LU and the non-SNA LUs require inbound flow control, code RNRPKT=YES on the X.25 MCH statment.

LLC0 PVC Reset Support

To cause NPSI to send a reset packet when a BIND or UNBIND command is received from the host application, code the RESETUNB keyword.

New Use of the Gate Error/Information Report

Instead of NPSI sending a negative response to a command received from the CTCP application in the host, code the GATEINFO keyword to cause NPSI to send an Error/Information Report.

Enhance Flow Control for FTPI Connections

Use the FTPITH and FTPITHTO keywords to set a threshold for resetting a virtual circuit when a certain number of packets are queued on its outbound queue.

Abbreviations, Glossary, Bibliography, and Index

List of Abbreviations

AEF address extension facility

APPN Advanced Peer-to-Peer Networking

ASCII American National Standard Code for Information Interchange

BER box error record

BSC binary synchronous communication

CCITT Consultative Committee on International Telegraph and Telephone

CCU central control unit

CD-ROM compact disk read-only memory

CICS/VS Customer Information Control System/Virtual Storage

CSDN circuit-switched data network

CSFI Communication Subsystem for Interconnection

CSS connectivity subsystem

CTCP communication and transmission control program

CUD call user data

CV control vector

DATE dedicated access to X.25 transport extension

DCE data circuit-terminating equipment

DCI diagnostic code indicator

DLC data link control

DMA direct memory access

DSE data switching equipment

DR dynamic reconfiguration

DTE data terminal equipment

ENP enable presentation (characters)

ESA Enterprise Systems Architecture

FID format identification

FTPI Fast Transaction Processing Interface

GATE general access to X.25 transport extension

GMF Graphics Monitor Facility

GOSIP Government Open Systems Interconnection Profile

HDLC high-level data link control

HPTSS high performance transmission subsystem

ICA integrated communication adapter

IDBLK identification block

IMS/VS Information Management System/Virtual Storage

INOP inoperative

INP inhibit presentation (characters)

INOP inoperative

IOH input/output halfword

IOHI input/output halfword intermediate

IPL initial program load

ISO International Organization for Standardization

ITU-TS International Telecommunication Union-Telecommunication Standardization Sector

Kbps kilobits per second

LAPB link access protocol balanced

LCGN logical channel group number

LLC logical link control

LU logical unit

MCH multichannel link

MVS Multiple Virtual Storage

NCP Network Control Program

NDF network definition facility

NEO network extension option

NIA Network Interface Adapter

NPI numbering plan identification

NPM NetView Performance Monitor

NPSI X.25 Network Control Program Packet Switching Interface

NRF Network Routing Facility

NSI Non-SNA Interconnection

NTO Network Terminal Option

OIC only-in-chain

OSI Open Systems Interconnection

OSICS Open Systems Interconnection Communication System

OUFT optional user facility table

PAD packet assembler/disassembler

PCNE protocol converter for non-SNA equipment

PIU path information unit

PLP packet level protocol

PRPQ programming request for price quotation

PSDN packet switching data network

PSE packet switching equipment

PTF program temporary fix

PU physical unit

PVC permanent virtual circuit

QLLC qualified logical link control

QOS quality of service

RECFMS record formatted maintenance statistics

RH request/response header

RNR receive not ready (packet)

RR receive ready (packet)

RU request/response unit

SAA Systems Application Architecture

SDLC Synchronous Data Link Control

SDOC Supplier's Declaration of Conformity

SHM short hold mode

SLU secondary logical unit

SMN switched major node

SNA Systems Network Architecture

SNI SNA network interconnection

SP service point

SSCP system services control point

SSP System Support Programs

SVC switched virtual circuit

SVCSC switched virtual circuit subarea communication

SVCSHM switched virtual circuit short hold mode

TA terminal adapter

TAP trace analysis program

TG transmission group

TH transmission header

TOA type of address

TSO Time Sharing Option

TSS transmission subsystem

TTY teletypewriter

USS unformatted system services

VCCPT virtual circuit connection parameter table

VM virtual machine

VR virtual route

WAN wide area network

XA extended architecture

XI X.25 SNA Interconnection

XID exchange identification

Glossary

This glossary includes terms and definitions from:

- The *American National Standard Dictionary for Information Systems*, ANSI X3.172-1990, copyright 1990 by the American National Standards Institute (ANSI). Copies may be purchased from the American National Standards Institute, 11 West 42nd Street, New York, New York 10036. Definitions are identified by the symbol (A) after the definition.
- The ANSI/EIA Standard—440-A, *Fiber Optic Terminology*. Copies may be purchased from the Electronic Industries Association, 2001 Pennsylvania Avenue, N.W., Washington, DC 20006. Definitions are identified by the symbol (E) after the definition.
- The *Information Technology Vocabulary*, developed by Subcommittee 1, Joint Technical Committee 1, of the International Organization for Standardization and the International Electrotechnical Commission (ISO/IEC JTC1/SC1). Definitions of published parts of this vocabulary are identified by the symbol (I) after the definition; definitions taken from draft international standards, committee drafts, and working papers being developed by ISO/IEC JTC1/SC1 are identified by the symbol (T) after the definition, indicating that final agreement has not yet been reached among the participating National Bodies of SC1.
- The *IBM Dictionary of Computing*, New York: McGraw-Hill, 1994.
- Internet Request for Comments: 1208, *Glossary of Networking Terms*
- Internet Request for Comments: 1392, *Internet Users' Glossary*
- The *Object-Oriented Interface Design: IBM Common User Access Guidelines*, Carmel, Indiana: Que, 1992.

The following cross-references are used in this glossary:

Contrast with: This refers to a term that has an opposed or substantively different meaning.

Synonym for: This indicates that the term has the same meaning as a preferred term, which is defined in its proper place in the glossary.

Synonymous with: This is a backward reference from a defined term to all other terms that have the same meaning.

See: This refers the reader to multiple-word terms that have the same last word.

See also: This refers the reader to terms that have a related, but not synonymous, meaning.

A

abend. (1) Abnormal end of task; the termination of a task before its completion because of an error condition that cannot be resolved by recovery facilities while the task is executing. (2) Synonym for *abnormal termination*.

abnormal termination. (1) The cessation of processing prior to planned termination. (T) (2) A system failure or operator action that causes a job to end unsuccessfully. (3) Synonymous with *abend*.

accept. (1) In a VTAM application program, to establish a session with a logical unit (LU) in response to a CINIT request from a system services control point (SSCP). The session-initiation request may begin when a terminal user logs on, a VTAM application program issues a macroinstruction, or a VTAM operator issues a command. See also *acquire*. (2) An SMP process that moves distributed code and MVS-type programs to the distribution libraries.

ACF. Advanced Communications Function.

ACF/NCP. Advanced Communications Function for the Network Control Program. Synonym for *NCP*.

ACF/SSP. Advanced Communications Function for the System Support Programs. Synonym for *SSP*.

ACF/TAP. Advanced Communications Function/Trace Analysis Program. Synonymous with *TAP*.

ACF/VTAM. Advanced Communications Function for the Virtual Telecommunications Access Method. Synonym for *VTAM*.

acknowledgment. (1) The transmission, by a receiver, of acknowledge characters as an affirmative response to a sender. (T) (2) An indication that an item sent was received.

acquire. (1) In VTAM, to take over resources that were formerly controlled by an access method in another domain or to resume control of resources that were controlled by that domain but released. Contrast with *release*. See also *resource takeover*. (2) In a VTAM application program, to initiate and establish a session with another logical unit (LU). The acquire process begins when the application program issues a macroinstruction. See also *accept*.

activate. To make a resource ready to perform its function. Contrast with *deactivate*.

adaptive pacing. Synonym for *adaptive session-level pacing*.

adaptive session-level pacing. A form of session-level pacing in which session components exchange pacing windows that may vary in size during the course of a session. This allows transmission within a network to adapt dynamically to variations in availability and demand of buffers on a session-by-session basis. Session-level pacing occurs within independent stages along the session path according to local congestion at the intermediate and endpoint nodes. Synonymous with *adaptive pacing* and *adaptive session pacing*. Contrast with *fixed session-level pacing*.

adaptive session pacing. Synonym for *adaptive session-level pacing*.

adjacent link station (ALS). (1) In SNA, a link station directly connected to a given node by a link connection over which network traffic can be carried.

Note: Several secondary link stations that share a link connection do not exchange data with each other and therefore are not adjacent to each other.

(2) With respect to a specific node, a link station partner in an adjacent node.

Administrative Domain. A collection of hosts and routers, and the interconnecting networks, managed by a single administrative authority.

Advanced Peer-to-Peer Networking (APPN). An extension to SNA featuring (a) greater distributed network control that avoids critical hierarchical dependencies, thereby isolating the effects of single points of failure; (b) dynamic exchange of network topology information to foster ease of connection, reconfiguration, and adaptive route selection; (c) dynamic definition of network resources; and (d) automated resource registration and directory lookup. APPN extends the LU 6.2 peer orientation for end-user services to network control and supports multiple LU types, including LU 2, LU 3, and LU 6.2.

