Introduction to Networking for HP NonStop S-Series Servers

Abstract

This manual provides an overview of networking and data communications concepts, tasks, products, and manuals for HP NonStop™ S-series servers. It is intended for programmers, system and network managers, and others who will select products for specific applications.

Product Version

NA

Supported Release Version Updates (RVUs)

This manual supports the G06.24 RVU and all subsequent RVUs until otherwise indicated in a new edition.

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2. Communications Product Concepts and Components (continued)

3. Application Programming With Communications Products

5. Expand Network (continued)

6. Device-Specific Connections

7. HP NonStop S-Series Systems Network Architecture (SNA) Network Connections

8. Open Systems Interconnection (OSI) Network Connections

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Abstract

This manual provides an overview of networking and data communications concepts, tasks, products, and manuals for HP NonStop™ S-series servers. It is intended for programmers, system and network managers, and others who will select products for specific applications.

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New and Changed Information

Note. In April 2006, removed part number from Section 2, Communications Product Concepts and Components. To view part numbers, from the home page of the NonStop Technical Library (NTL), select **Support and Service > Service Information > Part Number**s.

This manual has been revised to support the G06.24 RVU. The new Gigabit Ethernet 4-port ServerNet adapter (G4SA) product is discussed in this version of the manual, which includes the following new or changed topics:

- ServerNet LAN Systems Access (SLSA) Subsystem on page 2-11
- Table 2-1, HP ServerNet Adapters, on page 2-21

- SWAN 2 Concentrator Connections on page 2-29
- TSM and OSM Packages on page 4-13
- Subsystem Control Facility (SCF) on page 4-14
- Port Access Method (PAM) on page 8-15
- LAN Interfaces for HP NonStop S-Series Servers on page 9-2
- Parallel Library TCP/IP Architecture and Features on page 10-8
- Ethernet Failover on page 10-9
- HP NonStop Communications Products
- Glossary: Gigabit Ethernet 4-port ServerNet adapter (G4SA), I/O adapter module (IOAM), I/O adapter module enclosure (IOAM enclosure), and Parallel Library TCP/IP

About This Manual

The *Introduction to Networking for HP NonStop S-Series Servers* provides an overview of HP networking and data communications concepts, tasks, products, and manuals. It discusses ways to connect NonStop S-series servers to various devices and networks, and it introduces the tools and interfaces you can use.

This manual does not provide detailed descriptions of networking or communications standards, architectures, or protocols. It is not an introduction to the operation of NonStop S-series servers, nor does it explain programming on the HP NonStop Kernel operating system. See the *NonStop S-Series Planning and Configuration Guide* and the *Guardian Programmer's Guide* for information on these topics.

Finally, this manual does not provide comprehensive descriptions of each product. Refer to the appropriate product manuals to find this information.

Note. There is some variation in the usage of the terms **networking** and **data communications** in the computer industry. In general, the former term denotes high-level, application-oriented communications functions and implies the intelligence of the communicating systems or devices. The latter term denotes lower-level, transmission-oriented functions or connections between systems and terminals (or terminal emulators). This manual uses the term **communications** to encompass both sets of functions.

Who Should Use This Manual

This manual is intended mainly for three types of readers:

- Programmers who will write applications that use communications products directly
- System and network managers who will administer systems or networks including HP communications products
- Technical managers and other personnel who will select products for specific applications

It is presumed that readers have some knowledge of networking and data communications concepts. For the benefit of readers who do not have this background, the manual includes brief discussions of some terms and concepts.

How This Manual Is Organized

This manual consists of two main parts, three appendixes, and a glossary that contains technical terms and abbreviations used throughout the manual.

Part I Contents

Part I, HP Communications Concepts and Facilities, consists of Sections 1 through 4. These sections describe the characteristics of the products from both the programmer's and the system manager's points of view. Table i summarizes the contents of the sections in Part I.

Table i. Summary of Contents (Part I)

Section	Title	Contents
1	HP Networking and Data Communications	Describes the benefits and features of HP NonStop server communications products.
2	Communications Product Concepts and Components	Introduces architectural concepts common to HP NonStop server communications products. It also introduces common components such as the ServerNet wide area network (SWAN) concentrator and ServerNet adapters.
3	Application Programming With Communications Products	Describes programming concepts common to HP NonStop server communications products.
4	Managing Communications Subsystems	Describes the tools used to manage HP NonStop server communications products.

Part II Contents

Part II, HP Networking Solutions, consists of Sections 5 through 11. These sections explain how HP communications products meet requirements for connecting diverse devices and networks. Table ii summarizes the contents of the sections in Part II.

Table ii. Summary of Contents (Part II)

Section	Title	Contents
5	Expand Network	Describes the HP Expand network software, which is used to create networks of HP NonStop S-series servers and other NonStop systems.
6	Device-Specific Connections	Describes HP products and facilities that can be used to connect different kinds of devices to a NonStop S-series server or an Expand network.
7	HP NonStop S-Series Systems Network Architecture (SNA) Network Connections	Describes HP products and facilities that allow NonStop S-series servers to communicate with IBM Systems Network Architecture (SNA) systems and devices.
8	Open Systems Interconnection (OSI) Network Connections	Describes HP products and facilities that allow NonStop S-series servers to participate in Open Systems Interconnection (OSI) networks.
9	Local Area Network (LAN) Connections	Describes HP products and facilities that allow NonStop S-series servers to communicate with workstations and systems on local area networks (LANs).
10	TCP/IP Network Connections	Describes HP products and facilities that allow NonStop S-series servers to communicate with other systems over Transmission Control Protocol/Internet Protocol (TCP/IP) networks. Parallel Library TCP/IP is also described.
11	Internet Applications	Describes HP products and facilities that enable you to integrate applications with the World Wide Web.

Appendices

Appendix A, HP NonStop Communications Products, is an alphabetical list of HP products with brief descriptions.

Appendix B, Communications Products by Type of Connection, lists types of systems and devices that you can connect to a NonStop system along with products you can use to accomplish each type of connection.

Appendix C, Guide to the Manuals, describes HP manuals relevant for users of HP communications products.

Change Bar Notation

Change bars are used to indicate differences between this edition of the manual and the preceding edition. Change bars are vertical rules placed in the right margin of changed portions of text, figures, tables, examples, and so on. Change bars highlight new or revised information.

For example:

> The message types specified in the REPORT clause are different in the COBOL85 environment and the Common Run-Time Environment (CRE).
>
> The CRE has many new message types and some new message type codes for old message types. In the CRE, the message type SYSTEM includes all messages except LOGICAL-CLOSE and LOGICAL-OPEN.

Part I. HP Communications Concepts and Facilities

HP communications products share several characteristics. For example, all products support Distributed Systems Management (DSM), providing consistency in management of various products. Also, most of the application program interfaces (APIs) for communications products are based on the Guardian file-system interface. This uniformity means that what you have to learn to use one product often can be applied to future tasks involving different products; it also lends itself to a consistent approach to application design or system management.

Part I consists of the following sections, which describe the general characteristics of HP communications products:

1

HP Networking and Data Communications

Connectivity is an important part of online transaction processing (OLTP). HP offers a wide variety of communications hardware and software products. These products extend the OLTP power of your NonStop S-series server by supporting a wide range of application and networking configurations.

This section introduces the cornerstones of the HP communications offerings:

The Expand Network

The Expand network connects NonStop S-series servers and other types of NonStop servers. Several characteristics differentiate the Expand network from other proprietary or standards-based networks.

One important feature is **transparency**. Applications use one interface to refer to NonStop server resources anywhere in the network, regardless of the current path or connection technology. The network chooses the best path.

A second important feature is **availability**. The Expand subsystem is designed to support applications requiring continuous availability. If a line fails, communications are rerouted automatically; there is no need for operator or application intervention. A value-added transaction monitoring facility ensures data integrity despite component failures or even catastrophic failures.

A third important feature is **flexibility**. The network configuration can change—nodes can be added, moved, or removed—without disrupting the rest of the network. Resources and applications can be conveniently redistributed without compromising access to them and without reprogramming; new nodes can be added to the network without explicit definition.

The Expand subsystem supports the concurrent use of a wide range of data-transmission facilities, such as:

- Full-duplex leased lines or satellite connections using the High-Level Data Link Control (HDLC) protocol
- X.25 virtual-circuit connections to a packet-switched data network (PSDN)
- Connections to IBM Systems Network Architecture (SNA) networks

- Local area network (LAN) or wide area network (WAN) connections to networks that use the Internet Protocol (IP)
- Local area network (LAN) or wide area network (WAN) connections to Asynchronous Transfer Mode (ATM) networks
- Multi-mode, fiber-optic cables (FOX rings)
- Single-mode, fiber-optic cables (ServerNet clusters)

Comprehensive Connectivity

The devices best suited to an application are often manufactured by different vendors and can follow different sets of conventions—called **protocols**—for connections to other devices and servers. HP communications products support a wide range of device types and protocols, permitting the exchange of information among many kinds of devices and servers. In fact, some customers use HP servers for message switching in addition to other processing functions.

For example, HP applications can involve a variety of terminal types, printers, workstations, and personal computers, and devices such as automated teller machines (ATMs), cash registers, robots, and bar-code readers. These devices can be connected to an NonStop S-series server over a number of different media: dial-up lines, leased lines, digital networks, LANs, and frame relay and X.25 PSDNs. HP also provides interfaces that let you develop your own solutions to special device-connection needs.

Support of Standards

HP communications products make it possible to integrate computer systems from different manufacturers. They allow you to integrate the benefits of NonStop S-series servers and Expand networks into existing networks without making major changes to those networks. Your past investments in hardware and software are protected by products that support older protocols, and your current investments are protected by support of current and developing standards. Programs you develop can communicate with other standards-based hardware and software, now and as your network grows. Because your solutions are standards-based, you don’t incur the costs of developing and maintaining custom protocols.

HP offers products based on industry and *de facto* standards. For example, HP offers a range of products that let HP applications and devices use and be used by IBM Systems Network Architecture (SNA) applications and devices.

HP also offers a wide range of industry-standard communications products that allow equipment from multiple vendors to communicate. For example, HP offers products that implement the protocols of Open Systems Interconnection (OSI), Transmission Control Protocol/Internet Protocol (TCP/IP), and the legacy network basic input/output system (NetBIOS).

Integrated Management Tools

HP provides a variety of closely integrated management products. Direct support using NonStop NET/MASTER Management Services (MS) can be the focal point for management operations. In addition, the HP NonStop Open System Management (OSM) Interface is provided to help you troubleshoot, maintain, and service hardware components, including communications hardware.

HP NonStop Fundamentals

HP NonStop communications products support networking in environments that require:

- Fault-tolerance
- Modular growth
- Data integrity
- Performance
- Security
- Manageability

All of these fundamental characteristics, called **HP NonStop fundamentals**, are present in NonStop servers and Expand networks, but most are also present to some degree in other HP communications products.

For example, the communications software products are typically structured as NonStop process pairs, so a failure affecting one process results in a transfer of control to a backup process. In most cases, multiple instances of a communications product can be created or installed in response to an increased workload, and the same set of tools used to manage other parts of NonStop S-series servers and Expand networks can be used to manage communications products.

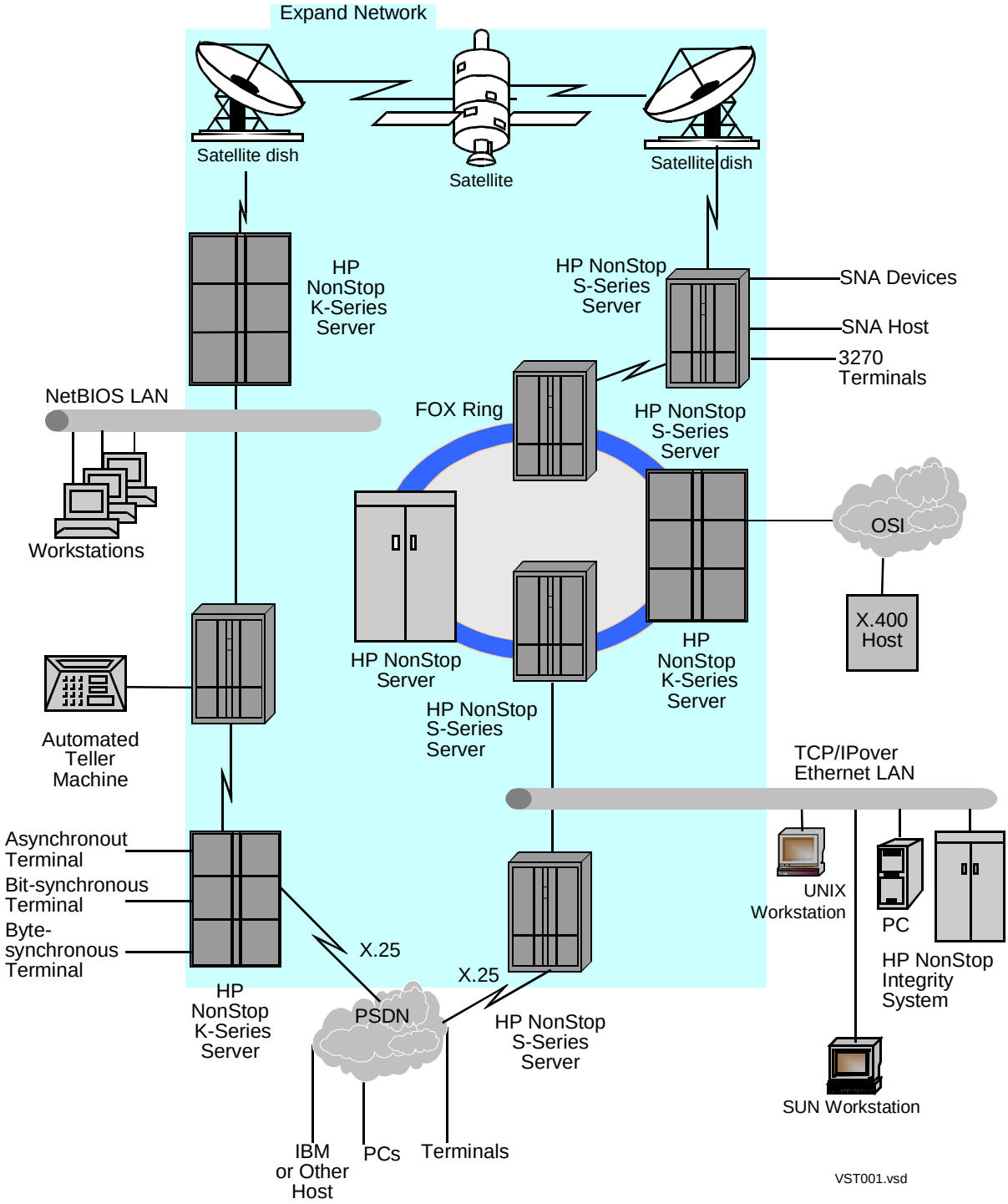
Both the communications software and the hardware products are designed to be fault-tolerant. The ServerNet wide area network (SWAN) concentrator and ServerNet adapters are structured to accommodate component failures.