Advanced Peer-to-Peer Networking (APPN) end node. A node that provides a broad range of end-user services and supports sessions between its local control point (CP) and the CP in an adjacent network node. It uses these sessions to dynamically register its resources with the adjacent CP (its network node server), to send and receive directory search requests, and to obtain management services. An APPN end node can also attach to a subarea network as a peripheral node or to other end nodes.

Advanced Peer-to-Peer Networking (APPN) network. A collection of interconnected network nodes and their client end nodes.

Advanced Peer-to-Peer Networking (APPN) network node. A node that offers a broad range of end-user services and that can provide the following:

- Distributed directory services, including registration of its domain resources to a central directory server
- Topology database exchanges with other APPN network nodes, enabling network nodes throughout the network to select optimal routes for LU-LU sessions based on requested classes of service
- Session services for its local LUs and client end nodes
- Intermediate routing services within an APPN network

Advanced Peer-to-Peer Networking (APPN) node. An APPN network node or an APPN end node.

AID. Attention identifier.

alias address. An address used by a gateway NCP and a gateway system services control point (SSCP) in one network to represent a logical unit (LU) or SSCP in another network.

alias name. A name that is defined in one network to represent a logical unit name in another interconnected network. The alias name does not have to be the same as the real name; if these names are not the same, translation is required.

ALS. Adjacent link station.

American National Standards Institute (ANSI). An organization consisting of producers, consumers, and general interest groups, that establishes the procedures by which accredited organizations create and maintain voluntary industry standards in the United States. (A)

analog. (1) Pertaining to data consisting of continuously variable physical quantities. (A) (2) Contrast with *digital*.

ANSI. American National Standards Institute.

APAR. Authorized program analysis report.

application. A collection of software components used to perform specific types of user-oriented work on a computer.

application programming interface (API). (1) The set of programming language constructs or statements that can be coded in an application program to obtain the specific functions and services provided by an underlying operating system or service program. (2) In VTAM, the language structure used in control blocks so that application programs can reference them and be identified to VTAM.

apply. An SMP process that moves distributed code and MVS-type programs to the system libraries.

Apply. A push button that carries out the selected choices in a window without closing the window.

APPN. Advanced Peer-to-Peer Networking.

APPN network. See *Advanced Peer-to-Peer Networking (APPN) network*.

APPN node. See *Advanced Peer-to-Peer Networking (APPN) node*.

ASCII (American National Standard Code for Information Interchange). The standard code, using a coded character set consisting of 7-bit coded characters (8 bits including parity check), that is used for information interchange among data processing systems, data communication systems, and associated equipment. The ASCII set consists of control characters and graphic characters. (A)

attention identifier (AID). A character in a data stream indicating that the user has pressed a key, such as the Enter key, that requests an action by the system.

attribute. (1) A characteristic that identifies and describes a managed object. The characteristic can be determined, and possibly changed, through operations on the managed object. (2) Information within a managed object that is visible at the object boundary. An attribute has a type, which indicates the range of information given by the attribute, and a value, which is within that range. (3) Variable data that is logically a part of an object and that represents a property of the object. For example, a serial number is an attribute of an equipment object.

authorized program analysis report (APAR). A report of a problem caused by a suspected defect in a current unaltered release of a program.

automated operator. In IMS/VS, an application program that can issue a subset of IMS/VS operator commands and receive status information on the execution of the commands.

autotask. An unattended NetView operator station task that does not require a terminal or a logged-on user. Autotasks can run independently of VTAM and are typically used for automated console operations. Contrast with *logged-on operator*.

B

B-channel. In the integrated services digital network (ISDN), a 64 kilobits-per-second channel for the transport of speech or data between the ISDN service provider and user.

backbone. (1) A set of nodes and their interconnecting links providing the primary data path across a network. (2) In a local area network multiple-bridge ring configuration, a high-speed link to which the rings are connected by means of bridges or routers. A backbone may be configured as a bus or as a ring. (3) In a wide area network, a high-speed link to which nodes or data switching exchanges (DSEs) are connected.

backbone network. A central network to which smaller networks, normally of lower speed, connect. The backbone network usually has a much higher capacity than the networks it helps interconnect or is a wide-area network (WAN) such as a public packet-switched datagram network.

basic encoding rules (BER). The rules specified in ISO 8825 for encoding data units described in abstract syntax notation 1 (ASN.1). The rules specify the encoding technique, not the abstract syntax.

BER. (1) Box event record. (2) Box error record. (3) Basic encoding rules.

bidder session. The half-session defined at session activation as having to request and receive permission from the other half-session to begin a bracket. Contrast with *first-speaker session*. Synonym for *contention-loser session*.

block. A string of data elements recorded or transmitted as a unit. The elements may be characters, words, or physical records. (T)

bridge. (1) A functional unit that interconnects two local area networks that use the same logical link control protocol but may use different medium access control protocols. (T) (2) A functional unit that interconnects multiple LANs (locally or remotely) that use the same logical link control protocol but that can use different medium access control protocols. A bridge forwards a frame to another bridge based on the medium access control (MAC) address. (3) In the connection of local loops, channels, or rings, the equipment and techniques used to match circuits and to facilitate accurate data transmission. (4) Contrast with *gateway* and *router*.

browse. (1) To look at records in a file. (2) In the NetView Graphic Monitor Facility, to open a view that cannot receive status changes from the NetView program. Contrast with *monitor*.

C

CCITT. International Telegraph and Telephone Consultative Committee. This was an organization of the International Telecommunication Union (ITU). On 1 March 1993 the ITU was reorganized, and responsibilities for standardization were placed in a subordinate organization named the Telecommunication Standardization Sector of the International Telecommunication Union (ITU-TS). "CCITT" continues to be used for recommendations that were approved before the reorganization.

CD. Compact disc.

CD-ROM. High-capacity read-only memory in the form of an optically read compact disc.

channel link. A System/370 I/O channel to control unit interface that has an SNA network address. A channel link can be either a subarea link or a peripheral link and is defined in an NCP generation definition using the GROUP, LINE, and PU definition statements.

CICS/VS. Customer Information Control System for Virtual Storage.

cluster controller. A device that can control the input/output operations of more than one device connected to it. A cluster controller may be controlled by a program stored and executed in the unit; for example, the IBM 3601 Finance Communication Controller. Or, it may be entirely controlled by hardware; for example, the IBM 3272 Control Unit. See also *cluster*.

command. (1) A request from a terminal for the performance of an operation or the execution of a particular program. (2) In SNA, any field set in the transmission header (TH), request header (RH), and sometimes portions of a request unit (RU), that initiates an action or that begins a protocol; for example: (a) Bind Session (session-control request unit), a command that activates an LU-LU session, (b) the change-direction indicator in the RH of the last RU of a chain, (c) the virtual route reset window indicator in an FID4 transmission header. (3) See also *VTAM operator command*.

communication controller. A type of communication control unit whose operations are controlled by one or more programs stored and executed in the unit. It manages the details of line control and the routing of data through a network.

compact disc (CD). (1) A disc, usually 4.75 inches in diameter, from which data is read optically by means of a laser. (2) A disc with information stored in the form of pits along a spiral track. The information is decoded by a compact-disc player and interpreted as digital audio data, which most computers can process.

configuration. (1) The manner in which the hardware and software of an information processing system are organized and interconnected. (T) (2) The devices and programs that make up a system, subsystem, or network. (3) In CCP, the arrangement of controllers, lines, and terminals attached to an IBM 3710 Network Controller. Also, the collective set of item definitions that describe such a configuration.

configuration services. One of the types of network services in a control point (SSCP, NNCP, or ENCP). Configuration services activates, deactivates, and records the status of physical units, links, and link stations.

contention-loser session. To an NAU, a session for which it was defined during session initiation to be the contention loser. Synonymous with *bidder session*.

contention-winner session. To an NAU, a session for which it was defined during session initiation to be the contention winner. Synonymous with *first-speaker session*.

control block. (1) A storage area used by a computer program to hold control information. (I) (2) In the IBM Token-Ring Network, a specifically formatted block of information provided from the application program to the Adapter Support Interface to request an operation.

Control Program (CP). In VM/ESA, a component that manages the resources of a single computer so multiple computing systems appear to exist. Each of these apparent systems, or virtual machines, is the functional equivalent of an IBM System/370, 370-XA, or ESA computer.

controller. A device that coordinates and controls the operation of one or more input/output devices, such as workstations, and synchronizes the operation of such devices with the operation of the system as a whole.

converted command. An intermediate form of a character-coded command produced by VTAM through use of an unformatted system services definition table. The format of a converted command is fixed; the unformatted system services definition table must be constructed in such a manner that the character-coded command (as entered by a logical unit) is converted into the predefined, converted command format. See also *unformatted*.

CP. (1) Control point. (2) In VM, Control Program.

Customer Information Control System for Virtual Storage (CICS/VS). An IBM licensed program that can be used in a communications network.

CSS. (1) Connectivity subsystem.

D

data. (1) A re-interpretable representation of information in a formalized manner suitable for communication, interpretation, or processing. Operations can be performed upon data by humans or by automatic means. (T) (2) Any representations such as characters or analog quantities to which meaning is or might be assigned. (A) (3) A representation of facts or instructions in a form suitable for communication, interpretation, or processing by human or automatic means. Data include constants, variables, arrays, and character strings.

Note: Programmers make a distinction between instructions and the data they operate on; however, in the usual sense of the word, data includes programs and program instructions.

data communication. (1) Transfer of data among functional units by means of data transmission according to a protocol. (T) (2) The transmission, reception, and validation of data. (A)

data link control (DLC). A set of rules used by nodes on a data link (such as an SDLC link or a token ring) to accomplish an orderly exchange of information.

data link control (DLC) layer. In SNA, the layer that consists of the link stations that schedule data transfer over a link between two nodes and perform error control for the link. Examples of data link control are SDLC for serial-by-bit link connection and data link control for the System/370 channel.

Note: The DLC layer is usually independent of the physical transport mechanism and ensures the integrity of data that reaches the higher layers.

data set. (1) Synonym for *file*.

data stream. (1) All information (data and control commands) sent over a data link usually in a single read or write operation. (2) A continuous stream of data elements being transmitted, or intended for transmission, in character or binary-digit form, using a defined format.

data terminal equipment (DTE). That part of a data station that serves as a data source, data sink, or both. (I) (A)

decrypt. (1) In computer security, to decipher or decode. (2) Synonym for *decipher*. (T)

degree. In NETDA/2, the maximum number of attachments (such as links, Ethernet connections, or token-ring connections) that a node can have. For example, if a node can have six attachments, that node has a degree of 6.

Delete. A choice that removes a selected object. The space it occupied is usually filled by the remaining object or objects in the window.

delimiter. (1) A character used to indicate the beginning and end of a character string. (T) (2) A flag that separates and organizes items of data. (A) (3) A character that groups or separates words or values in a line of input.

destination address. A code that identifies the location to which information is to be sent.

direct memory access (DMA). The system facility that allows a device on the Micro Channel bus to get direct access to the system or bus memory without the intervention of the system processor.

directory. (1) A table of identifiers and references to the corresponding items of data. (I) (A) (2) A database in an APPN node that lists names of resources (in particular, logical units) and records the CP name of the node where each resource is located. See *distributed directory database* and *local directory database*. (3) A type of file containing the names and controlling information for other files or other directories. (4) A listing of the files stored on a disk or diskette. (5) In VM, a Control Program (CP) disk file that defines each virtual machine's typical configuration: the user ID, password, regular and maximum allowable virtual storage, CP command privilege class or classes allowed, dispatching priority, logical editing symbols to be used, account number, and CP options desired.

disable. To make nonfunctional.

disabled. (1) Pertaining to a state of a processing unit that prevents the occurrence of certain types of interruptions. (2) Pertaining to the state in which a transmission control unit or audio response unit cannot accept incoming calls on a line. (3) In VTAM, pertaining to a logical unit (LU) that has indicated to its system services control point (SSCP) that it is temporarily not ready to establish LU-LU sessions. An initiate request for a session with a disabled logical unit (LU) can specify that the session be queued by the SSCP until the LU becomes enabled. The LU can separately indicate whether this applies to its ability to act as a primary logical unit (PLU) or a secondary logical unit (SLU). See also *enabled* and *inhibited*.

diskette. (1) A small magnetic disk enclosed in a jacket. (T) (2) A thin, flexible magnetic disk and a semi-rigid protective jacket, in which the disk is permanently enclosed.

display. (1) A visual presentation of data. (I) (A) (2) To present data visually. (I) (A)

display panel. In computer graphics, a predefined display image that defines the locations and characteristics of display fields on a display surface.

display station pass-through (DSPT). A communications function that allows a user to sign on to one system (either an AS/400 system, System/38, or System/36) from another system (either an AS/400 system, System/38, or System/36) and use that system's programs and data. Sometimes called pass-through or 5250 pass-through.

distributed directory database. The complete listing of all the resources in the network as maintained in the individual directories scattered throughout an APPN network. Each node has a piece of the complete directory, but it is not necessary for any one node to have the entire list. Entries are created, modified, and deleted through system definition, operator action, automatic registration, and ongoing network search procedures. Synonymous with *distributed network directory* and *network directory database*.

distributed network directory. Synonym for *distributed directory database*.

DLC. Data link control.

DMA. Direct memory access.

domain name. In the Internet suite of protocols, a name of a host system. A domain name consists of a sequence of subnames separated by a delimiter character. For example, if the fully qualified domain name (FQDN) of a host system is `ralvm7.vnet.ibm.com`, each of the following is a domain name:

- `ralvm7.vnet.ibm.com`
- `vnet.ibm.com`
- `ibm.com`

domain operator. In a multiple-domain network, the person or program that controls operation of resources controlled by one system services control point (SSCP). See also *network operator*.

downstream. In the direction of data flow from the host to the end user. Contrast with *upstream*.

DSPT. Display station pass-through.

DTE. Data terminal equipment. (A)

dump. (1) To record, at a particular instant, the contents of all or part of one storage device in another storage device. Dumping is usually for the purpose of debugging. (T) (2) Data that has been dumped. (T) (3) To copy data in a readable format from main or auxiliary storage onto an external medium such as tape, diskette, or printer. (4) To copy the contents of all or part of virtual storage for the purpose of collecting error information.

E

echo. (1) In computer graphics, the immediate notification of the current values provided by an input device to the operator at the display console. (I) (A) (2) In word processing, to print or display each character or line as it is keyed in. (3) In data communication, a reflected signal on a communications channel. On a communications terminal, each signal is displayed twice, once when entered at the local terminal and again when returned over the communications link. This allows the signals to be checked for accuracy.

element address. In SNA, a value in the element address field of the network address identifying a specific resource within a subarea. See also *subarea address*.

enabled. (1) Pertaining to a state of the processing unit that allows the occurrence of certain types of interruptions. (2) Pertaining to the state in which a transmission control unit or an audio response unit can accept incoming calls on a line. (3) In VTAM, pertaining to a logical unit (LU) that has indicated to its system services control point (SSCP) that it is ready to establish LU-LU sessions. The LU can separately indicate whether this prevents it from acting as a primary logical unit (PLU) or a secondary logical unit (SLU). See also *disabled* and *inhibited*.

encipher. (1) To scramble data or to convert data to a secret code that masks the meaning of the data to any unauthorized recipient. (2) In VTAM, to convert clear data into enciphered data. Contrast with *decipher*. Synonymous with *encrypt*.

encrypt. Synonym for *encipher*. (T)

end node domain. An end node control point, its attached links, and its local LUs.

entry point (EP). (1) The address or label of the first instruction executed on entering a computer program, routine, or subroutine. A computer program, routine, or subroutine may have a number of different entry points, each perhaps corresponding to a different function or purpose. (I) (A) (2) In SNA, a type 2.0, type 2.1, type 4, or type 5 node that provides distributed network management support. It sends network management data about itself and the resources it controls to a focal point for centralized processing, and it receives and executes focal-point initiated commands to manage and control its resources.

EP. (1) Emulation Program. (2) Entry point.

equipment. See *data terminal equipment (DTE)*.

Ethernet. A 10-Mbps baseband local area network that allows multiple stations to access the transmission medium at will without prior coordination, avoids contention by using carrier sense and deference, and resolves contention by using collision detection and delayed retransmission. Ethernet uses carrier sense multiple access with collision detection (CSMA/CD).

exchange identification (XID). A specific type of basic link unit that is used to convey node and link characteristics between adjacent nodes. XIDs are exchanged between link stations before and during link activation to establish and negotiate link and node characteristics, and after link activation to communicate changes in these characteristics.

exec. (1) In the AIX operating system, to overlay the current process with another executable program. (2) See also *fork*.

EXEC. In a VM operating system, a user-written command file that contains CMS commands, other user-written commands, and execution control statements, such as branches.

exit program. Synonym for *exit routine*.

exit routine. Either of two types of routines: installation exit routines or user exit routines. Synonymous with *exit program*. See *installation exit routine* and *user exit routine*.

extended architecture (XA). An extension to System/370 architecture that takes advantage of continuing high performance enhancements to computer system hardware.

external communication adapter (XCA). A communication adapter that is part of a device (such as the IBM 3172 Interconnect Controller) other than the host processor. Contrast with *integrated communication adapter*.