HP Advantages

HP communications products provide you with the following advantages:

- Freedom to choose the best hardware and software for each application. HP offers connectivity with many kinds of devices, systems, networks, transmission media, and telecommunications facilities, as illustrated in Figure 1-1 on page 1-5.
- A fully transparent, fault-tolerant network optimized for online transaction processing (OLTP). The Expand network is well suited to mission-critical applications, such as electronic funds transfer (EFT), and to applications that must easily accommodate growth and configuration changes, such as telecommunications applications.
- Product implementations based on recognized networking and data communications standards. You can integrate NonStop S-series servers and OLTP applications with your current equipment and know they will work with standards-based equipment and software you add in the future.
- Integration of transmission facilities such as local area networks (LANs) and wide area networks (WANs). Applications can use the same interface with different underlying connection technologies, and applications of different types can share transmission facilities.
- Tools and interfaces that help you to manage geographically distributed HP communications and processing resources and that help you to automate routine tasks and procedures.

Figure 1-1. A Complex Network



2

Communications Product Concepts and Components

As new technologies become available and user requirements become more sophisticated, HP communications products continue to evolve. Even though HP communications products vary widely in their functions, some common concepts apply across the product line.

This section describes the following aspects of HP networking and data communications:

Communications Software Concepts

Certain software concepts are common to all or many HP communications products. Knowing these concepts will make it easier for you to learn to use the products and especially to learn about other products after you are familiar with a first one. Also, the similarities let you develop applications and management procedures that use multiple products in a uniform way.

Layered Structures and Common Components

To achieve communication with a specific kind of device or network, you will often use several communications products. These products are related as components in a layered structure (sometimes called a **stack**), as shown in Figure 2-1 on page 2-3. Higher-level components, such as HP NonStop TCP/IP, use the services of lower-level ones, such as the ServerNet LAN systems access (SLSA) subsystem, to accomplish a connection. In general, the higher-level components are application-oriented, while the lower-level ones are network-oriented; the lowest-level components control the physical communications lines.

Note. In some protocols, terms such as **high-level** and **low-level** are narrowly defined. In this manual, the terms are used in their more general sense, where higher-level means closer to the user and lower-level means closer to the hardware.

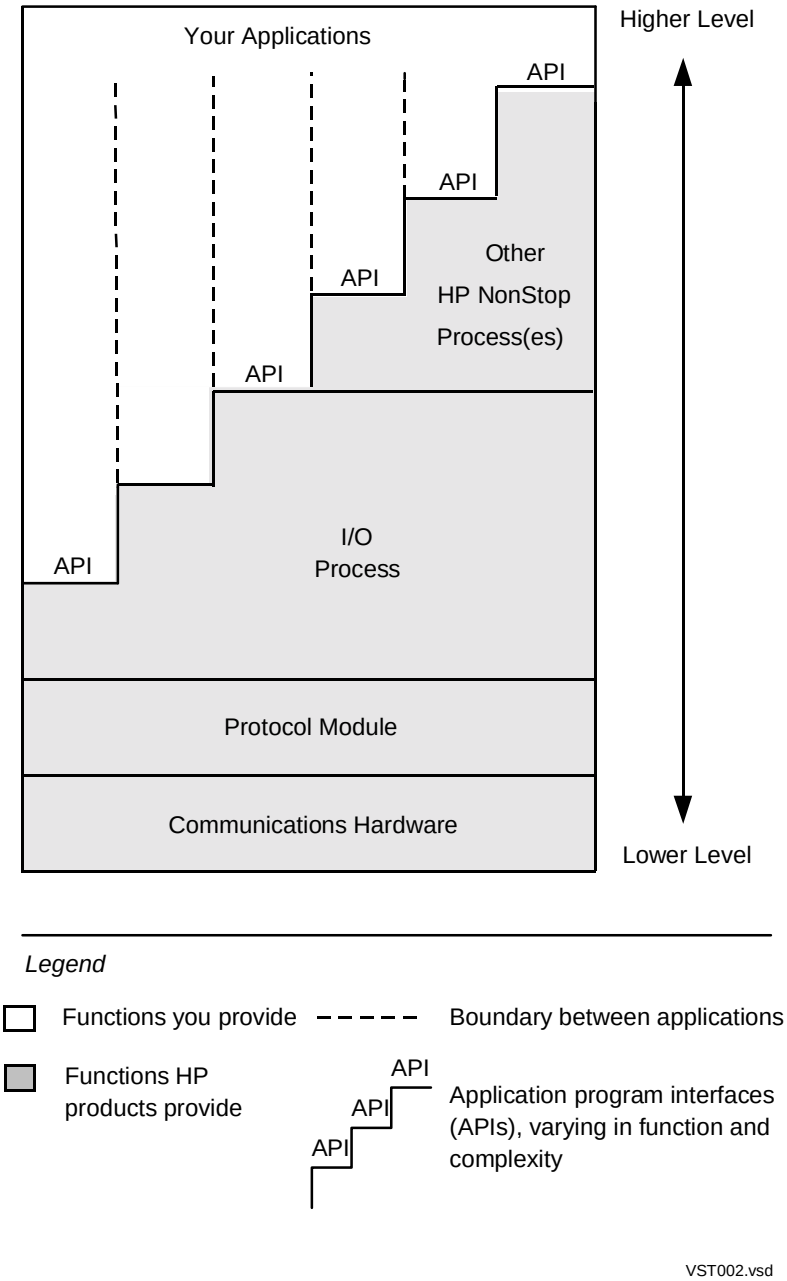
This modular product structure has three important characteristics:

- The same higher-level component can often use any of several lower-level components. Higher-level components and your applications are insulated from lower-level network characteristics. Conversely, multiple components at a given level can often use the services of the same lower-level component.
- **Application program interfaces (APIs)** are usually available at several levels of function and complexity—in fact, as Figure 2-1 on page 2-3 shows, the same component can have APIs on several levels—letting you tailor the connection to your needs. In effect, you can choose to perform higher-level protocol functions in your own application. In some cases you can also replace functions within the stack (for example, to customize a protocol for a specific kind of device) and still use higher-level HP software, such as Transaction Services/MP (TS/MP).
- Management interfaces are available as modules, allowing system managers (or management applications) to examine or control subsets of the communications resources. HP also provides management tools that present an integrated view of all communications resources.

Layered structures are very common in implementations of communications protocols. Other sections of this manual will show how particular HP products provide the functions of one or more layers defined by well-known communications protocols.

Figure 2-1 shows the HP communications product stack.

Figure 2-1. Communications Product Stack



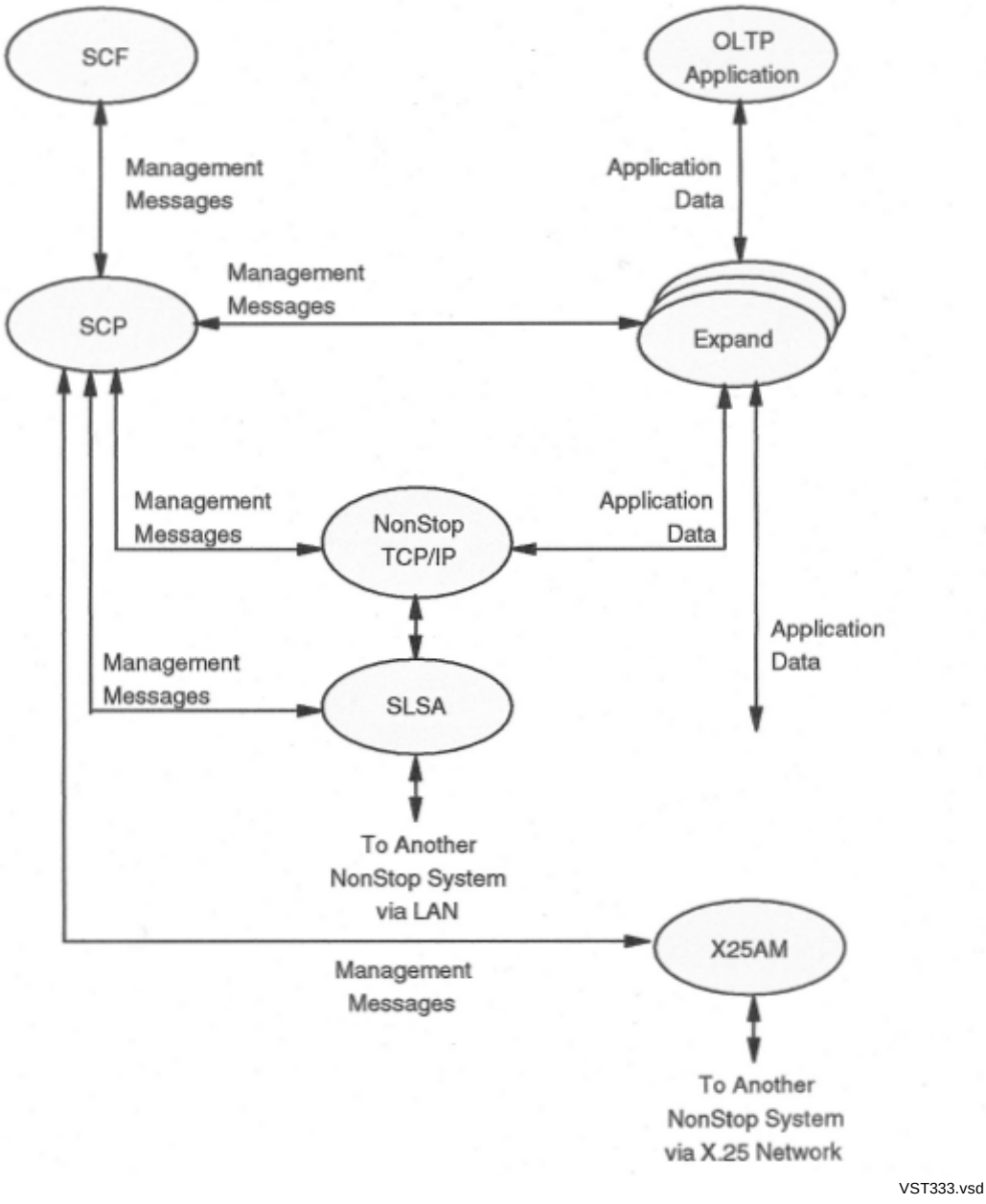
Communications Subsystems

A software product that provides users with access to a set of communications services is called a **communications subsystem (CSS)**. For example, the Expand subsystem allows you to use resources such as files and devices on other systems in the Expand network. (The Expand subsystem is described in Section 5, Expand Network.) Subsystems vary in the functions they provide and in the resources they manage. Many subsystems allow applications to communicate with specialized devices; a few subsystems exist to perform management services or to provide management interfaces to other communications subsystems.

A subsystem typically includes one or more of the types of components shown in Figure 2-1 on page 2-3; for example, one subsystem might include a higher-level process and several input/output processes (IOPs), while another might include an IOP and a protocol module. These types of components are described in Input/Output Processes (IOPs) on page 2-6 and Levels of Protocol Support on page 2-8.

Figure 2-2 on page 2-5 provides an example of how subsystems interact to support the work of applications. The Expand subsystem—which consists of multiple processes on a node—can use the NonStop TCP/IP subsystem or the X.25 Access Method (X25AM) subsystem to provide data transmission over local area networks (LANs) or wide area networks (WANs), respectively. (The Expand subsystem also has other communications interface options; NonStop TCP/IP and X25AM are merely examples.) Management subsystems, such as the Subsystem Control Point (SCP), interact with other communications subsystems to convey requests or collect management information from those subsystems. SCP is a focal point for managing components at all levels of a stack or even all the communications products within a system.

Figure 2-2. Subsystem Interactions



A communications subsystem consists of one or more subsystem **processes** and various other subsystem components running in the NonStop system, and possibly a **protocol module** running on a ServerNet adapter or ServerNet wide area network (SWAN) concentrator. The concept of a process is described in Processes on page 2-6; protocol modules are described in Levels of Protocol Support on page 2-8; ServerNet adapters and SWAN concentrators are discussed in Communications Hardware Concepts on page 2-19.

Processes

The part of an HP communications subsystem that runs in the NonStop S-series server is implemented as one or more processes.

A **process** is an execution of a program under control of the HP NonStop Kernel operating system. The same program file can execute concurrently multiple times; each execution is a separate process. Processes communicate with each other through file-system or message-system procedure calls. (Your application processes use the file system.)

There are **system processes** and **user processes**. In general, system processes are a permanent part of the operating system; they are automatically executed when a processor is loaded, and they continue to exist as long as the host processor remains available. User processes have only a temporary existence and are subject to creation, execution, and termination. Your applications are user processes. A communications subsystem can consist of system and user processes provided by HP.

Input/Output Processes (IOPs)

In the context of communications products, the system processes of major concern are **IOPs**, an important feature of the NonStop Kernel operating system. IOPs manage communications lines.

When an IOP works with other components to support a connection, the IOP is the lowest-level component that runs on the NonStop S-series server. Some IOPs rely, for the lowest-level protocol functions, on protocol modules that run in a ServerNet adapter or SWAN concentrator.

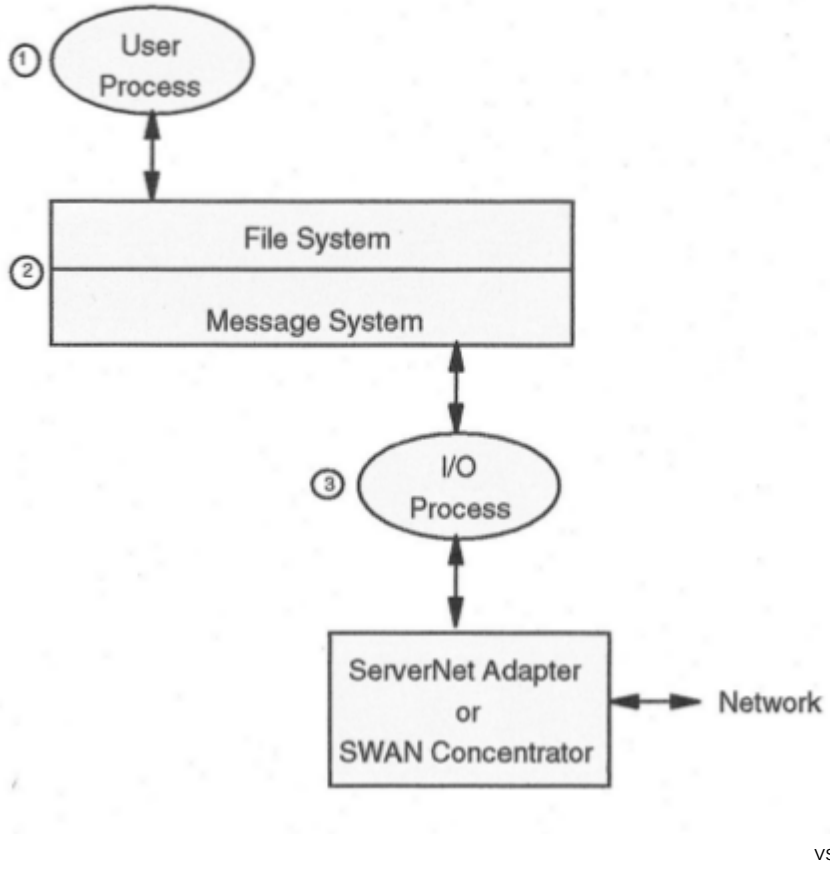
An I/O **process pair** typically controls one or more communications lines, which are physically connected to the system through a ServerNet adapter or SWAN concentrator. IOPs may be configured in pairs so that in the case of a failure affecting one of the processes, the other process can take control of the lines with minimal disruption to applications. (Application users usually are not even aware that a failure has occurred.)