F

feature. A part of an IBM product that may be ordered separately by the customer.

file. A named set of records stored or processed as a unit. (T) Synonymous with *data set*.

first-speaker session. The half-session defined at session activation as: (a) able to begin a bracket without requesting permission from the other half-session to do so, and (b) winning contention if both half-sessions attempt to begin a bracket simultaneously. Synonym for *contention-winner session*. Contrast with *bidder session*.

fixed pacing. Synonym for *fixed session-level pacing*.

fixed session-level pacing. A form of session-level pacing in which the data transfer rate is controlled using fixed pacing-window sizes, which are initialized at session-activation time. Synonymous with *fixed pacing*. Contrast with *adaptive session-level pacing*.

fork. In the AIX operating system, to create and start a child process.

G

gateway-capable host. A host node that has a defined NETID and SSCPNAME but does not perform gateway control functions, such as cross-network session initiation and termination.

gateway node. Synonym for *gateway NCP*.

gateway VTAM. An SSCP that is capable of cross-network session initiation, termination, takedown, and session outage notification. A gateway VTAM is in session with the gateway NCP; it provides network name translation and assists the gateway NCP in setting up alias network addresses for cross-network sessions. Synonymous with *gateway SSCP*.

generation. The process of assembling and link editing definition statements so that resources can be identified to all the necessary programs in a network.

generation definition. The definition statement of a resource used in generating a program.

generic unbind. Synonym for *session deactivation request*.

graphic monitor. The graphical user interface of the NetView Graphic Monitor Facility.

group ID (GID). (1) In RACF, a string of one to eight characters that identifies a group. The first character must be A through Z, #, $, or @. The rest can be A through Z, #, $, @, or 0 through 9. (2) In the AIX operating system, a number that corresponds to a specific group name. The group ID can often be substituted in commands that take a group name as a value.

H

hardcopy. (1) A permanent copy of a display image generated on an output device such as a printer or plotter, and which can be carried away. (T) (2) A printed copy of machine output in a visually readable form; for example, printed reports, listings, documents, and summaries. (3) Contrast with *softcopy*.

header. (1) System-defined control information that precedes user data. (2) The portion of a message that

contains control information for the message such as one or more destination fields, name of the originating station, input sequence number, character string indicating the type of message, and priority level for the message.

Help. A choice that gives a user access to helpful information about objects, choices, tasks, and products. A Help choice can appear on a menu bar or as a push button.

help panel. Information displayed by a system in response to a help request from a user.

high-level data link control (HDLC). In data communication, the use of a specified series of bits to control data links in accordance with the International Standards for HDLC: ISO 3309 Frame Structure and ISO 4335 Elements of Procedures.

host ID. In the Internet suite of protocols, that part of the IP address that defines the host system on the network. The length of the host ID depends on the type of network or network class (A, B, or C).

host LU. An SNA logical unit located in a host processor; for example, a VTAM application program. Contrast with *peripheral LU*.

I

IBM Disk Operating System (DOS). A disk operating system based on MS-DOS that operates with all IBM personal computers.

ICP. Internet Control Protocol.

ID. (1) Identifier. (2) Identification.

inactive. (1) Not operational. (2) Pertaining to a node or device not connected or not available for connection to another node or device. (3) In the AIX operating system, pertaining to a window that does not have an input focus. (4) In VTAM, the state of a resource or a major or minor node that has not been activated or for which the VARY INACT command has been issued. (5) Contrast with *active*. (6) See also *inoperative*.

inbound. In communications, data that is received from the network.

inhibited. In VTAM, pertaining to a logical unit (LU) that has indicated to its system services control point (SSCP) that it is temporarily not ready to establish LU-LU sessions. An initiate request for a session with an inhibited LU will be rejected by the SSCP. The LU can separately indicate whether this applies to its ability to act as a primary logical unit (PLU) or a secondary logical unit (SLU). See also *disabled* and *enabled*.

initial program load (IPL). (1) The initialization procedure that causes an operating system to commence operation. (2) The process by which a configuration image is loaded into storage at the beginning of a work day or after a system malfunction. (3) The process of loading system programs and preparing a system to run jobs. (4) Synonymous with *system restart* and *system startup*.

inoperative. The condition of a resource that has been active but is not currently active. A resource may be inoperative for reasons such as the following: a) it may have failed, b) it may have received an INOP request, or c) it may be suspended while a reactivate command is being processed. See also *inactive*.

insert. In LANs, to make an attaching device an active part of the LAN.

installation. (1) In system development, preparing and placing a functional unit in position for use. (T) (2) A particular computing system, including the work it does and the people who manage it, operate it, apply it to problems, service it, and use the results it produces.

installation exit. The means specifically described in an IBM software product's documentation by which an IBM software product may be modified by a customer's system programmers to change or extend the functions of the IBM software product. Such modifications consist of exit routines written to replace one or more existing modules of an IBM software product, or to add one or more modules or subroutines to an IBM software product, for the purpose of modifying or extending the functions of the IBM software product. Synonymous with *installation-wide exit*. See *user exit*.

installation exit routine. A routine written by a user to take control at an installation exit of an IBM software product.

installation-wide exit. Synonym for *installation exit*.

interactive. (1) Pertaining to a program or system that alternately accepts input and then responds. An interactive system is conversational, that is, a continuous dialog exists between user and system. Contrast with *batch*. (2) Pertaining to the exchange of information between a user and a computer.

interconnection. See *SNA network interconnection (SNI)*.

interface. (1) A shared boundary between two functional units, defined by functional characteristics, signal characteristics, or other characteristics, as appropriate. The concept includes the specification of the connection of two devices having different functions. (T) (2) Hardware, software, or both, that links systems, programs, or devices.

Internet Control Protocol (ICP). The VIrtual NEtworking System (VINES) protocol that provides exception notifications, metric notifications, and PING support. See also *RouTing update Protocol (RTP)*.

IPL. (1) Initial program loader. (A) (2) Initial program load.

ISO. International Organization for Standardization.

ITU-T. See *ITU-TS*.

ITU-TS. International Telecommunication Union - Telecommunication Standardization Sector. The part of the International Telecommunication Union (ITU) that is responsible for developing recommendations for telecommunications.

K

Kbps. Kilobits per second.

keyword operand. An operand that consists of a keyword followed by one or more values (such as `DSNAME=HELLO`). See also *definition statement*. Contrast with *positional operand*.

keyword parameter. A parameter that consists of a keyword followed by one or more values.

L

LAN. Local area network.

LAPB. Link access protocol balanced.

line control discipline. Synonym for *link protocol* and *protocol*.

link. (1) The combination of the link connection (the transmission medium) and two link stations, one at each end of the link connection. A link connection can be shared among multiple links in a multipoint or token-ring configuration. (2) To interconnect items of data or portions of one or more computer programs: for example, the linking of object programs by a linkage editor, linking of data items by pointers. (T) (3) In SNA, synonymous with *data link*.

link access protocol balanced (LAPB). A protocol used for accessing an X.25 network at the link level. LAPB is a duplex, asynchronous, symmetric protocol, used in point-to-point communication.

link-attached. Pertaining to devices that are connected to a controlling unit by a data link. Contrast with *channel-attached*. Synonymous with *remote*.

link connection segment. A portion of the configuration that is located between two resources listed consecutively in the service point command service (SPCS) query link configuration request list.

local area network (LAN). (1) A computer network located on a user's premises within a limited geographical area. Communication within a local area network is not subject to external regulations; however, communication across the LAN boundary may be subject to some form of regulation. (T) (2) A network in which a set of devices are connected to one another for communication and that can be connected to a larger network. (3) See also *Ethernet* and *token ring*. (4) Contrast with *metropolitan area network (MAN)* and *wide area network (WAN)*.

local directory database. That set of resources (LUs) in the network known at a particular node. The resources included are all those in the node's domain as well as any cache entries.

logged-on operator. A NetView operator station task that requires a terminal and a logged-on user. Contrast with *autotask*.

logical channel identifier. A bit string in the header of a packet that associates the packet with a specific switched virtual circuit or permanent virtual circuit.

logical line. In NCP, the representation of the connection between NCP and a node communicating with NCP over a physical line such as token-ring or frame-relay. A single physical line can support multiple logical lines. Contrast with *physical line*.

logon mode. In VTAM, a subset of session parameters specified in a logon mode table for communication with a logical unit. See also *session parameters*.

low-entry networking (LEN) end node. A LEN node receiving network services from an adjacent APPN network node.

LU. Logical unit.

LU 6.2. A type of logical unit that supports general communication between programs in a distributed processing environment. LU 6.2 is characterized by (a) a peer relationship between session partners, (b) efficient utilization of a session for multiple transactions, (c) comprehensive end-to-end error processing, and (d) a generic application programming interface (API) consisting of structured verbs that are mapped into a product implementation.

M

macroinstruction. (1) An instruction in a source language that is to be replaced by a defined sequence of instructions in the same source language and that may also specify values for parameters in the replaced instructions. (T) (2) In assembler programming, an assembler language statement that causes the assembler to process a predefined set of statements called a macro definition. The statements normally produced from the macro definition replace the macroinstruction in the program. See also *definition statement*.

maintenance analysis procedure (MAP). A maintenance document that gives an IBM service representative a step-by-step procedure for tracing a symptom to the cause of a failure.

maintenance services. In SNA, one of the types of network services in system services control points (SSCPs) and physical units (PUs). Maintenance services provide facilities for testing links and nodes and for collecting and recording error information.

MAN. Metropolitan area network.

management services (MS). (1) One of the types of network services in control points (CPs) and physical units (PUs). Management services are the services provided to assist in the management of SNA networks, such as problem management, performance and accounting management, configuration management, and change management. (2) Services that assist in the management of systems and networks in areas such as problem management, performance management, business management, operations management, configuration management, and change management.

management services focal point (MSFP). For any given management services discipline (for example, problem determination or response time monitoring), the control point that is responsible for that type of network management data for a sphere of control. This responsibility may include collecting, storing or displaying the data or all of these. (For example, a problem determination focal point is a control point that collects, stores, and displays problem determination data.)

manager. (1) In OSI management, a user that, for a particular interaction, has assumed a manager role. (2) A system that assumes a manager role.

MAP. Maintenance analysis procedure.

mapping. The process of converting data that is transmitted in one format by the sender into the data format that can be accepted by the receiver.

metric. In Internet communications, a value, associated with a route, which is used to discriminate between multiple exit or entry points to the same autonomous system. The route with the lowest metric is preferred.

metropolitan area network (MAN). A network formed by the interconnection of two or more networks which may operate at higher speed than those networks, may cross administrative boundaries, and may use multiple access methods. (T) Contrast with *local area network (LAN)* and *wide area network (WAN)*.

migration. The installation of a new version or release of a program to replace an earlier version or release.

minor node. In VTAM, a uniquely defined resource within a major node. See *major node* and *node*.

mixed-media multilink transmission group (MMMLTG). See *transmission group (TG)*.

MLTG. Multilink transmission group.

MMMLTG. Mixed-media multilink transmission group.

mode name. The name used by the initiator of a session to designate the characteristics desired for the session, such as traffic pacing values, message-length limits, sync point and cryptography options, and the class of service within the transport network.

modem (modulator/demodulator). (1) A functional unit that modulates and demodulates signals. One of the functions of a modem is to enable digital data to be transmitted over analog transmission facilities. (T) (A) (2) A device that converts digital data from a computer to an analog signal that can be transmitted on a telecommunication line, and converts the analog signal received to data for the computer.

modulus. A number, such as a positive integer, in a relationship that divides the difference between two related numbers without leaving a remainder; for example, 9 and 4 have a modulus of 5 (9 - 4 = 5; 4 - 9 = -5; and 5 divides both 5 and -5 without leaving a remainder).

monitor. (1) A device that observes and records selected activities within a data processing system for analysis. Possible uses are to indicate significant departure from the norm, or to determine levels of utilization of particular functional units. (T) (2) Software or hardware that observes, supervises, controls, or verifies operations of a system. (A) (3) The function required to initiate the transmission of a token on the ring and to provide soft-error recovery in case of lost tokens, circulating frames, or other difficulties. The capability is present in all ring stations. (4) In the NetView Graphic Monitor Facility, to open a view that can receive status changes from the NetView program. Problem determination and correction can be performed directly from the view. Contrast with *browse*.

MSFP. Management services focal point.

multidrop line. Synonym for *multipoint line*.

multilink transmission group (MLTG). See *transmission group (TG)*.

Multiple Virtual Storage (MVS). See *MVS*.

multipoint line. (1) A telecommunication line or circuit that connects two or more stations. (2) Synonymous with *multidrop line*. (3) Contrast with *point-to-point line*.

MVS. Multiple Virtual Storage. Implies MVS/370, the MVS/XA product, and the MVS/ESA product.

N

NCP. (1) Network Control Program. (2) Synonymous with *ACF/NCP*.

negative response (NR). In SNA, a response indicating that a request did not arrive successfully or was not processed successfully by the receiver. Contrast with *positive response*.

NETID. See *network identifier*.

NetView Bridge. A set of application programming interfaces that allow the NetView program to interact with various types of databases in the MVS environment.

NetView Graphic Monitor Facility (NGMF). A function of the NetView program that provides the network operator with a graphic topological presentation of a network controlled by the NetView program and that allows the operator to manage the network interactively.

NetView Installation and Administration Facility/2 (NIAF/2). An OS/2-based tool that allows new NetView users or users migrating from a prior release of NetView to install, administer, and maintain the NetView program. NIAF/2 replaces the Interactive System Productivity Facility-based (ISPF-based) NetView Installation Facility.

NetView-NetView task (NNT). The task under which a cross-domain NetView operator session runs. See *operator station task*.

NetView Performance Monitor (NPM). An IBM licensed program that collects, monitors, analyzes, and displays data relevant to the performance of a VTAM telecommunication network. It runs as an online VTAM application program.

network. (1) An arrangement of nodes and connecting branches. (T) (2) A configuration of data processing devices and software connected for information interchange. (3) A group of nodes and the links interconnecting them.

network accessible unit (NAU). A logical unit (LU), physical unit (PU), control point (CP), or system services control point (SSCP). It is the origin or the destination of information transmitted by the path control network. Synonymous with *network addressable unit*.

network address translation. In SNA network interconnection, the conversion of the network address assigned to a logical unit in one network into an address in an adjacent network. This function is provided by the gateway NCP that joins the two networks. See also *alias address* and *real address*.

network architecture. The logical structure and operating principles of a computer network. (T)

Note: The operating principles of a network include those of services, functions, and protocols.

network congestion. An undesirable overload condition caused by traffic in excess of what a network can handle.

Network Control Program (NCP). An IBM licensed program that provides communication controller support for single-domain, multiple-domain, and interconnected network capability.

network directory database. Synonym for *distributed directory database*.

network identifier. (1) In TCP/IP, that part of the IP address that defines a network. The length of the network ID depends on the type of network class (A, B, or C). (2) A 1- to 8-byte customer-selected name or an 8-byte IBM-registered name that uniquely identifies a specific subnetwork. (3) In MPTN architecture, the address qualifier of a transport provider address that identifies a group of nodes according to the network in which they reside.

network node domain. An APPN network-node control point, its attached links, the network resources for which it answers directory search requests (namely, its local LUs and adjacent LEN end nodes), the adjacent APPN end nodes with which it exchanges directory search requests and replies, and other resources (such as a local storage device) associated with its own node or an adjacent end node for which it provides management services.

network performance analyzer (NPA). A function of NCP that collects performance data about devices. The data is recorded by NPM.

network services (NS) header. In SNA, a 3-byte field in a function management data (FMD) request/response unit (RU) flowing in an SSCP-LU, SSCP-PU, or

SSCP-SSCP session. The network services header is used primarily to identify the network services category of the request unit (RU) (for example, configuration services and session services) and the particular request code within a category.

NIAF/2. NetView Installation and Administration Facility/2.

notification. (1) An unscheduled, spontaneously generated report of an event that has occurred. (2) In OSI management, information emitted by a managed object relating to an event that has occurred within the managed object, such as a threshold violation or a change in configuration status.

NOTIFY. A network services request that is sent by a system services control point (SSCP) to a logical unit (LU) to inform the LU of the status of a procedure requested by the LU.

NPM. NetView Performance Monitor.

NPSI. X.25 NCP Packet Switching Interface.

NS. Network services.

NTune. A set of programs (NTuneMON and NTuneNCP) that allow monitoring and tuning of active NCPs.

NTuneNCP. A program that runs in a communication controller and, with NTuneMON and VTAM, enables a network administrator to tune NCP interactively.

O

object. (1) In object-oriented design or programming, an abstraction consisting of data and the operations associated with that data. See also *class*. (2) An item that a user can manipulate as a single unit to perform a task. An object can appear as text, an icon, or both.

OEM. Original equipment manufacturer.

Off. A choice that appears in the cascaded menu from the Refresh choice. It sets the refresh function to off.

offline. (1) Pertaining to the operation of a functional unit that takes place either independently of, or in parallel with, the main operation of a computer. (T) (2) Neither controlled by, nor communicating with, a computer. Contrast with *online*.

On. A choice that appears in a cascaded menu from the Refresh choice. It immediately refreshes the view in a window.

online. (1) Pertaining to the operation of a functional unit when under the direct control of the computer. (T) (2) Pertaining to a user's ability to interact with a computer. (A) (3) Pertaining to a user's access to a computer via a terminal. (A) (4) Controlled by, or communicating with, a computer. (5) Contrast with *offline*.

online information. Information stored in a computer system that can be displayed, used, and modified in an interactive manner without any need to obtain hardcopy.

open. (1) A break in an electrical circuit. (2) To make an adapter ready for use.