To use any communications line, other processes must send requests to the process that controls the line. The IOP, in turn, calls other procedures to handle the protocols of the lines it controls and to achieve the physical transfer of data through the ServerNet adapter or SWAN concentrator. The application process and the IOP can be located in different nodes; the application interfaces are the same for local and remote communications.

Figure 2-3 illustrates how calls are passed from a user process to an IOP and then to communications lines:

1. The user process obtains access to subsystem resources by issuing Guardian procedure calls to the file system, identifying the resource and the action to be performed. (Some user processes that are part of communications subsystems use the message system directly, but all applications use the file system.)
2. The file system determines the location of the resource and passes the request to the message system, which in turn passes it to the appropriate IOP.
3. The IOP manipulates the data communications resource on behalf of the user process, using a ServerNet adapter or SWAN concentrator.

Figure 2-3. User Process Communicates With IOP Through the File System



Other Communications Processes

Many communications products include processes other than IOPs. Such processes typically perform higher-level protocol functions or resource-management functions for the subsystem. Examples of higher-level communications processes are the NonStop TCP/IP and the SNAX Extended Facility (SNAX/XF) service manager.

Higher-level communications processes usually run as fault-tolerant process pairs, and most are accessible to applications through the file system, as in the case of IOPs. Some, however, have a different style of interface, as described in Using Standards-Based Interfaces on page 3-18.

Management Processes

A **management process** provides an interface through which applications, including subsystem command interpreters, can control and monitor system resources. (A **command interpreter** is a command-oriented operator interface for controlling and monitoring one or more subsystems.)

Communications products share a management process called the **Subsystem Control Point (SCP)**. SCP provides a management interface through which applications can control any number of communications subsystems. The Subsystem Control Facility (SCF)—the utility that operators use to control communications subsystems—uses SCP. Management processes and interfaces are described in detail in Section 4, Managing Communications Subsystems.

Levels of Protocol Support

Communications subsystems differ in the levels of protocol support they provide. Many of them provide full protocol support, often for a very specific kind of device. For example, AM3270 supports communications with IBM 3270 terminals that use byte-synchronous protocols. HP provides subsystems that implement a large number of standard and popular protocols.

Other subsystems implement basic features common to a set of related protocols, relying on the application to implement other features as required by the target device. Such subsystems allow you a greater degree of flexibility and control over specialized protocols than do the full protocol implementations; however, they require your application to do more work, and they require that you be much more familiar with the communications protocol. In general, you use such subsystems only if you need to connect a device for which HP does not offer a full protocol implementation. Examples of subsystems in this group are EnvoyACP/XF and CP6100, described in Section 6, Device-Specific Connections.

Many subsystems offer interfaces at several levels of function and complexity. For example, SNAX/XF provides a high-level interface for 3270 devices and a low-level interface for custom device support, in addition to other interfaces.

Interfaces

HP communications subsystems provide several kinds of user interfaces:

- Most subsystems provide application program interfaces (APIs) through which users gain access to subsystem services. These APIs let you develop applications that communicate with devices or across communications lines controlled by the subsystem. These interfaces are described in more detail in Section 3, Application Programming With Communications Products.
- Some subsystems, such as the X.25 Access Method (X25AM), also provide interactive interfaces to their services.
- All subsystems provide interfaces for managing subsystem resources, for example, defining device configurations and starting and stopping lines. Such management interfaces can be interactive or programmatic, as described in Management Interfaces on page 2-10.

Very High-Level, High-Level, and Low-Level Interfaces

There are, generally speaking, three levels of APIs to communications subsystems: very high-level interfaces, high-level interfaces, and low-level interfaces.

Most programmers who write applications that use terminals or communications lines do not need to be concerned about data communications: they use very high-level interfaces. For example, most programmers using the Pathway environment or the SNAX/High Level Support (SNAX/HLS) product need to know very little about communications. Programmers using the Expand network need to know nothing at all about communications; in fact, applications communicate across Expand networks without explicitly invoking the Expand subsystem. Other very high-level interfaces include the Exchange remote batch emulation system and the mail, file transfer, and terminal emulation services of NonStop TCP/IP.

Most products discussed in this manual demand slightly more of the application and the application programmer. For example, if you use an HP Open Systems Interconnection (OSI) product, a device-specific access method such as AM3270, or SNAX/Advanced Program Communication (SNAX/APC), which implements the SNA LU 6.2 protocol, your application need not be concerned with low-level communications protocol, but it will have various options for setting parameters and for handling errors. Therefore, to use these products, you must be familiar with some aspects of the protocol they support.

Finally, those products and interfaces intended for custom device support typically require you to understand the target protocol and its **data stream**—for example, its message formats—because you implement part of the protocol, and possibly format the messages, in your application. Products and interfaces in this group include the SNAX Application Logical Unit (SNALU) interface; the Envoy, EnvoyACP/XF, and CP6100 input/output processes (IOPs); and the Ethernet port interface of the Port Access Method (PAM) subsystem, among others. Some of these products also require that you understand the underlying communications hardware.

File-System and Standards-Based Interfaces

The majority of HP communications products have file-system interfaces. That is, your application communicates with the target device or line by making file-system calls. The file system sends the request to the appropriate process. Although the exact operation of some procedures is product-dependent and protocol-dependent, there is still considerable similarity among these interfaces.

A few products have standards-based interfaces instead of file-system interfaces; instead of file-system calls, your application uses procedures that map directly to a standard interface. (Most standards describe functions rather than interfaces, but in some cases a specific interface is common enough to be regarded as standard.)

If you have used another vendor's implementation of the same interface, a standards-based interface should be quite easy for you to learn, and your applications should be able to migrate reasonably quickly. OSI/AS, OSI/FTAM, and NonStop TCP/IP all have standards-based procedural interfaces.

Management Interfaces

Subsystems also include the following types of management interfaces:

Interactive	Every communications subsystem has an interactive command interface. Most communications subsystems share a command interpreter; a few have their own.
Programmatic	Several communications subsystems have a programmatic command interface, which allows you to write management applications that automate operator functions.
Event Management	All communications subsystems report significant events, such as hardware malfunctions, to a common location from which you can retrieve the information interactively or programmatically.

Subdevices

A concept common to almost all communications subsystems is that of the **subdevice**. Subdevices are defined if a subsystem potentially operates on numerous, separately addressable objects, such as stations on a multipoint line or X.25 virtual circuits. The line is considered a device; the stations or virtual circuits are subdevices. The concept is also applied in other ways; even a product that does not manage real devices or lines can have subdevices. For example, a management or diagnostic subdevice might serve as the abstract recipient of management or diagnostic requests.

A subdevice is actually just a way of relating a group of requests. An application that wishes to use a particular subdevice, or an operator who wishes to control or inquire about the subdevice, refers to it by name. For example, communications subsystems that support multipoint lines normally allow the stations on those lines to have different

operational attributes; the operator, or an application that performs operator functions, uses the subdevice name in specifying the attributes. The subdevice name is an extension of the line name; subdevice names have the same form regardless of the subsystem, but the interpretation of the name, except for a few reserved names, is subsystem-specific.

Example Product Structures

The examples in this subsection illustrate and discuss some examples of layered product structures. Local Area Networks (LANs) and Wide Area Networks (WANs) shows how LAN and WAN support is integrated for several networking products. Systems Network Architecture (SNA) Interfaces on page 2-16 shows relationships among some of the HP SNA interface products. Custom Device Support on page 2-18 shows how products can be combined to provide custom device support.

Local Area Networks (LANs) and Wide Area Networks (WANs)

Two important HP communications interfaces for LANs and WANs are the ServerNet LAN systems access (SLSA) subsystem and the WAN subsystem. These products provide LAN and WAN connections for many other communications interface products.

Note. All of the HP communications interface products are described in Part II of this manual.

ServerNet LAN Systems Access (SLSA) Subsystem

The SLSA subsystem provides an architecture that supports parallel LAN input/output (I/O). This architecture allows NonStop S-series servers to communicate across a ServerNet system area network (ServerNet SAN) and access devices through various LAN protocols.

The SLSA subsystem uses the shared memory segment provided by the (QIO subsystem to move the ownership of data between processes. SLSA also uses QIO-based driver/interrupt handlers (DIHs) to communicate with the appropriate adapter type over the ServerNet SAN. The driver controls the ServerNet adapters and uses a set of system library routines accessible by each process that needs to use the SLSA subsystem. Supported adapters include the following:

- ATM 3 ServerNet adapter (ATM3SA)
- Ethernet 4 ServerNet adapter (E4SA)
- Fast Ethernet ServerNet adapter (FESA)
- Gigabit Ethernet ServerNet adapter (GESA)
- Gigabit Ethernet 4-port ServerNet adapter (G4SA)
- Multifunction I/O board (MFIOB) in the processor multifunction (PMF) customer-replaceable unit (CRU) and I/O multifunction CRU
- Token-Ring ServerNet adapter (TRSA)
- Common Communication ServerNet Adapter (CCSA)

Note. The Ethernet ports on the MFIOBs can be used only for the system console.

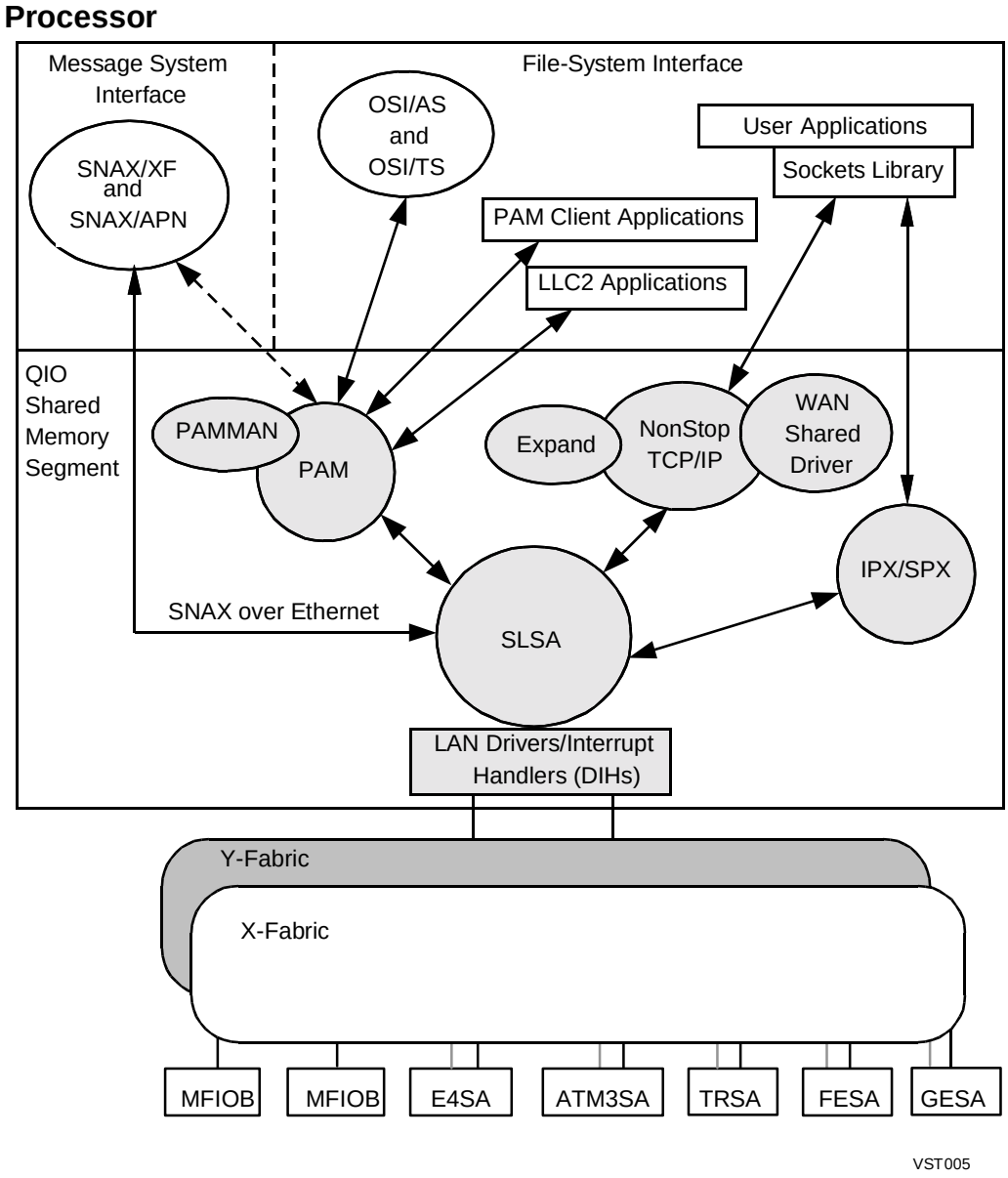
Processes that use the SLSA subsystem to send and receive data on a LAN attached to a NonStop S-series server are called **LAN service providers**. Three directly attached LAN service providers—the NonStop TCP/IP subsystem, the Port Access Method (PAM) subsystem, and NonStop IPX/SPX—are currently supported. They provide access for the following:

QIO application program interface (API) clients	These are protocol subsystems that communicate with a LAN transport service provider directly through QIO. Currently, these are: ● The Expand subsystem, which connects through the QIO API to NonStop TCP/IP in order to provide Expand-over-IP connections. The Expand subsystem is described in Section 5, Expand Network. NonStop TCP/IP is described in Section 10, TCP/IP Network Connections. ● WAN IOP drivers, which connect through the QIO API to NonStop TCP/IP to provide access to remote ServerNet wide area network (SWAN) concentrators. ● NonStop IPX/SPX, which provides connectivity to a Novell NetWare LAN. IPX/SPX is described in Section 9, Local Area Network (LAN) Connections. ● The PAM subsystem, which provides programmatic access to Ethernet and token-ring LANs. The OSI/AS, OSI/TS, SNAX/XF, and SNAX/APN subsystems interface to SLSA through the PAM subsystem. PAM is described in Port Access Method (PAM) Programmatic Interfaces on page 9-3. ● SNAX over Ethernet uses QIO to communicate directly with SLSA and eliminate the need for the PAM subsystem.
Sockets Library applications	These are user applications and HP utilities (such as TELSERV and FTP) that use the sockets library to establish remote connections and communicate through NonStop TCP/IP and IPX/SPX.

LAN clients are processes, user applications, and subsystems that use the SLSA subsystem and related LAN providers to connect to an Ethernet, a Fast Ethernet, Gigabit Ethernet, or a token-ring LAN attached to a NonStop S-series server. For example, the WAN subsystem is a client of the SLSA subsystem because the SLSA subsystem provides the WAN subsystem access to the SWAN concentrator through the LAN. The WAN subsystem is described in Wide Area Network (WAN) Subsystem on page 2-14.

Figure 2-4 shows how the SLSA subsystem relates to several other communications subsystems

Figure 2-4. SLSA and Other Communications Subsystems



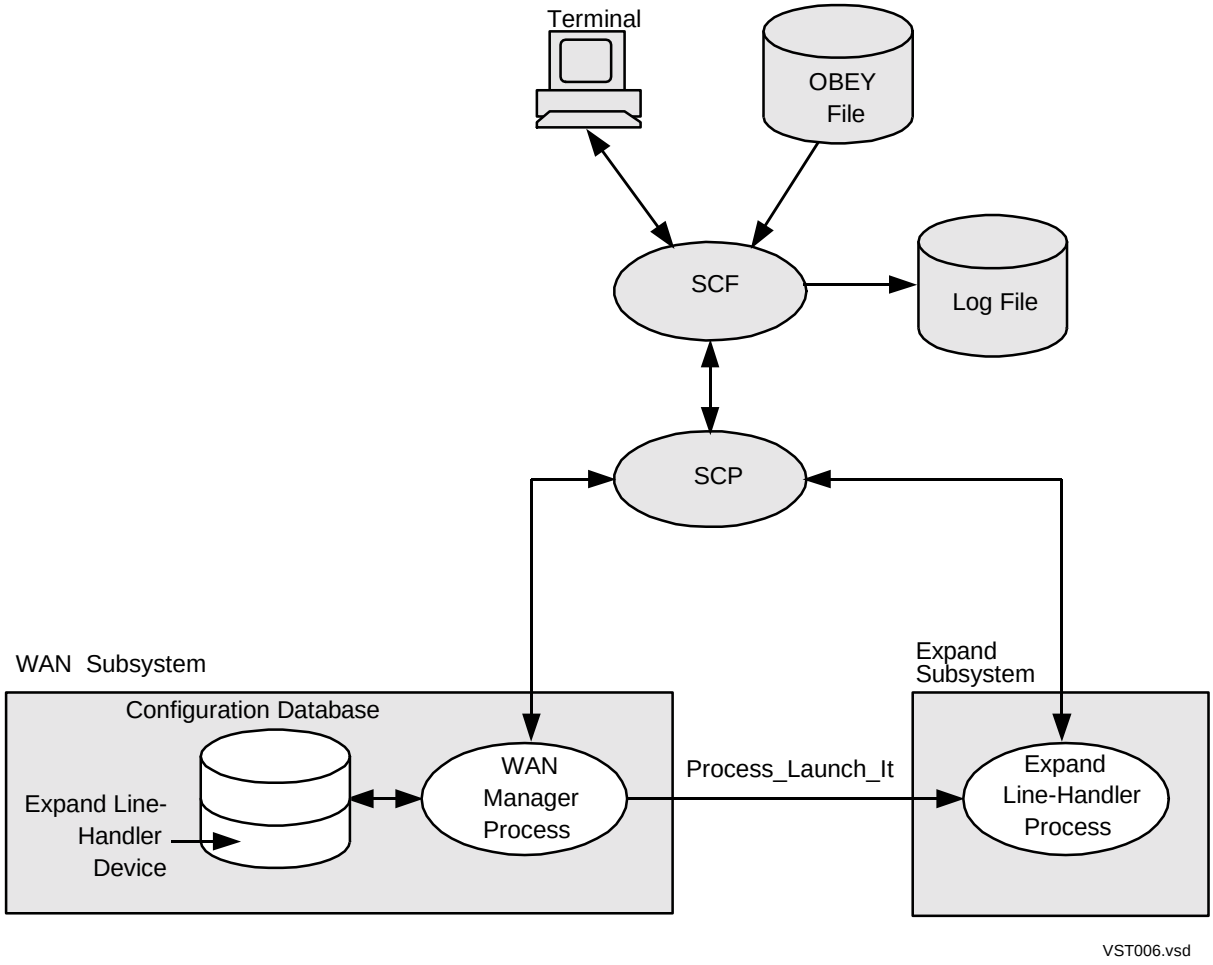
Wide Area Network (WAN) Subsystem

The WAN subsystem is used to configure and manage both WAN and LAN connectivity for the following communications subsystem objects:

- AM3270 subsystem line-handler processes
- ATP6100 subsystem line-handler processes
- CP6100 subsystem line-handler processes
- Envoy subsystem line-handler processes
- EnvoyACP/XF subsystem line-handler processes
- Expand subsystem network control process and line-handler processes
- SNAX/APN subsystem service manager process and line-handler processes
- SNAX/XF subsystem service manager process and line-handler processes
- TR3271 subsystem line-handler processes
- X25AM subsystem line-handler processes

These communications subsystem objects are defined as WAN subsystem devices (DEVICE objects). You use the WAN Subsystem Control Facility (SCF) to create DEVICE objects. Figure 2-5 shows the creation of an Expand line-handler process DEVICE object.

Figure 2-5. WAN Subsystem Device Creation Example

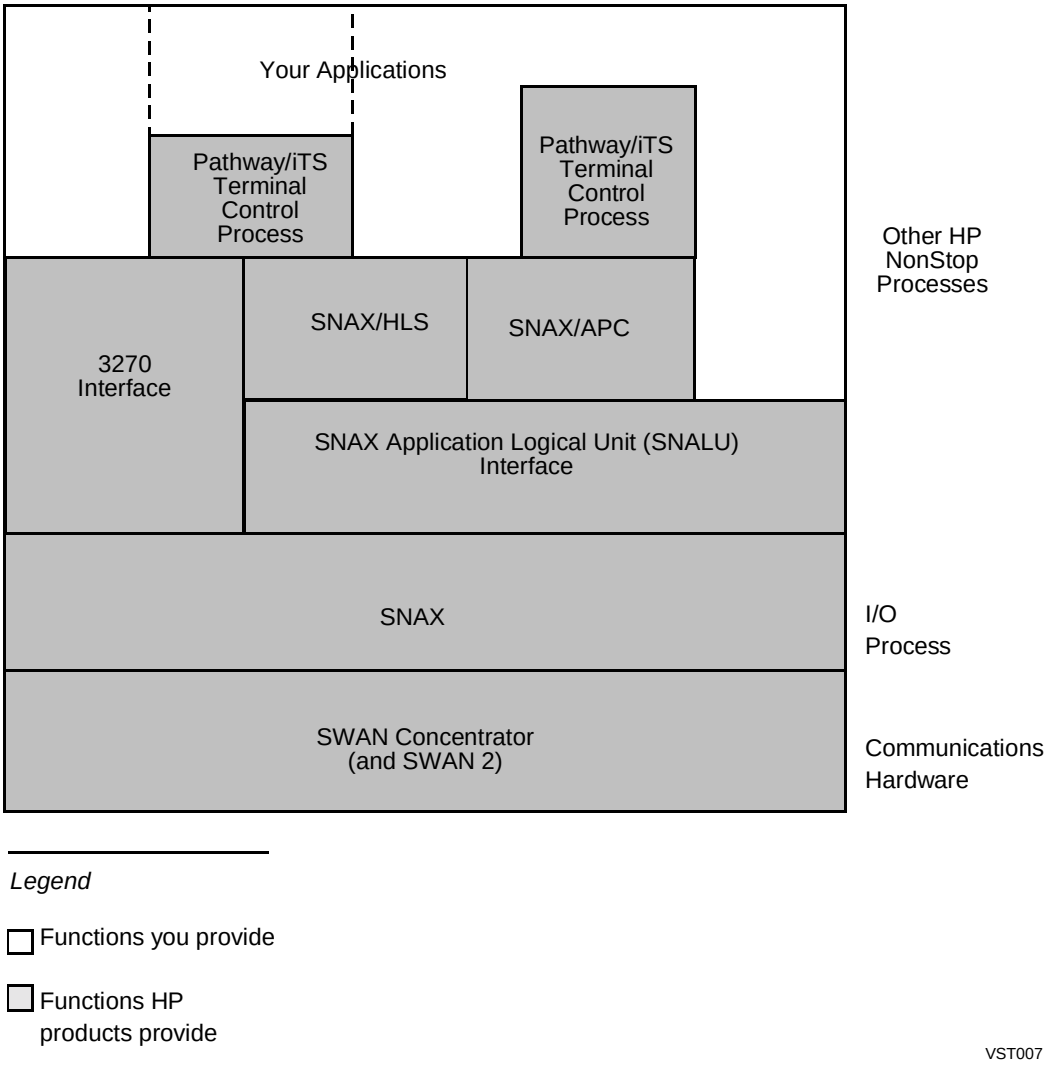


The WAN subsystem is also used to control access to the SWAN concentrator, described in ServerNet Wide Area Network (SWAN) Concentrator on page 2-24.

Systems Network Architecture (SNA) Interfaces

The SNAX family of products provides the means for connecting NonStop S-series servers with devices and networks that implement IBM SNA. Figure 2-6 illustrates the process structure of the SNAX Extended Facility (SNAX/XF) and related products.

Figure 2-6. SNAX/XF Process Structure



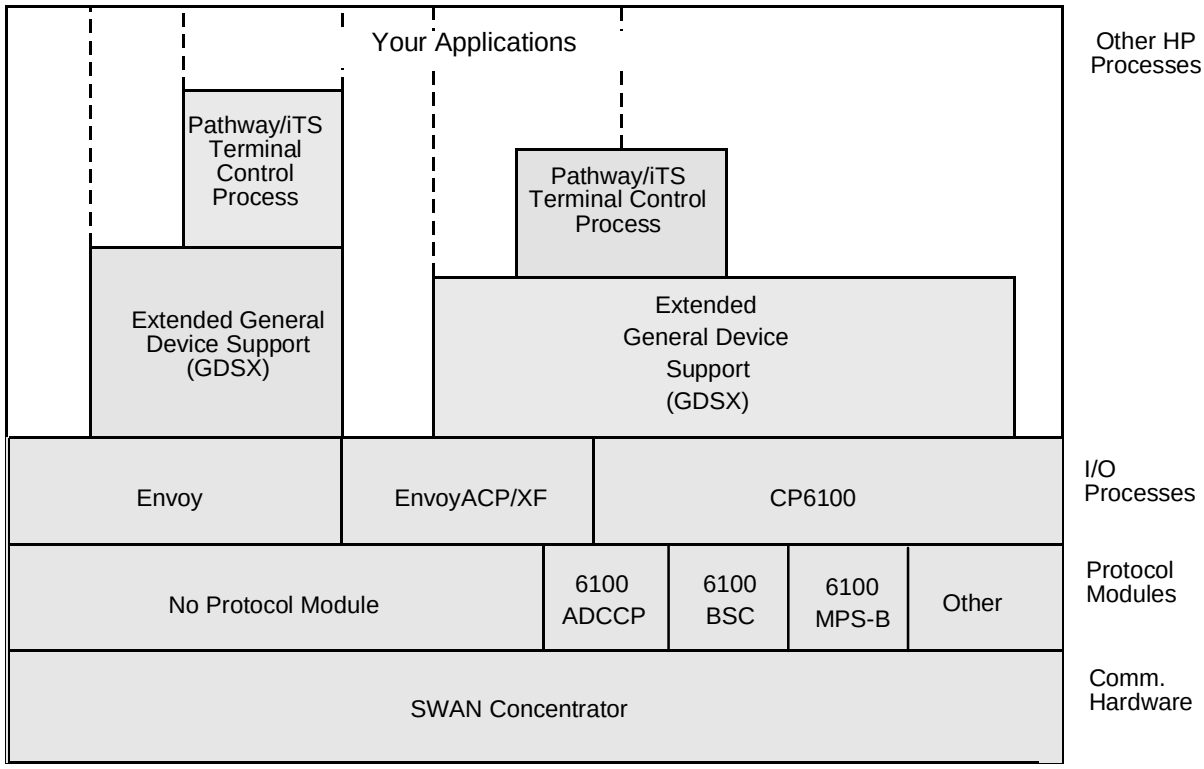
Pathway/TS	Provides a multithreaded terminal control process (TCP) for communications with terminals, including fault-tolerance and transaction processing.
SNAX/XF	Provides the functions of an SNA host (node type 5) to SNA devices and appears as a cluster controller (node type 2) to SNA hosts. Includes a high-level interface for communicating with 3270 devices and a low-level interface (SNALU) for custom device support.
SNAX/APN	Provides two main functions: ● Advanced Peer-to-Peer Networking (APPN), which enables a variety of systems to communicate as peers. With the base product, the NonStop S-series server acts as a low-entry networking (LEN) node; with the extended version, SNAX/APN-EN, it acts as an end node. ● Dependent LU support for devices in IBM networks requesting LU-LU sessions with HP applications (logon). SNAX/APN (LEN Node) provides dependent LU support using only the extended logon facility (XLF). SNAX/APN-EN (End Node) provides dependent LU support using both XLF and the enhanced logon facility (ELF).
SNAX/HLS	Provides a high-level interface with a wide range of SNA systems, devices, and applications (logical unit—or LU—types 0, 1, 2, 3, 4, and 7).
SNAX/APC	Provides a high-level interface with applications using LU type 6.2 protocols.
SNAX/CPI-C	Works with SNAX/APC and uses the LU 6.2 protocol. SNAX/CPI-C provides an easy-to-use, platform-independent programming interface for transaction programs (TPs) that require program-to-program communication.

You can also write applications that use any of these interfaces directly. HP SNA products are described in Section 7, HP NonStop S-Series Systems Network Architecture (SNA) Network Connections.

Custom Device Support

Figure 2-7 illustrates some of the products you can use for custom device support.

Figure 2-7. Custom Device Support



Pathway/TS	Provides a multithreaded terminal control process (TCP) for communication with terminals, including fault-tolerance and transaction processing.
Extended General Device Support (GDSX)	Serves as a skeleton for a custom device support application, implementing standard functions for NonStop Kernel operating system processes. You can also use other IOPs, such as X25AM, with GDSX.
EnvoyACP/XF	Provides bit-synchronous data-link control functions over leased or switched lines.
Envoy	Provides asynchronous and byte-synchronous data-link control functions over leased or switched lines.
CP6100	Provides an interface with low-level protocol modules running in intelligent communications controllers.
6100 ADCCP, BSC, and other protocol modules	Provide data-link control functions for various protocols.

Communications Hardware Concepts

The ServerNet adapters and the ServerNet wide area network (SWAN) concentrator are communications devices that control devices or communications lines on behalf of communications subsystems. Your application has access to a ServerNet adapter or SWAN concentrator through an IOP as described in Input/Output Processes (IOPs) on page 2-6.