Open. A choice that leads to a window in which users can select the object they want to open.

open system. A system whose characteristics comply with standards made available throughout the industry and that therefore can be connected to other systems complying with the same standards. (T)

operation. In object-oriented design or programming, a service that can be requested at the boundary of an object. Operations include modifying an object or disclosing information about an object.

operator station task (OST). The NetView task that establishes and maintains the online session with the network operator. There is one operator station task for each network operator who logs on to the NetView program. See *NetView-NetView task*.

original equipment manufacturer (OEM). A manufacturer of equipment that may be marketed by another manufacturer.

outbound. In communications, data that is transmitted to the network.

pacing group. Synonym for *pacing window*.

pacing response. In SNA, an indicator that signifies the readiness of a receiving component to accept another pacing group. The indicator is carried in a response header (RH) for session-level pacing and in a transmission header (TH) for virtual route pacing.

pacing window. (1) The path information units (PIUs) that can be transmitted on a virtual route before a virtual-route pacing response is received, indicating that the virtual route receiver is ready to receive more PIUs on the route. (2) The requests that can be transmitted on the normal flow in one direction on a session before a session-level pacing response is received, indicating that the receiver is ready to accept the next group of requests. (3) Synonymous with *pacing group*.

package. A collection of attributes, notifications, operations, or behaviors that are treated as a single module in the specification of a managed object class. Pack-

ages can be mandatory or conditional when referenced in a definition of a managed object class.

packet. In data communication, a sequence of binary digits, including data and control signals, that is transmitted and switched as a composite whole. The data, control signals, and, possibly, error control information are arranged in a specific format. (I)

packet level. (1) The packet format and control procedures for exchange of packets containing control information and user data between data terminal equipment (DTE) and data circuit-terminating equipment (DCE). See also *data link level* and *physical level*. (2) A part of Recommendation X.25 that defines the protocol for establishing logical connections between two DTEs and for transferring data on these connections.

packet size. (1) In X.25 communications, the length of the user data in a data packet. (2) The maximum amount of user data in a packet.

packet switching. (1) The process of routing and transferring data by means of addressed packets so that a channel is occupied only during transmission of a packet. On completion of the transmission, the channel is made available for transfer of other packets. (I) (2) Synonymous with *packet mode operation*. See also *circuit switching*.

page. (1) In a virtual storage system, a fixed-length block that has a virtual address and is transferred as a unit between real storage and auxiliary storage. (I) (A) (2) A printed form. (3) The information displayed at the same time on the screen of a display device. (4) In VSE, a fixed-length block of instructions, data, or both that can be located in processor storage or in the page data set on disk. (5) To replace the information displayed on the screen with prior or subsequent information from the same file.

panel. (1) See *window*. (2) A formatted display of information that appears on a display screen. See *help panel* and *task panel*. (3) In computer graphics, a display image that defines the locations and characteristics of display fields on a display surface.

parallel transmission groups. Multiple transmission groups between adjacent nodes, with each group having a distinct transmission group number.

pass-through. See *display station pass-through (DSPT)*.

password. (1) A value used in authentication or a value used to establish membership in a set of people having specific privileges. (2) A unique string of characters known to a computer system and to a user, who must specify the character string to gain access to a system and to the information stored within it. (3) In computer security, a string of characters known to the computer system and a user, who must specify it to gain full or limited access to a system and to the data stored within it.

path statement. In NETDA/2, a type of route statement used for subarea routing. Existing VTAM and NCP path statements can be included in a network design, or new path statements can be generated.

pending active session. In VTAM, the state of an LU-LU session recorded by the system services control point (SSCP) when it finds both logical units (LUs) available and has sent a CINIT request to the primary logical unit (PLU) of the requested session.

peripheral PU. In SNA, a physical unit in a peripheral node. Contrast with *subarea PU*.

physical connection. (1) A connection that establishes an electrical circuit. (2) A point-to-point or multipoint connection. (3) Synonymous with *connection*.

physical line. In NCP, the physical connection between NCP and an adjacent device or local area network (LAN). A single physical line, such as token-ring or frame-relay, can support multiple logical lines. Contrast with *logical line*.

point-to-point connection. A connection established between two data stations for data transmission. (I) (A)

Note: The connection may include switching facilities.

point-to-point line. (1) A switched or nonswitched telecommunication line that connects a single remote station to a computer. (2) Contrast with *multipoint line*.

positional operand. An operand in a language statement that has a fixed position. See also *definition statement*. Contrast with *keyword operand*.

positive response. In SNA, a response indicating that a request was received and processed. Contrast with *negative response*.

problem determination. The process of determining the source of a problem; for example, a program component, machine failure, telecommunication facilities, user or contractor-installed programs or equipment, environmental failure such as a power loss, or user error.

process identification number (process ID). A unique number assigned to a process by the operating system. The number is used internally by processes to communicate.

profile. Data that describes the significant characteristics of a user, a group of users, or one or more computer resources.

program operator. A VTAM application program that is authorized to issue VTAM operator commands and receive VTAM operator awareness messages. See also *solicited message* and *unsolicited message*.

protocol. (1) A set of semantic and syntactic rules that determine the behavior of functional units in achieving communication. (I) (2) In Open Systems Interconnection architecture, a set of semantic and syntactic rules that determine the behavior of entities in the same layer in performing communication functions. (T) (3) In SNA, the meanings of, and the sequencing rules for, requests and responses used for managing the network, transferring data, and synchronizing the states of network components. Synonymous with *line control discipline* and *line discipline*. See *bracket protocol* and *link protocol*.

PU type. The type of physical unit in a node.

R

read-only. A type of access to data that allows data to be read but not copied, printed, or modified.

read-only memory (ROM). Memory in which stored data cannot be modified by the user except under special conditions.

real address. The address by which a logical unit (LU) is known within the SNA network in which it resides.

reassembly. In communications, the process of putting segmented packets back together after they have been received.

receive pacing. In SNA, the pacing of message units that a component is receiving. Contrast with *send pacing*.

record. (1) In programming languages, an aggregate that consists of data objects, possibly with different attributes, that usually have identifiers attached to them. In some programming languages, records are called structures. (I) (2) A set of data treated as a unit. (T) (3) A set of one or more related data items grouped for processing. (4) In VTAM, the unit of data transmission for record mode. A record represents whatever amount of data the transmitting node chooses to send.

redirection. The use of a logical device name that has been redirected so that data is obtained from a different source or is sent to a different destination.

release. (1) A distribution of a new product or new function and APAR fixes for an existing product. Normally, programming support for the prior release is discontinued after some specified period of time following availability of a new release. The first version of a product is announced as Release 1, Modification Level 0. (2) In VTAM, to relinquish control of resources (communication controllers or physical units). See also *resource takeover*. Contrast with *acquire*.

remote procedure call (RPC). A facility that a client uses to request the execution of a procedure call from a server. This facility includes a library of procedures and an external data representation.

resource. (1) Any facility of a computing system or operating system required by a job or task, and including main storage, input/output devices, the processing unit, data sets, and control or processing programs. (2) In the NetView program, any hardware or software that provides function to the network.

Resource Object Data Manager (RODM). A component of the NetView program that operates as a cache manager and that supports automation applications. RODM provides an in-memory cache for maintaining real-time data in an address space that is accessible by multiple applications.

resource takeover. In VTAM, an action initiated by a network operator to transfer control of resources from one domain to another without breaking the connections or disrupting existing LU-LU sessions on the connection. See also *acquire* and *release*.

response time. (1) The elapsed time between the end of an inquiry or demand on a computer system and the beginning of the response; for example, the length of time between an indication of the end of an inquiry and the display of the first character of the response at a user terminal. (I) (A) (2) For response time monitoring, the time from the activation of a transaction until a response is received, according to the response time definition coded in the performance class.

REX. Route extension.

route daemon. A program that runs under 4BSD UNIX to propagate route information among machines on a local area network. Also referred to as *routed* (pronounced “route-d”).

route extension (REX). In SNA, the path control network components, including a peripheral link, that make up the portion of a path between a subarea node and a network addressable unit (NAU) in an adjacent peripheral node. See also *explicit route (ER)*, *path*, and *virtual route (VR)*.

router. (1) A computer that determines the path of network traffic flow. The path selection is made from several paths based on information obtained from specific protocols, algorithms that attempt to identify the shortest or best path, and other criteria such as metrics or protocol-specific destination addresses. (2) An attaching device that connects two LAN segments,

which use similar or different architectures, at the reference model network layer. (3) In OSI terminology, a function that determines a path by which an entity can be reached. (4) In TCP/IP, synonymous with *gateway*. (5) Contrast with *bridge*.

RouTing update Protocol (RTP). The VIrtual NEtworking System (VINES) protocol that maintains the routing database and allows the exchange of routing information between VINES nodes. See also *Internet Control Protocol (ICP)*.

RPC. Remote procedure call.

RTP. RouTing update Protocol.