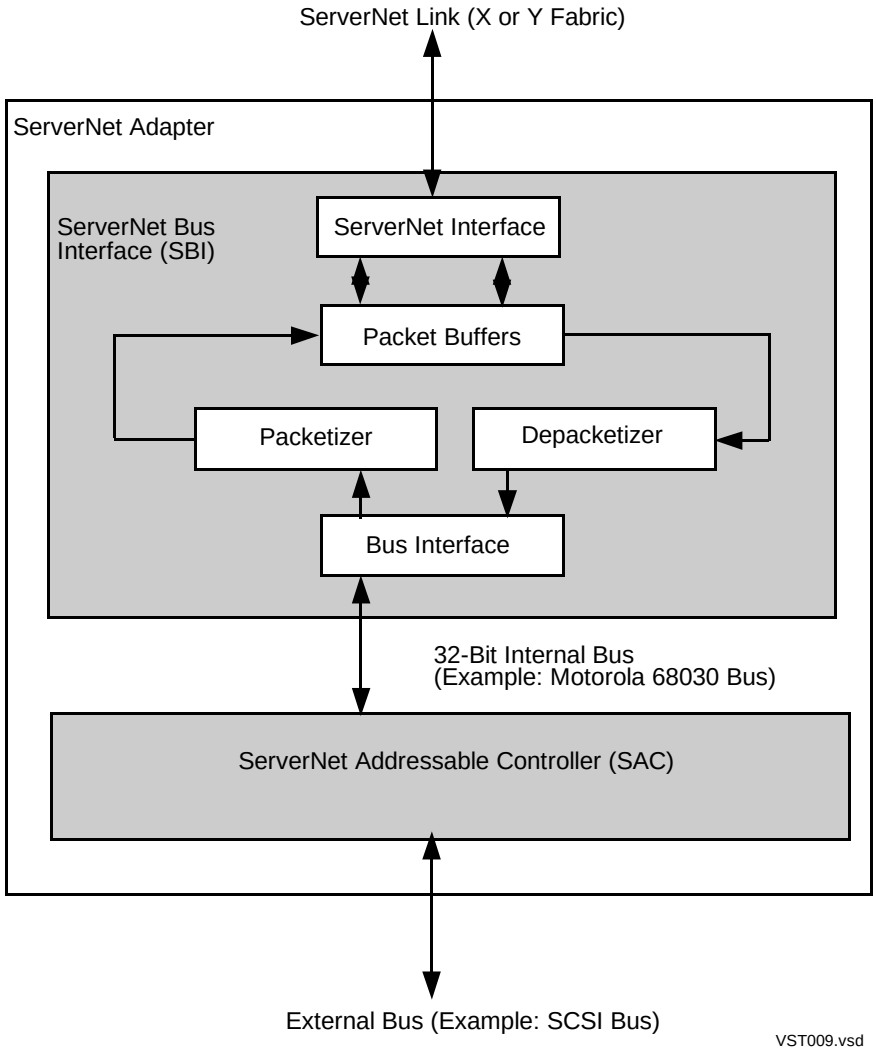
ServerNet Adapters

A ServerNet adapter provides the interface between the ServerNet SAN and a particular I/O bus, such as Ethernet or SCSI. A ServerNet adapter contains a ServerNet **bus interface (SBI)** and one or more ServerNet **addressable controllers (SACs)**.

- The SBI is an application-specific integrated circuit (ASIC) on the ServerNet adapter that provides the interface between the ServerNet SAN and a different industry-standard bus within the adapter, such as the Motorola 68030 bus, to which SACs are attached.
- SACs provide the controller functions for ServerNet adapters. These controllers provide the interfaces to buses such as SCSI, which connect to peripheral devices.

Figure 2-8 shows a simplified block diagram of a ServerNet adapter.

Figure 2-8. Block Diagram of a ServerNet Adapter



Types of ServerNet Adapters

The following ServerNet adapters are currently supported on the NonStop S-series server:

Table 2-1. HP ServerNet Adapters (page 1 of 2)

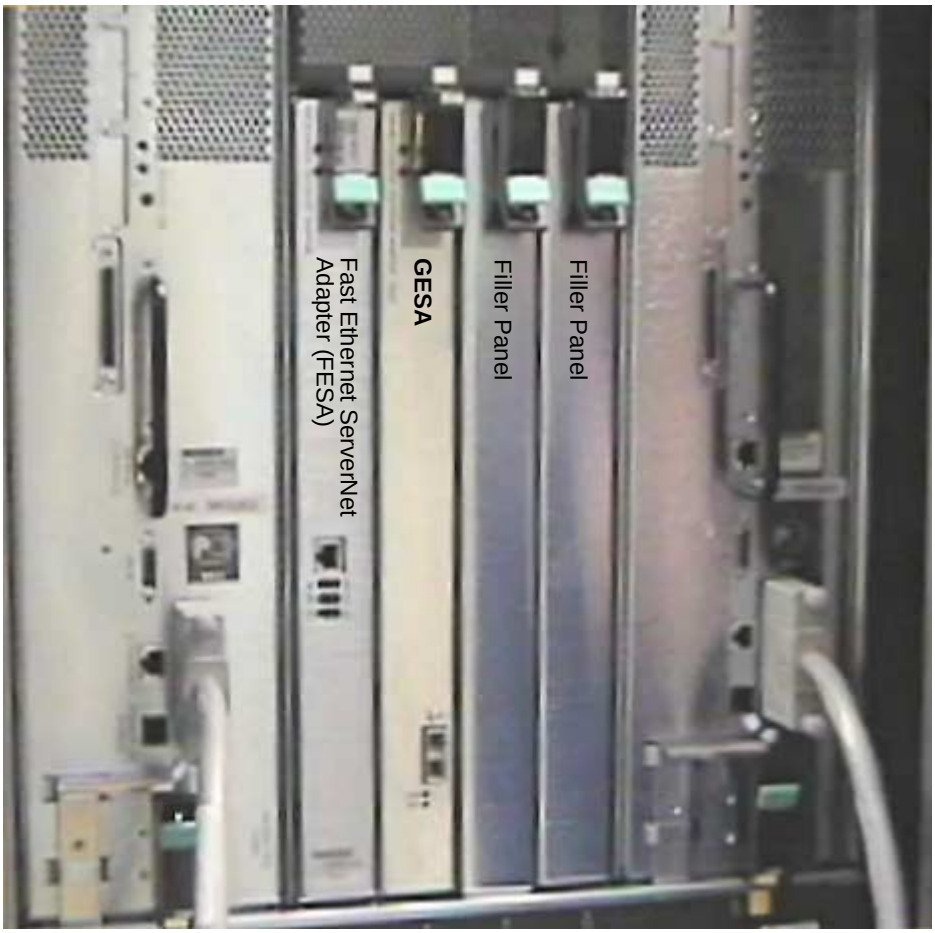
Adapter	Description
ATM 3 ServerNet adapter (ATM3SA)	Provides connectivity between NonStop S-series servers and asynchronous transfer mode (ATM) networks. It features one port per board. The ATM3SA uses the ATM subsystem to deliver ATM connectivity. ATM is a networking technology that relays fixed-sized cells as opposed to frames or packets. This cell-relay model reduces processing time in the switching hardware, making ATM a high-bandwidth networking option.
Ethernet 4 ServerNet adapter (E4SA)	Provides connectivity between NonStop S-series servers and Ethernet 802.3 LANs. It features 4 ports per board, with each port supporting communications speeds of 10 megabits per second (Mbps). The E4SA uses the SLSA subsystem to deliver external LAN access. The SLSA subsystem is described in ServerNet LAN Systems Access (SLSA) Subsystem on page 2-11.
Fast Ethernet ServerNet adapter (FESA)	Provides connectivity between NonStop S-series servers and Fast Ethernet 802.3u LANs. It features a single-port adapter supporting communication speeds of 100 Mbps and 10 Mbps. The FESA uses the SLSA subsystem to deliver external LAN access. The SLSA subsystem is described in ServerNet LAN Systems Access (SLSA) Subsystem on page 2-11.
Gigabit Ethernet ServerNet adapter (GESA)	Provides Gigabit connectivity between NonStop S-series systems and Ethernet LANs. Two versions of the GESA are available based on the transmission medium: copper or fiber. GESA also provides an open interface for an Asynchronous Wide Area Network (AWAN) and ServerNet Wide Area Network (SWAN) attachment to a ServerNet interconnect. GESA is supported by SNMP and WAN Wizard Pro. The data transfer rate for SWAN is 10 Mbps and 10/100 Mbps for SWAN 2. (This feature applies to GESA-C only.)

Table 2-1. HP ServerNet Adapters (page 2 of 2)

Adapter	Description
Gigabit Ethernet 4-port ServerNet adapter (G4SA)	Provides Gigabit connectivity between NonStop S-series systems and Ethernet LANs. The G4SA is a multiport adapter with a copper and fiber interface, and it is a field-replaceable unit (FRU). The G4SA is the only LAN adapter supported for the I/O adapter module (IOAM) enclosure. Although the G4SA supersedes the Ethernet 4 ServerNet adapter (E4SA), Fast Ethernet ServerNet adapter (FESA), and the Gigabit Ethernet ServerNet adapter (GESA), it cannot be installed in a NonStop S-series enclosure. The G4SA also provides an open interface for an Asynchronous Wide Area Network (AWAN) and ServerNet Wide Area Network (SWAN) attachment to a ServerNet interconnect. G4SA is supported by SNMP and WAN Wizard Pro. The data transfer rate for SWAN is 10 Mbps and 10/100 Mbps for SWAN 2.
Multifunction I/O board (MFIOB)	Provides several functions, including one Ethernet SAC for the Ethernet port on the processor multifunction (PMF) customer-replaceable unit (CRU). This port can be used only by the system console. The MFIOB is a ServerNet adapter that is integrated into the PMF CRU.
ServerNet/FX adapter	Provides connectivity to an existing FOX ring. The ServerNet/FX adapter is a field-replaceable unit (FRU). The ServerNet/FX adapter uses the ServerNet/FX adapter subsystem to deliver Expand-over-FOX connectivity. Expand-over-FOX connectivity is described in Section 5, Expand Network.
Token-Ring ServerNet adapter (TRSA)	Provides connectivity between NonStop S-series servers and token-ring 802.5 LANs. It features one port per board. The TRSA uses the SLSA subsystem to deliver token-ring LAN access. The SLSA subsystem is described in ServerNet LAN Systems Access (SLSA) Subsystem on page 2-11.

An example of an enclosure with a GESA and a FESA installed follows:

Figure 2-9. Enclosure Showing MFIOB, PMF CRU, GESA, Filler Panels, and FESA Installed



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ServerNet Wide Area Network (SWAN) Concentrator

The SWAN concentrator is a communications device that connects bit-synchronous, byte-synchronous, and asynchronous devices to NonStop S-Series servers. This enables customers migrating from NonStop K-series to S-series servers to preserve their investment in legacy devices.

A SWAN concentrator can be removed from or added to the Ethernet LAN pair without interrupting the operation of other attached devices. This feature enables the online replacement of SWAN concentrators and facilitates online expansion.

Each SWAN concentrator contains three communications line interface processors (CLIPs) and each CLIP supports two serial ports. The resulting six lines can support any combination of the following interfaces:

- RS-232
- RS-449
- V.35
- X.21

Each SWAN line can support asynchronous, byte-synchronous, or bit-synchronous transmissions independent of the other lines. This enables a single SWAN concentrator to perform the functions of multiple controllers.

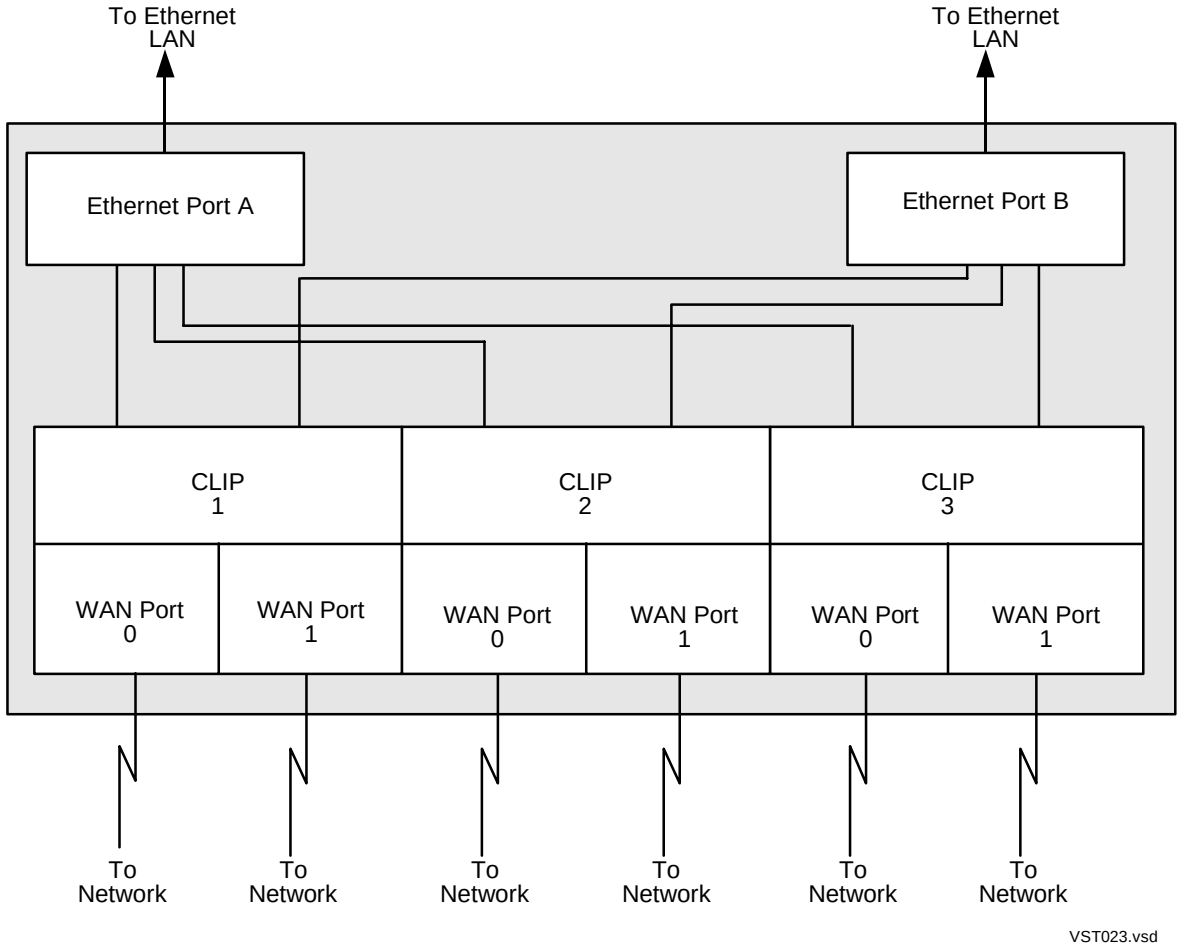
Note. The configuration rules allow any I/O protocol to share a CLIP with any other I/O protocol. All combinations are fully supported.

The SWAN concentrator connects to the NonStop S-Series server using fault-tolerant, 10Base-T Ethernet connections provided by one or two Ethernet 4 ServerNet adapters (E4SAs). HP recommends that you configure the SWAN concentrator to connect to Ethernet ports on two E4SAs; this type of configuration provides more fault-tolerance for the IOPs that use the lines on the SWAN concentrator in the event of failure in one of the paths to the SWAN concentrator.

The WAN subsystem is used to control access to the SWAN concentrator. The WAN subsystem is described in Wide Area Network (WAN) Subsystem on page 2-14.

Figure 2-10 shows a simplified block diagram of the SWAN concentrator.

Figure 2-10. Block Diagram of the SWAN Concentrator



ServerNet Wide Area Network (SWAN 2) Concentrator

The SWAN 2 concentrator is a next-generation SWAN concentrator. The SWAN 2 concentrator is a communications device that connects bit-synchronous, byte-synchronous, and asynchronous devices to NonStop S-Series servers. The SWAN 2 concentrator enables customers migrating from NonStop K-series servers to NonStop S-Series servers to preserve their investment in legacy devices.

The SWAN 2 concentrator is based on a faster processor. Some of the SWAN 2 concentrator's features are:

- Modularity
- Redundant power
- Two-line fault zone
- Increased throughput and availability
- Online-replaceable hardware components known as customer-replaceable units (CRUs)

The SWAN 2 concentrator connects to the NonStop S-Series server through dual 10/100 Base-T Ethernet connections, which provide fault tolerance if an Ethernet link or controller fails.

Supported Electrical and Physical Interfaces

Note. The communications line interface processor (CLIP) is also known as a WAN logic board (LB).

Each SWAN 2 concentrator contains six communications line interface processors (CLIPs). Each CLIP has an associated WAN backplane interface card (BIC). Together they support two WAN serial ports, resulting in 12 lines that can support any combination of the following electrical and physical interfaces:

- RS-232
- RS-449
- V.35
- X.21

Because each SWAN 2 line supports asynchronous, byte-synchronous, or bit-synchronous transmissions independent of other lines, a single SWAN 2 concentrator performs the functions of multiple controllers.

Note. The configuration rules allow any I/O protocol to share a CLIP with any other I/O protocol. All combinations are fully supported.

SWAN 2 Concentrator Hardware Components

The SWAN 2 concentrator contains hardware components that you can replace yourself, which are called customer-replaceable units (CRUs). Table 2-2 lists these CRUs.

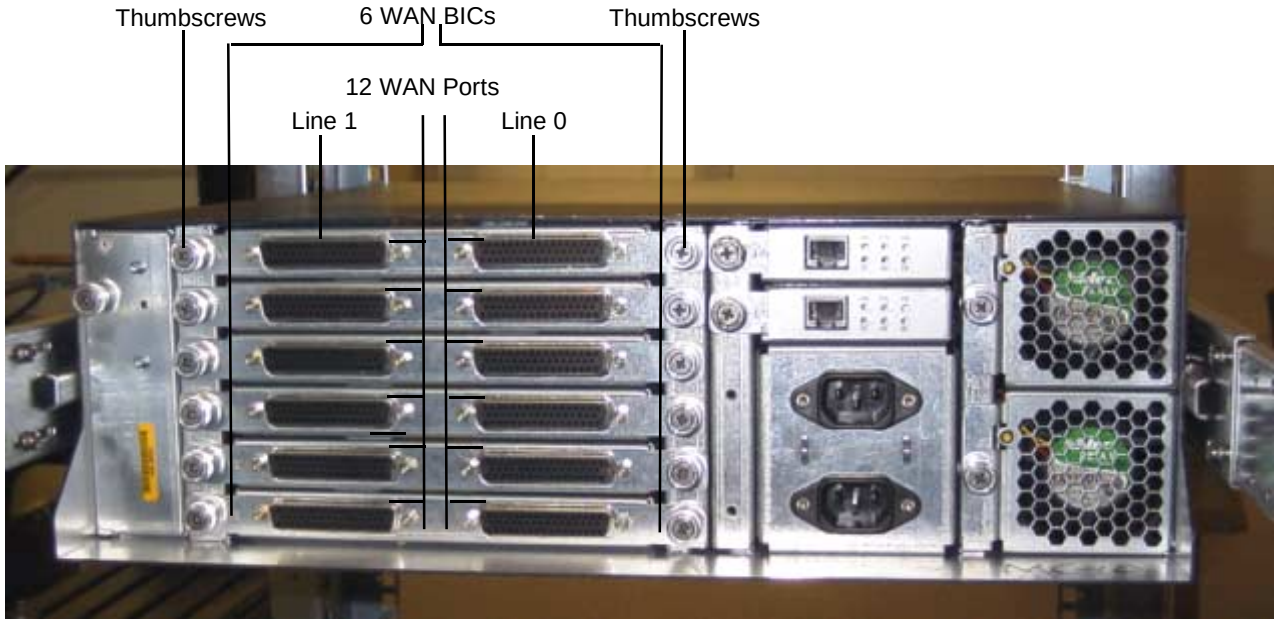
Note. All the SWAN 2 concentrator CRUs can be replaced online without powering off the SWAN 2 concentrator, except for the chassis CRU.

Table 2-2. SWAN 2 Concentrator CRUs

CRU	Description
Communications line interface processor (CLIP)	(Also known as a WAN logic board (LB).) Contains the internal local area network (LAN) logic and WAN logic, communications controller, random-access memory (RAM), flash memory, and all the intelligence for the SWAN 2 concentrator. Six CLIPs are located on the front panel of a SWAN 2 concentrator.
WAN backplane interface card (BIC)	Provides the connectors for the WAN interface converter cables. Six WAN BICs are located on the back panel of a SWAN 2 concentrator.
LAN logic board (LB)	Provides the LAN connection to the host. The LAN LB also has a switch to connect the host LAN to each CLIP. Two LAN LBs are located on the front panel of a SWAN 2 concentrator.
LAN BIC	Provides the RJ-45 direct connection to the host and has light-emitting diodes (LEDs) to indicate the type of host connection. Two LAN BICs are located on the back panel of a SWAN 2 concentrator.
Power supply	Provides redundant power to the components within the SWAN 2 concentrator. Two power supplies are located on the front panel of a SWAN 2 concentrator.
Battery	Provides 30-second backup power in case of AC power loss. One battery is located on the back panel of a SWAN 2 concentrator.
Fan	Provides cooling to the components within the SWAN 2 concentrator. Two fans are located on the back panel of a SWAN 2 concentrator.
Chassis	Contains the midplane and the sheet metal for the other CRUs; the chassis cannot be replaced without powering off a SWAN 2 concentrator.

Figure 2-11 shows the back panel of the SWAN 2 concentrator.

Figure 2-11. SWAN 2 Concentrator Back Panel



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Protocols Supported by the SWAN 2 Concentrator

- AM3270 (T9371)
- ATP6100 (T9337)
- BSC Multi-Point Supervisor (T6568)
- BSC Multi-Point Tributary (T6567)
- Burroughs Multi-Point Supervisor (T6566)
- CP6100 (T9338)
- Envoy (T9051)
- EnvoyACP/XF (T9088)
- Expand (T9057)
- Generalized Full-Duplex Protocol (T6565)
- SNAX/APN (T9564)
- SNAX/XF (T9064)
- TR3271 (T9372)
- X25AM (T9060)

SWAN 2 Concentrator Connections

You can connect more than one SWAN 2 concentrator to an E4SA, FESA, GESA, or G4SA by using an unmanaged or managed switch (HP recommends this method for performance reasons). You can also use an Ethernet hub. The SWAN 2 concentrator has been functionally tested with the following switches and hubs:

- HP Procurve Series 2300 and 2500 Switches (managed switches)

  Information on HP Procurve Series 2300 and 2500 Switches can be found at: <http://www.hp.com/rnd/support/manuals/23xx_25xx.htm>.

- HP Procurve 408 Switch (unmanaged switch)

  Information on the HP Procurve 408 Switch can be found at: <http://www.hp.com/rnd/support/manuals/sw_408.htm>

- HP Procurve 10/100 Hubs

  Information on HP Procurve 10/100 Hubs can be found at: <http://www.hp.com/rnd/support/manuals/10-100_hub_12_24.htm>.

AWAN (Asynchronous Wide Area Network) Access Server

The AWAN access server (3883, 3884, 3885) is a local area network (LAN)-based communications device that provides the following types of connections:

- Asynchronous connections to HP 6530 terminals, 6530-compatible terminals, VT-series terminals, serial printers, and workstation-based 6530 and VT-series terminal emulators for NonStop S-Series and NonStop K-series servers
- Remote access for DOS, Windows, and Macintosh computers
- VT-to-6530 protocol conversion for VT-series terminals attached to a Transmission Control Protocol/Internet Protocol (TCP/IP) terminal server and LAN-attached workstation-based VT-series terminal emulators
- Dial-out connections for LAN-attached DOS, Windows, and Macintosh computers.

Depending on your network, you can configure any or all of these connections. The AWAN access server supports multiple protocols, enabling users to connect to the AWAN access server simultaneously using different types of protocols.

Note. The AWAN Access Servers are subject now to controlled availability. The AWAN 3886 Servers are preferred.

AWAN 3886 Servers

The AWAN 3886 servers is a family of asynchronous terminal servers that provide asynchronous ports for a variety of devices, including terminals, modems, printers, and similar devices. AWAN 3886 servers support 6530 terminal emulation. TELNET protocols create sessions between server ports and the following:

- NonStop Telserv, used by applications such as TACL and the Pathway Terminal Control Processes (PATHTCP2). Using the 3886 AWAN 3886 servers, the TELNET session is initiated by the server port.
- FASTPTCP Spooler Print Process (T8932); using the 3886 AWAN 3886 servers, the session is initiated by the FASTPTCP print process.

The asynchronous ports on 3886 AWAN 3886 servers have these common characteristics:

- RS-232 EIA electrical signaling
- Common asynchronous signaling speeds up to 115.2 kbps; 7 or 8 bit, even, odd or no parity
- Support for dialing into the ports using Point-to-Point (PPP), Serial Line Internet Protocol (SLIP), and CSLIP protocols

  Note. The origination of outgoing connections using these protocols is not supported.

- Support for the following dial-in security protocols:
  - Remote Authentication Dial-In User Service (RADIUS) security
  - Challenge Access Protocol (CHAP)
- Basic TELNET access for dumb terminals where the session is initiated by the terminal.
- Support for FASTPTCP protocol, including HP Tandem Transparent Protocol (TTAP) printers.
- Support for other asynchronous printers through TELNET and Line Printer Daemon and support for asynchronous terminals and emulators.

The 6530 protocol support is available on HP 3886 servers by installing the optional AWAN 3886-6530 Flash RAM card. This support includes these port AWAN types:

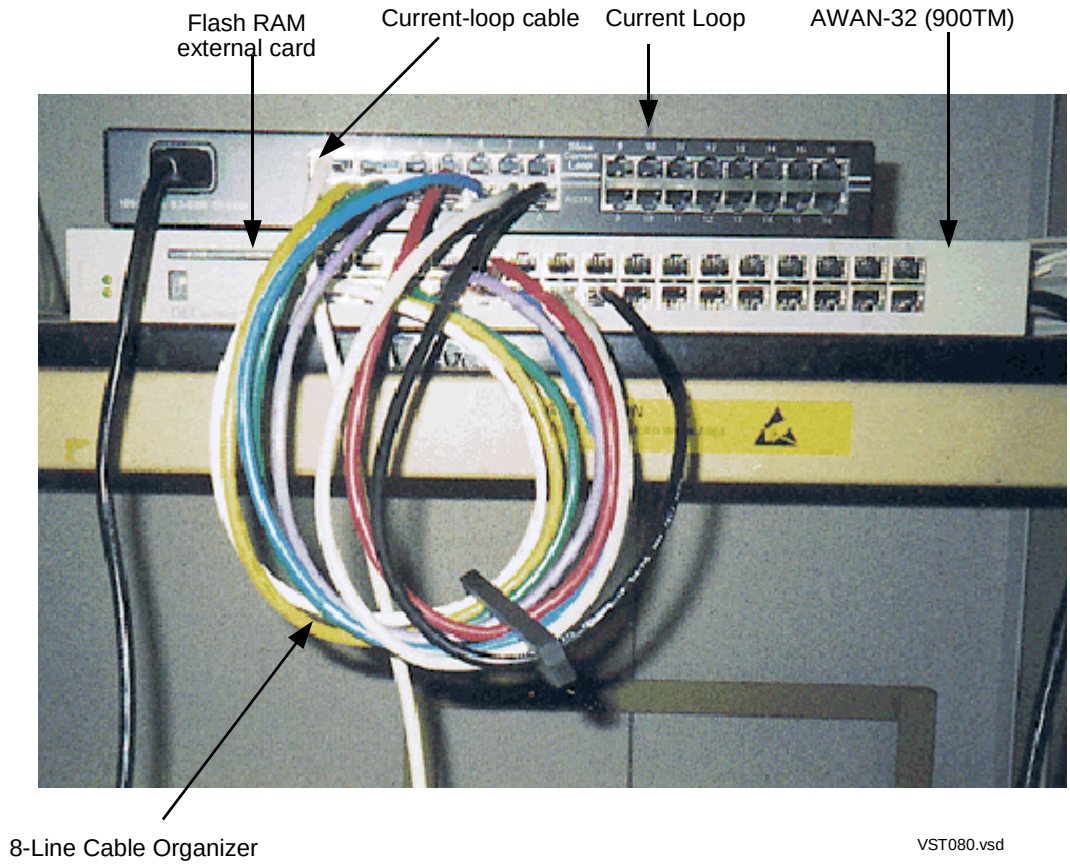
- T6530 for 6530 family of terminals and emulators
- FASTP for improved operation with non-TTAP serial printers
- ATAP for non-standard asychronous devices. (ATAP is only available with third-party GAP software.)

Current loop for AWAN 3886 (16 and 32) models is supported by using an external 16-port RS232 to Current Loop 20-milliampere converter (3886-CL). The RS-232 to Current Loop converter is a 16-port external hardware converter that converts the AWAN 3886 RS-232 interface to current loop on a line-by-line basis. Because only RJ45 connectors are supported, only AWAN 3886-16 and AWAN 3886-32 models can

use the 3886-CL. To view part numbers, from the home page of the NonStop Technical Library (NTL), select **Support and Service > Service Information > Part Numbers**.

Note. The AWAN 3886 DECserver 700-16 and DECserver 900 have been replaced by the DECserver 716 and DECserver 732 due to end-of-life components in the 700-16 and 900. The new design is identical in delivery of features. Both the DECserver 732 and DECserver 716 share the same design base. At present, the DECserver 700-08 is at end-of-life and is subject to controlled availability.

Figure 2-12. AWAN-32 Port (DECserver 900TM), Current Loop 20-milliampere Converter, 8-Port Cable Organizer



Using an AWAN 3886 server can provide for a smooth transition from a NonStop K-series server to a NonStop S-Series server by permitting the asynchronous conversion to occur in advance of the NonStop S-Series installation.