S

screen. (1) The physical surface of a display device upon which information is shown to users. (2) In the AIX extended curses library, a window that is as large as the display screen of the workstation.

send pacing. In SNA, the pacing of message units that a component is sending. Contrast with *receive pacing*.

server. (1) A functional unit that provides shared services to workstations over a network; for example, a file server, a print server, a mail server. (T) (2) In a network, a data station that provides facilities to other stations; for example, a file server, a print server, a mail server. (A) (3) In the AIX operating system, an application program that usually runs in the background and is controlled by the system program controller. (4) In AIX Enhanced X-Windows, a program that provides the basic windowing mechanism. It handles interprocess communication (IPC) connections from clients, demultiplexes graphics requests onto screens, and multiplexes input back to clients.

session activation request. In SNA, a request that activates a session between two network accessible units (NAUs) and specifies session parameters that control various protocols during session activity; for example, BIND and ACTPU. Contrast with *session deactivation request*.

session connector. A session-layer component in an APPN network node or in a subarea node boundary or gateway function that connects two stages of a session. Session connectors swap addresses from one address space to another for session-level intermediate routing, segment session message units as needed, and (except for gateway function session connectors) adaptively pace the session traffic in each direction. See also *half-session*.

session control (SC). In SNA, either of the following:

- One of the components of transmission control. Session control is used to purge data flowing in a session after an unrecoverable error occurs, to resynchronize the data flow after such an error, and to perform cryptographic verification.
- A request unit (RU) category used for requests and responses exchanged between the session control components of a session and for session activation and deactivation requests and responses.

SNA. Systems Network Architecture.

socket. (1) An endpoint for communication between processes or application programs. (2) Synonym for *port*.

softcopy. (1) A nonpermanent copy of the contents of storage in the form of a display image. (T) (2) One or more files that can be electronically distributed, manipulated, and printed by a user. (3) Contrast with *hardcopy*.

solicited message. A response from VTAM to a command entered by a program operator. Contrast with *unsolicited message*.

SSCP ID. In SNA, a number that uniquely identifies a system services control point (SSCP). The SSCP ID is used in session activation requests sent to physical units (PUs) and other SSCPs.

SSP. System Support Programs.

static. (1) In programming languages, pertaining to properties that can be established before execution of a program; for example, the length of a fixed length variable is static. (I) (2) Pertaining to an operation that occurs at a predetermined or fixed time. (3) Contrast with *dynamic*.

status. The condition or state of hardware or software, usually represented by a status code.

status monitor. A component of the NetView program that collects and summarizes information on the status of resources defined in a VTAM domain.

stream. (1) To send data from one device to another. (2) See *data stream*.

subarea LU. In SNA, a logical unit in a subarea node. Contrast with *peripheral LU*.

subarea network. Interconnected subareas, their directly attached peripheral nodes, and the transmission groups that connect them.

subarea PU. In SNA, a physical unit in a subarea node. Contrast with *peripheral PU*.

subsystem. A secondary or subordinate system, usually capable of operating independently of, or asynchronously with, a controlling system. (T)

system. In data processing, a collection of people, machines, and methods organized to accomplish a set of specific functions. (I) (A)

system definition. The process, completed before a system is put into use, by which desired functions and operations of the system are selected from various available options. Synonymous with *system generation*.

system generation. Synonym for *system definition*.

system restart. Synonym for *initial program load (IPL)*.

system services control point (SSCP) domain. The system services control point, the physical units (PUs), the logical units (LUs), the links, the link stations, and all the resources that the SSCP has the ability to control by means of activation and deactivation requests.

system startup. Synonym for *initial program load (IPL)*.

System Support Programs (SSP). An IBM licensed program, made up of a collection of utilities and small programs, that supports the operation of the NCP.

Systems Network Architecture (SNA). The description of the logical structure, formats, protocols, and operational sequences for transmitting information units through, and controlling the configuration and operation of, networks. The layered structure of SNA allows the ultimate origins and destinations of information, that is, the end users, to be independent of and unaffected by the specific SNA network services and facilities used for information exchange.

T

task panel. Online display from which you communicate with the program in order to accomplish the program's function, either by selecting an option provided on the panel or by entering an explicit command. See also *help panel*.

Task-Related User Exit (TRUE). A CICS module used for invoking resource managers that are outside of CICS. A TRUE is one of the components of CICS sockets.

terminal. A device, usually equipped with a keyboard and a display device, that is capable of sending and receiving information.

TG. Transmission group.

TH. Transmission header.

time stamp. (1) To apply the current system time. (2) The value on an object that is an indication of the system time at some critical point in the history of the object. (3) In query, the identification of the day and time when a query report was created that query automatically provides on each report.

token ring. (1) According to IEEE 802.5, network technology that controls media access by passing a token (special packet or frame) between media-attached stations. (2) A FDDI or IEEE 802.5 network with a ring topology that passes tokens from one attaching ring station (node) to another. (3) See also *local area network (LAN)*.

transmission group (TG). (1) A connection between adjacent nodes that is identified by a transmission group number. See also *parallel transmission groups*. (2) In a subarea network, a single link or a group of links between adjacent nodes. When a transmission group consists of a group of links, the links are viewed as a single logical link, and the transmission group is called a *multilink transmission group (MLTG)*. A *mixed-media multilink transmission group (MMMLTG)* is one that contains links of different medium types (for example, token-ring, switched SDLC, nonswitched SDLC, and frame-relay links). (3) In an APPN network, a single link between adjacent nodes.

transmission group (TG) profile. In VTAM, a named set of characteristics (such as cost per byte, cost per unit of time, and capacity) that is used for APPN links.

transmission group (TG) vector. A representation of an endpoint TG in a T2.1 network, consisting of two control vectors: the TG Descriptor (X'46') control vector and the TG Characteristics (X'47') control vector.

transmission services (TS) profile. In SNA, a specification in a session activation request (and optionally, in the responses) of transmission control (TC) protocols (such as session-level pacing and the usage of session-level requests) to be supported by a particular session. Each defined transmission services profile is identified by a number.

transport network. (1) The part of the SNA network that includes the data link control and path control layers. Synonymous with *path control network*. (2) An implementation of transport networking. Examples are parts of SNA, TCP/IP, OSI, IPX, NetBIOS, DECnet, and Appletalk.

TRUE. Task-Related User Exit.

tuning. The process of adjusting an application or a system to operate in a more efficient manner in the work environment of a particular installation.

unsolicited message. A message, from VTAM to a program operator, that is unrelated to any command entered by the program operator. Contrast with *solicited message*.

user. (1) Any person or any thing that may issue or receive commands and messages to or from the information processing system. (T) (2) Anyone who requires the services of a computing system.

user exit. (1) A point in an IBM-supplied program at which a user exit routine may be given control. (2) A programming service provided by an IBM software product that may be requested during the execution of an application program for the service of transferring control back to the application program upon the later occurrence of a user-specified event.

user exit routine. A user-written routine that receives control at predefined user exit points. User exit routines can be written in assembler or a high-level language.

V.24. In data communications, a specification of the CCITT that defines the list of definitions for interchange circuits between data terminal equipment (DTE) and data circuit-terminating equipment (DCE).

V.35. In data communications, a specification of the CCITT that defines the list of definitions for interchange circuits between data terminal equipment (DTE) and data circuit-terminating equipment (DCE) at various data rates.

version. A separately licensed program that usually has significant new code or new function.

view. In IBM network management products, a graphical representation of a network or a part of a network. A view consists of resource symbols and resource labels; it may also include a background picture or text that a network operator has placed within it.

Virtual Machine/Enterprise Systems Architecture (VM/ESA). An IBM licensed program that manages the resources of a single computer so that multiple computing systems appear to exist. Each virtual machine is the functional equivalent of a real machine.

virtual route (VR) pacing. In SNA, a flow control technique used by the virtual route control component of path control at each end of a virtual route to control the rate at which path information units (PIUs) flow over the virtual route. VR pacing can be adjusted according to traffic congestion in any of the nodes along the route. See also *session-level pacing*.

Virtual Telecommunications Access Method (VTAM). An IBM licensed program that controls communication and the flow of data in an SNA network. It provides single-domain, multiple-domain, and interconnected network capability.

VM/ESA. Virtual Machine/Enterprise Systems Architecture.

VSE/ESA. Virtual Storage Extended/Enterprise Systems Architecture.

VTAM. (1) Virtual Telecommunications Access Method. (2) Synonymous with *ACF/VTAM*.

VTAM operator. A person or program authorized to issue VTAM operator commands. See *domain operator*, *program operator*, and *network operator*.

VTAM operator command. A command used to monitor or control a VTAM domain. See also *definition statement*.

W

WAN. Wide area network.

wide area network (WAN). (1) A network that provides communication services to a geographic area larger than that served by a local area network or a metropolitan area network, and that may use or provide public communication facilities. (T) (2) A data communications network designed to serve an area of hundreds or thousands of miles; for example, public and private packet-switching networks, and national telephone networks. (3) Contrast with *local area network (LAN)* and *metropolitan area network (MAN)*.