Cluster Switches

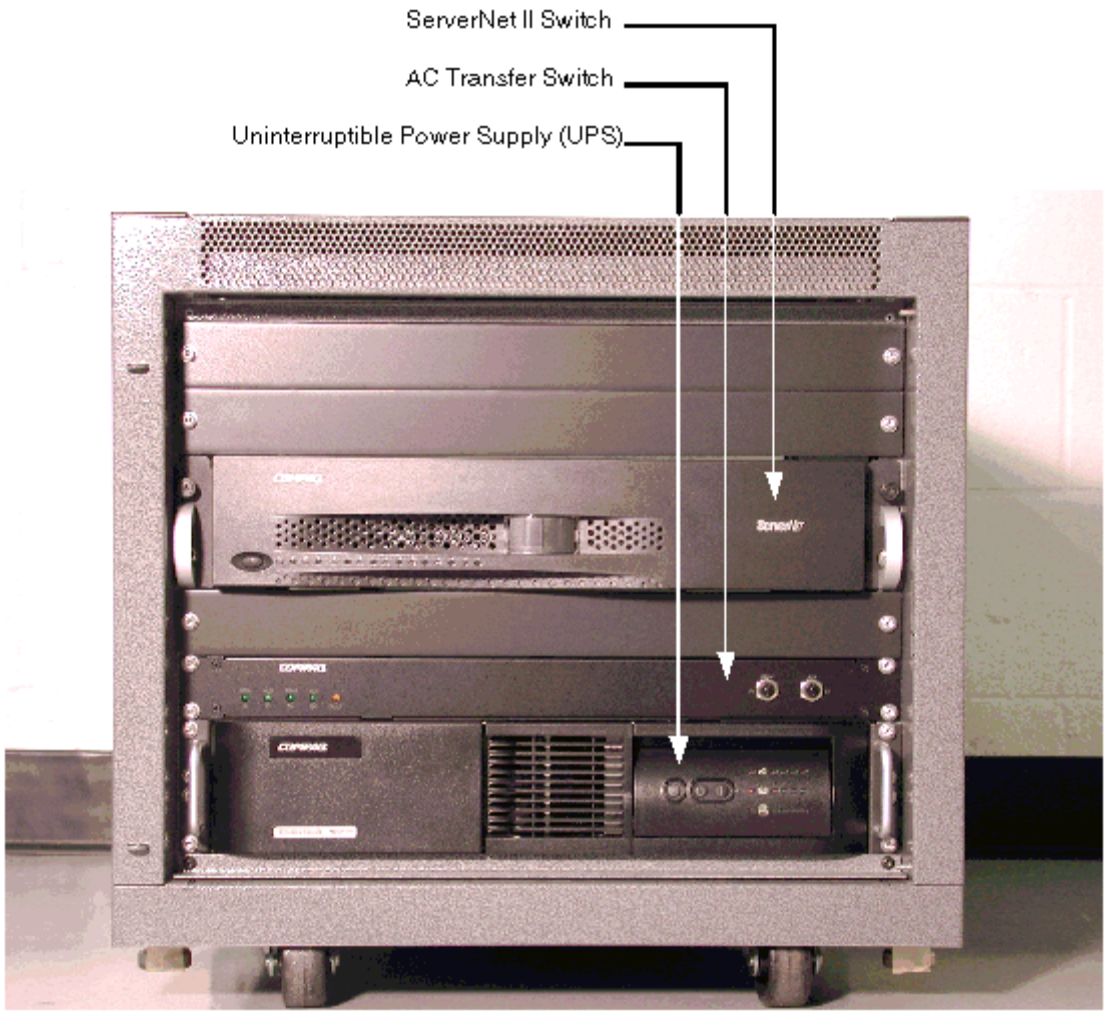
The cluster switches route packets between ServerNet nodes on the external ServerNet X and Y fabrics of a ServerNet cluster. There are two cluster switches: the 6770 HP NonStop Cluster Switch and the HP NonStop ServerNet Switch (model 6780).

The 6770 HP NonStop Cluster Switch consists of the following components:

- ServerNet II Switch
- Uninterruptible power supply (UPS)
- AC transfer switch

Figure 2-13 shows the 6770 HP NonStop Cluster Switch in the switch enclosure. (For information about the 6780 switch, see the *ServerNet Cluster 6780 Planning and Installation Guide*.)

Figure 2-13. 6770 HP NonStop Cluster Switch in Enclosure (Door Removed)



Fiber-optic cables in group 01 of each ServerNet node link the node to an X-fabric and a Y-fabric cluster switch.

For more information about the HP NonStop Cluster Switch, see the *ServerNet Cluster Manual*.

Terminals and Workstations

In addition to communications devices, HP offers terminals and workstations. Asynchronous terminals can be connected to a NonStop S-series server using the ATP6100 subsystem and a SWAN concentrator, or an asynchronous wide area network (AWAN) access server and the NonStop TCP/IP subsystem and Telserv software. Connecting asynchronous devices using these products is described in detail in Industry-Standard Connections and HP Terminals on page 6-3.

6530 Family Terminals and Emulators

There are 6530 family of terminals and emulators and other widely-used terminals available from HP and other third parties. These terminals are specifically designed for reliable online transaction processing (OLTP). They provide a flexible communications interface to fit a variety of application needs.

System Consoles

A system console is an HP-approved personal computer used to run maintenance and diagnostic software for HP NonStop S-series servers. A system console requires additional HP and third-party software and an HP approved modem to use all functionality provided by OSM and TSM applications. Only PCs provided by HP can be used as system consoles. Starting with G06.22, PCs provided by HP for use as system consoles come preloaded with the software necessary to run OSM applications (TSM applications can be installed from the HP NonStop System Console Installer CD).

System consoles configured as the primary and backup dial-out points are referred to as the primary and backup system consoles, respectively.

System consoles communicate with NonStop S-series servers over a dedicated local area network (LAN); some OSM and TSM applications can also be used over a nondedicated (public) LAN.

Printer Interfaces, Processes, and Printers

Printer Interfaces

The following printer interfaces are not directly supported on an NonStop S-series server:

- RS-232
- Current loop
- Centronics
- Dataproducts Long Line Parallel (DPLL)

However, each of these printer interfaces can be indirectly supported and connected by using converters and remote access servers.

RS-232 Serial Interface:

An RS-232 serial interface works without conversion on an AWAN access server (3883/3884/3885) even though current loop is recommended. An RS-232 serial interface also works with the AWAN 3886-family of terminal servers.

Current-loop Interface Printer:

A current-loop printer can be connected by either using a SWAN concentrator or an AWAN 3886 server and converting the printer's RS-232 output to current loop by using an HP-designed RS-232 to current-loop converter (T3886-CL).

AWAN servers also support current-loop through a separately designed current-loop module. However, these terminal servers are subject to controlled availability.

See Current Loop.

Centronics Parallel Interface:

A Centronic parallel interface on a printer can use a Centronics to a TCP/IP Ethernet LAN converter to connect directly to the LAN.

DPLL Interface:

A printer that has a DPLL interface can be connected to a NonStop S-Series server if the DPLL interface is replaced with either a serial, Centronics, or a TCP/IP Ethernet LAN interface on the printer.

Current Loop

Current loop can support a signal up to 1,500 feet. As an alternative to RS-232, current loop is supported by some terminals and serial printers. SWAN, AWAN 3883, and AWAN 3886 (16, 32) require external adapters to support current loop. An HP-designed RS-232 to current loop converter (T3886CL) is available for AWAN 3886-16 and AWAN 3886-32 models. See Figure 2-12 on page 2-31.

FASTP Print Process

Because FASTP added its own device support and relied on nearly no device-specific actions within the I/O process, FASTP has become the basis for other print processes that use networking and remote FASTP spooling protocols (XNS for Xerox, SMB, and NetWare). The most successful of these print processes has been FASTPTCP, introduced in the D30 RVU, which is supported on G-series systems and supports a wide variety of protocols and devices, including AWAN servers.

FASTPTCP is a Spooler Print Process that supports a wide-range of network printers as well as printers connected to print servers and terminal servers. Protocols supported include HPJetDirect, Lexmark, Microplex, LPD1179, TELNET, and “raw” TCP. AWAN 3883/4/5 access servers and 3886 AWAN server models include enhanced support for FASTPTCP TELNET protocol. Special support is provided for HP TTAP and HP PCL printers.

The following FASTP network print processes are:

- FASTPTCP for TCP/IP LANs (T8932)
- FASTSMB for SMB LANs (T9146)
- FASTPNOV for Netware LANs (T8924)
- FASTPX25 for X.25 WANs (T8934)
- FASTPXNS for XNS LANs (T8931)

See the *Spooler FASTP Network Print Processes Manual* and the *Spooler Utilities Reference Manual* for more information.

Printers

Many printer models are approved for use with the NonStop S-Series system. See your HP representative for more information about recommended printers. The following printers are supported: 5524, 5525, 5526, 5527, 5528, 5529,5530, 5531, and 5532.

3

Application Programming With Communications Products

The major function of communications applications running on NonStop S-series servers is to support the transfer of information between a NonStop S-series server and other systems or between a NonStop S-series server and data-capture and data-display devices.

This section discusses the interfaces and some general concepts related to writing applications that use HP communications subsystems. The term **application** in this section refers to the program you write to perform communications functions; the same program may be part of many different business applications.

This section discusses the following topics:

Application Architecture Examples

NonStop S-series servers and Expand networks lend themselves to many kinds of applications with different communications requirements. Figure 3-1 on page 3-3, Figure 3-2 on page 3-5, and Figure 3-3 on page 3-7 illustrate some possible kinds of applications and the HP products and interfaces that might be used to accomplish them. The accompanying text describes the programming tasks the sample applications imply.

These examples are similar, but not identical to, real applications and are meant for illustration only. The application designs and the products used to realize them are not necessarily the best ones for your application. In fact, you will often have many products and interfaces from which to choose. Your selection will depend on the equipment you have, your performance requirements, and the amount of control you want to have over the communications part of your application.

Figure 3-1 illustrates the use of the Expand network and the Pathway environment to automate a substantial part of a telecommunications business, including the integration of related applications.

Figure 3-1 on page 3-3 shows nine NonStop S-series servers. Several of these servers are dedicated to specific telecommunications or administrative applications, and two are communications servers controlling a network of many kinds of terminals. Each application has two parts: a terminal interface part that runs on one of the communications servers, and a database management part that runs on a departmental server.

For example, the database management part of the billing application runs on the server in the accounting department. The applications are integrated in the sense that they are selections on a common operator interface and are able to share data by using one another’s server processes when appropriate.

Most of the programming for this kind of environment is on an extremely high level. The network is transparent, and the device connection requirements of the IBM 3270 terminals are virtually transparent to programmers (because the Pathway environment supports them transparently). The only communications programming the example requires is the development of a front-end process that supports hand-held terminals. This process receives data from the Pathway/iTS requester, modifies the data as required by the terminal device, and passes the data to the device through the ATP6100 asynchronous terminal process. Conversely, it accepts data from the device through ATP6100 and modifies it before passing it to the Pathway/iTS requester.

The label IDS on the diagram refers to the Pathway/iTS intelligent device support feature, which provides for the exchange of messages between a Pathway application and a specialized device.

Figure 3-1. Expand and Pathway Application

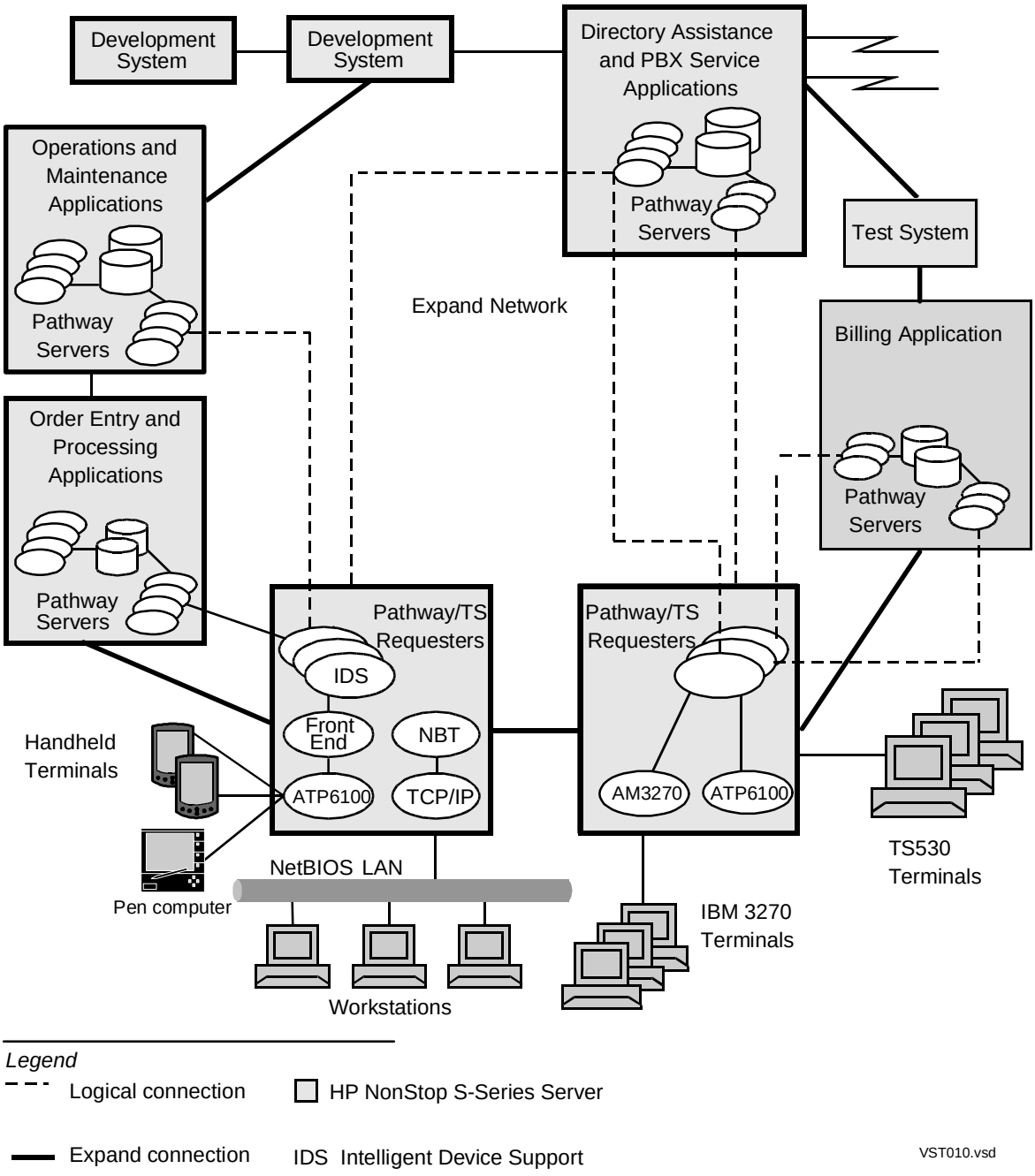


Figure 3-2 on page 3-5 illustrates a railway reservation system. Transactions are initiated at terminals connected to UNIX workstations over either an Ethernet LAN or an X.25 packet-switched data network (PSDN). Depending on the nature of a transaction, the UNIX workstation routes it to either the NonStop S-series server (in the case of a seat-reservation transaction) or another system on the LAN or PSDN (in the case of a railway timetable query).

The railway reservation application is a Pathway application operating on an SQL database. The application uses HP Open Systems Interconnection (OSI) products for connection to LANs and wide area networks (WANs). For the LAN, the OSI products are client applications of the Port Access Method (PAM) subsystem. The PAM subsystem uses the ServerNet LAN systems access (SLSA) subsystem to send and receive data on a LAN. For the WAN, the OSI products use the HP X.25 Access Method (X25AM).

There is one communications programming task on the NonStop S-series server: A front-end process using OSI/TS supports cooperative processing between requesters on the UNIX workstations and database servers on the NonStop S-series server. The same application code can run over either network.

The fact that each OSI/TS process uses a different instance of the PAM subsystem or X25AM represents an application designer’s choice, not a configuration restriction. Multiple instances of OSI/TS can use the same input/output process (IOP), and one instance of OSI/TS can use both X25AM and the PAM subsystem.