X

X.25. (1) An International Telegraph and Telephone Consultative Committee (CCITT) recommendation for the interface between data terminal equipment and packet-switched data networks. (2) See also *packet switching*.

X.25 interface. An interface consisting of a data terminal equipment (DTE) and a data circuit-terminating equipment (DCE) in communication over a link using the procedures described in the CCITT Recommendation X.25.

X.25 NCP Packet Switching Interface (NPSI). An IBM licensed program that allows SNA users to communicate over packet switching data networks that have interfaces complying with CCITT Recommendation X.25. It allows SNA programs to communicate with SNA or non-SNA equipment over such networks.

X.25_1980. CCITT Recommendation X.25 (Geneva, 1980).

X.25_1984. CCITT Recommendation X.25 (Malaga-Torremolinos, 1984).

X.28. An International Telegraph and Telephone Consultative Committee (CCITT) recommendation for the DTE/DCE interface for a start-stop mode data terminal equipment (DTE) accessing the packet assembly/disassembly (PAD) facility in a public data network situated in the same country.

X.29. An International Telegraph and Telephone Consultative Committee (CCITT) recommendation for procedures for the exchange of control information and user data between a packet assembly/disassembly (PAD) facility and a packet mode data terminal equipment (DTE) or another PAD facility.

X.3. An International Telegraph and Telephone Consultative Committee (CCITT) recommendation for packet assembly/disassembly (PAD) in a public data network.

X.32. An International Telegraph and Telephone Consultative Committee (CCITT) recommendation that defines the interface between data terminal equipment (DTE) and packet-switching networks through a public switched network, such as a public telephone network.

XA. Extended architecture.

XI. X.25 SNA Interconnection.

XID. Exchange identification.

Bibliography

X.25 NCP Packet Switching Interface Publications

The following paragraphs briefly describe the library of books associated with X.25 NCP Packet Switching Interface Version 3.

X.25 NPSI Version 3 Release 9 Data Areas (LY30-5627)

This book is written for system programmers to assist them in troubleshooting and diagnosing problems with the X.25 NCP Packet Switching Interface. It provides control block information for NPSI.

NCP Version 7 and X.25 NPSI Version 3 Diagnosis, Customization, and Tuning (LY30-5610)

This book is written for system programmers to assist them in troubleshooting and diagnosing problems with the X.25 NCP Packet Switching Interface. It helps programmers to diagnose problems, resolve common errors, and describe problems to and interface with the IBM Support Center.

X.25 NPSI Version 3 General Information (GC30-3469)

This book introduces managers, system designers, programmers, and other data processing personnel to the basic concepts of packet-switching, X.25, and IBM's X.25 NCP Packet Switching Interface licensed program.

X.25 NPSI Version 3 Host Programming (SC30-3502)

This book is written for application and system programmers to assist them in writing application programs that use the X.25 NCP Packet Switching Interface. Application programmers should have some knowledge of DATE and GATE functions and the operating systems that support them. System programmers should be knowledgeable in SNA architecture.

NCP Version 7 and X.25 NPSI Version 3 Planning and Installation (SC30-3470)

This book provides system programmers and analysts with the information required to plan and implement the installation of NPSI. The topics include hardware and software requirements, preinstallation system performance considerations, instructions for defining and generating NPSI, and installation examples.

Other Networking System Product Libraries

The following books provide cross-product information for NCP, NetView, and VTAM. For detailed information about these products refer to the library for each.

ACF/NCP, ACF/SSP, EP, NPSI, and NTuneMON Softcopy Collection Kit (LK2T-0414, CD-ROM)

IBM Online Libraries: Softcopy Collection Kit User's Guide (GC28-1700)

Planning for Integrated Networks (SC31-8062)

Planning for NetView, NCP, and VTAM (SC31-8063)

NCP, SSP, and EP Library

The following publications apply to the NCP, SSP, and EP library.

NCP and EP Reference (LY43-0029)

NCP and EP Reference Summary and Data Areas (LY43-0030)

NCP and SSP Customization Guide (LY43-0031)

NCP and SSP Customization Reference (LY43-0032)

NCP, SSP, and EP Diagnosis Guide (LY43-0033)

NCP, SSP, and EP Generation and Loading Guide (SC31-6221)

NCP, SSP, and EP Messages and Codes (SC31-6222)

NCP, SSP, and EP Resource Definition Guide (SC31-6223)

NCP, SSP, and EP Resource Definition Reference (SC31-6224)

NCP, SSP, and EP Trace Analysis Handbook (LY43-0037)

NCP V7R7 Migration Guide (SC30-3889)

NCP V7R7, SSP V4R7, and EP R14 Library Directory (SC30-3971)

NTuneNCP Feature Reference (LY43-0039)

NTuneMON V2R5 User's Guide (SC31-6266)

VTAM Library

The following list shows the books in the VTAM library.

VTAM Customization (LY43-0068)

VTAM Data Areas for MVS/ESA (LY43-0071)

VTAM Diagnosis (LY43-0069)

VTAM Messages and Codes (SC31-6546)

VTAM Migration Guide (GC31-6547)

VTAM Network Implementation Guide (SC31-6548)

VTAM Operation (SC31-6549)

VTAM Programming (SC31-6550)

VTAM Programming for LU 6.2 (SC31-6551)

VTAM Release Guide (GC31-6555)

VTAM Resource Definition Reference (SC31-6552)

VTAM Resource Definition Samples (SC31-6554)

NetView Library

The following list shows the books in the NetView library.

TME 10 NetView for OS/390 NGMF User's Guide (SC31-8234)

TME 10 NetView for OS/390 User's Guide (SC31-8241)

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TME 10 NetView for OS/390 Messages (SC31-8237)

TME 10 NetView for OS/390 Diagnosis Guide (LY43-0108)

TME 10 NetView for OS/390 Resource Object Data Manager and GMFHS Programmer's Guide (SC31-8233)

TME 10 NetView for OS/390 Tuning Guide (SC31-8240)

TME 10 NetView for OS/390 NGMF User's Guide (SC31-8234)

NPM Library

The following list shows the books in the NPM library.

NetView Performance Monitor at a Glance (GH19-6960)

NetView Performance Monitor Concepts and Planning (GH19-6961)

NetView Performance Monitor Desk/2 User's Guide (SH19-6963)

NetView Performance Monitor Diagnosis (LY19-6381)

NetView Performance Monitor Graphic Subsystem (SH19-6967)

NetView Performance Monitor Installation and Customization (SH19-6964)

NetView Performance Monitor Messages and Codes (SH19-6966)

NetView Performance Monitor Reports and Record Formats (SH19-6965)

NetView Performance Monitor User's Guide (SH19-6962)

SNA Publications

The following publications contain information on SNA:

Systems Network Architecture Formats (GA27-3136)

Systems Network Architecture: Management Services Reference (SC30-3346)

Systems Network Architecture Technical Overview (GC30-3073)

X.25 DTE/DCE and DTE/DTE Interface Architecture Reference (SC30-3409)

X.25 1980 Interface for Attaching IBM SNA Nodes to Packet-Switched Data Networks: General Information Manual (GA27-3345)

X.25 1984/1988 DTE/DCE and DTE/DTE Interface General Information Manual (GA27-3761)

372x Publications

The following list shows selected publications for the IBM 372x.

3720/3721 Communication Controllers Configuration Guide (GA33-0063)

3720/3721 Communication Controllers Introduction (GA33-0060)

3725 Communication Controllers Principles of Operation (GA33-0013)

3745 Publications

The following list shows the publications for the IBM 3745.

IBM 3745 Basic Operations Guide for MOSS Operations (SA33-0098)

IBM 3745 Communication Controller Introduction (GA33-0092 for 3745 Models 210, 310, 410 and 610)

IBM 3745 Communication Controller Introduction (GA33-0138 for 3745 Models 130, 150, and 170)

IBM 3745 Communication Controller (all models): Principles of Operation (SA33-0102)

IBM 3745 Models 21A through 61A Migration and Planning Guide (GA33-0183)

CCITT Recommendations

The following book provides information about CCITT recommendations X.1–X.32.

Blue Book, Volume VIII—Fascicle VIII.2, Data Communication Networks: Services and Facilities, Interfaces, Recommendations X.1—X.32.

GOSIP

The following book provides information about the United States Government Open System Interconnection Profile (GOSIP).

Federal Information Processing Standard (FIPS) 146-2

ISO Publications

The following books provide information about ISO standards 7776 and 8208.

ISO 7776 Information Processing Systems—Data Communication— High-Level Data Link Control Procedures—Description of the X.25 LAPB-Compatible DTE Data Link Procedures

ISO 8208 Information Processing Systems—Data Communication—X.25 Packet Level Protocol for Data Terminal Equipment.

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