Figure 3-2. LAN and WAN OSI Application

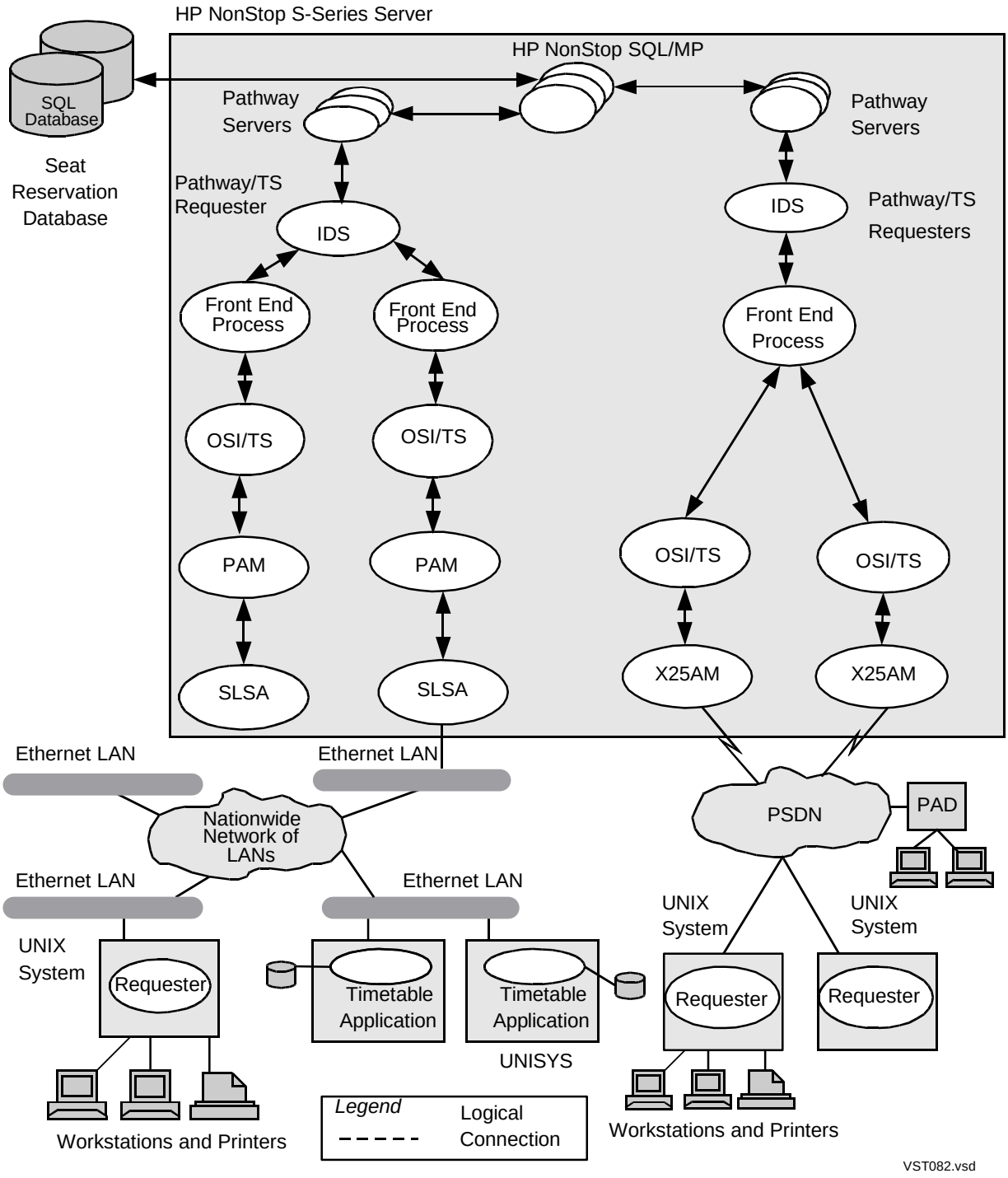
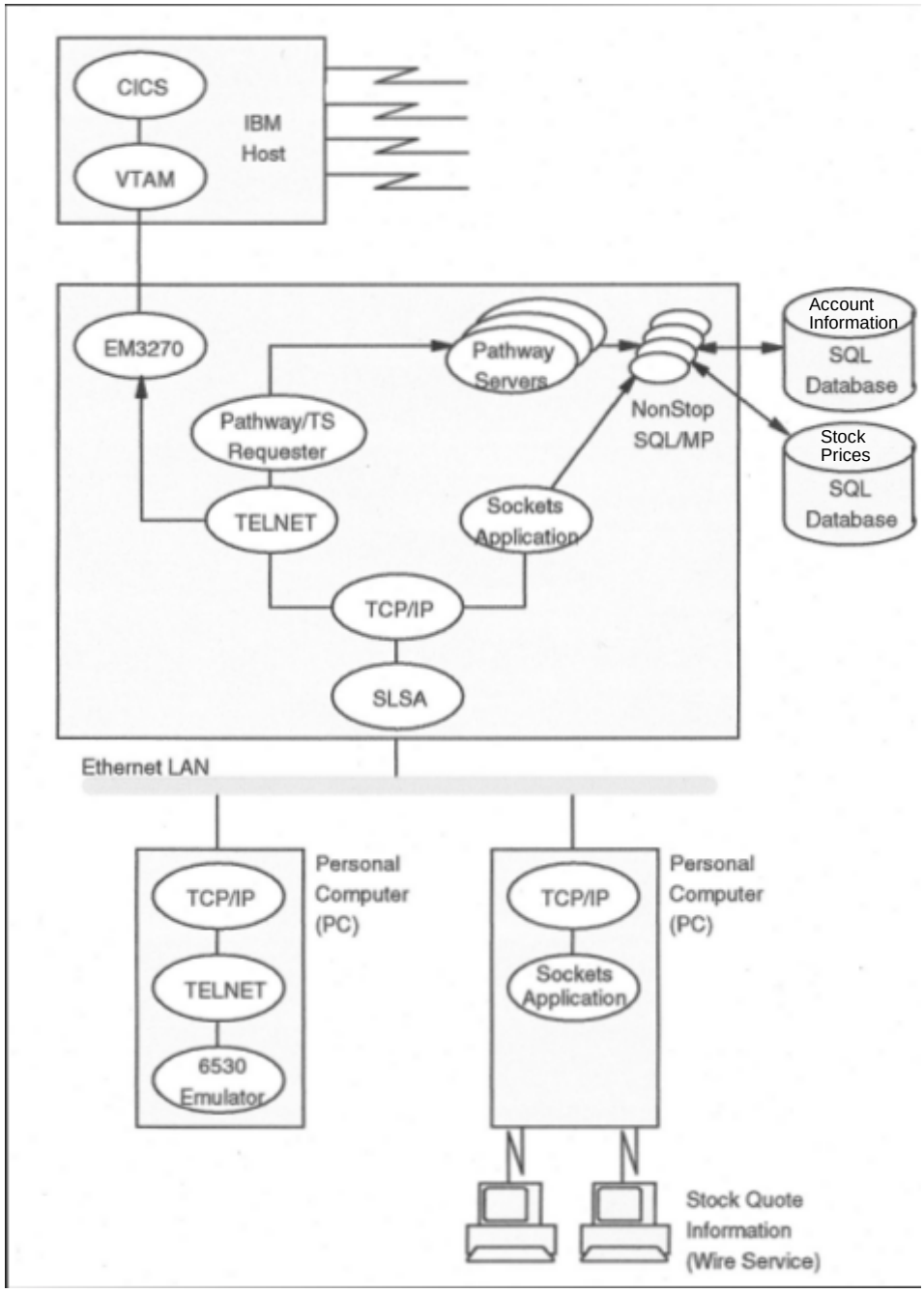


Figure 3-3 on page 3-7 illustrates two related securities applications:

- A cooperative processing application to retrieve stock quotes from a wire service and maintain an SQL database of stock prices on the NonStop S-series server.
- A trading application in which personal computers (PCs) emulate HP terminals for access to a Pathway application. The same PCs also emulate IBM 3270 terminals, so system managers can monitor the status of batch operations on the IBM host. Account and portfolio information is maintained in an SQL database on the NonStop S-series server.

The trading application requires no communications programming. The NonStop Transmission Control Protocol/Internet Protocol (NonStop TCP/IP) product and the TELNET application (which implements the NonStop TCP/IP network terminal protocol), along with the corresponding software and the 6530 emulators on the PCs, allow the Pathway application to support the PCs transparently. Likewise, the EM3270 emulator on the NonStop S-series server provides for transparent communication with the IBM host. The cooperative processing application requires one communications programming task on the NonStop S-series server: an application using the sockets interface of NonStop TCP/IP to communicate with a companion application on the workstation that receives the stock quotes. (The same application also performs database functions.)

Figure 3-3. LAN TCP/IP Application



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Requester-Server Model

The relationship between your application and a HP communications product reflects an architectural concept called the **requester-server model**. When you run an application program on the NonStop S-series server, the NonStop Kernel operating system creates a user process. User processes make requests of a communications subsystem through file-system calls to a subsystem process. Even if your application does not make file-system calls directly, your statements are translated internally into file-system calls. The subsystem process accepts the requests, performs the requested action, and then returns the status of the operation to the application process through the file system. The subsystem process then waits for another request.

Within the context of the requester-server model, HP communications products support several kinds of relationships between the application process on the NonStop S-series server and an external device or system:

- The application can be a requester, controlling the external device or system as an application resource. In this case, the application opens the external device or system in order to use it. This is the most common model for HP communications products.
- The application can serve an external device or system. In this case, the application waits for an external device or system to request to use it. The HP communications product receives the initiation request and informs the application, which then establishes a session with the external requester.

Note. If you are familiar with client-server architecture, the HP original requester-server design might look very familiar to you. The requester-server architecture is conceptually the same as the client-server architecture.

Communications Applications in Context

As the examples in this section demonstrate, most communications applications are not isolated but operate in the context of larger transaction processing (TP) applications. Specifically, a great many applications involving communications products also use the services of the Pathway TP environment and the NonStop SQL distributed relational database management system.

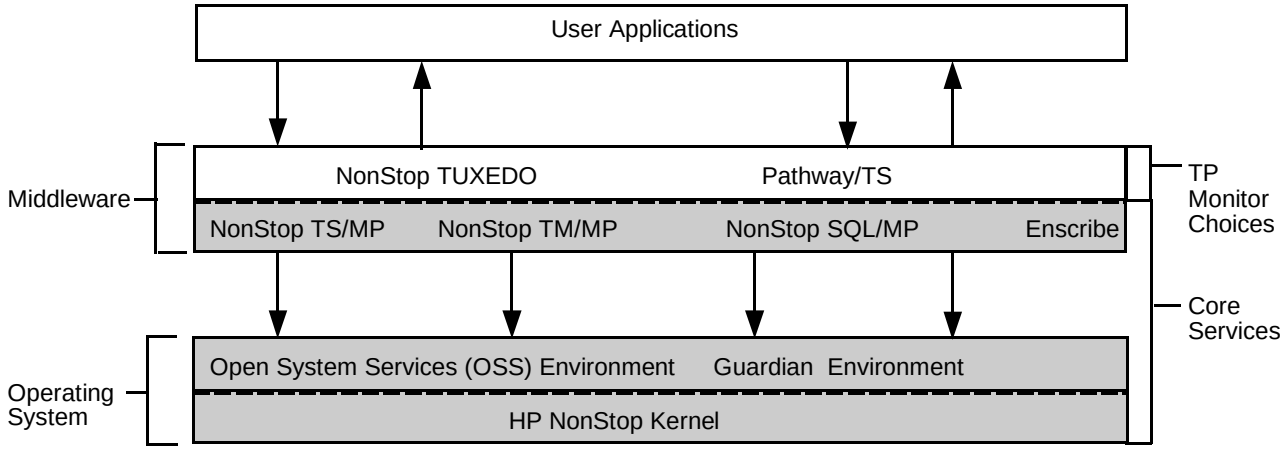
HP Transaction Processing (TP) Services on page 3-9 describes the Pathway environment—as well as the other TP services provided by HP—and the NonStop SQL product in more detail.

Note. For complete information about HP TP services, refer to the *Introduction to NonStop SQL/MP* and the *Introduction to Pathmaker* manuals.

HP Transaction Processing (TP) Services

The HP TP services consist of a set of core services that provide the underlying infrastructure for your TP application and a choice of TP monitor environments, as shown in Figure 3-4. A **TP monitor** is a set of software processes that provides an environment for developing, running, and managing high-volume online transaction processing (OLTP) applications.

Figure 3-4. HP Transaction Processing (TP) Services



- Middleware products provide services to application programs while "hiding" the underlying operating system platform.
- TP monitor products provide transaction routing, resource allocation and monitoring, APIs, development tools, and administrative tools.
- The core services provide the HP fundamentals: parallelism, scalability, availability, and manageability.

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NonStop TUXEDO applications run in the Open System Services (OSS) environment; Pathway applications run in the Guardian environment.

Core Services

The core services include the following:

- The NonStop Kernel, the operating system that provides low-level functions such as interprocess message management, file management, memory management, and so on. The operating system provides two operating environments:
  - Open System Services (OSS)
  - Guardian
- The HP NonStop Transaction Services/MP (NonStop TS/MP) product, which provides services such as process management and link management for your transaction processing application. (Link management enables communication between clients and servers.)
- The HP NonStop Transaction Manager/MP (NonStop TM/MP) product, which provides services that ensure that all logical transactions complete entirely or not at all.
- A choice of database products:
  - The NonStop SQL relational database management system
  - The Enscribe database record manager

TP Monitor Environment Choices

To provide the TP monitor functions for your application, you can choose from the following environments:

- Pathway
- NonStop TUXEDO

Pathway Environment

Through Pathway/iTS and related products, the Pathway environment provides a client-server model for web-based, terminal-based, and workstation-based applications. Transactions can be initiated by workstations, terminals, intelligent devices, and general devices. The optional Pathway/XM product provides enhanced and simplified system management, increased system capacity, automatic load balancing, and other features for managing Pathway applications.

If you have investments in 6530 terminals, for example, or if your organization requires central control of program code, the Pathway environment is the choice for you.

NonStop TUXEDO Environment

Through the NonStop TUXEDO product, the TUXEDO environment provides a client-server model for open applications and the benefits of the HP fundamentals. The TUXEDO environment provides a standard, easy-to-use API and robust features for both the administrative and development environments. The TUXEDO API has been selected by the X/Open Company and UNIX International as a reference technology for open OLTP application programming.

If the use of standard APIs and portability of programs and programmer skills are important for your application, for example, or if your existing TUXEDO applications could benefit from the HP fundamentals, the TUXEDO environment is the choice for you.

NonStop SQL/MP

HP NonStop SQL/MP is a relational, distributed, database-management system based on the ANSI-standard Structured Query Language (SQL), which is used both to describe and to manipulate data. SQL offers conversational and programmatic interfaces, includes a data dictionary, and permits logical views of the data. It also includes a report writer (not supported by the SQL/MX version.) NonStop SQL is integrated into the NonStop Kernel operating system and uses parallel execution to provide outstanding transaction-processing and query performance along with fault-tolerance.

You can develop applications using either the traditional HP Guardian services or using industry-standard services as provided by the HP Open System Services (OSS). COBOL85 and C programs running in either the Guardian or OSS environment can concurrently access the same data and be governed by the same concurrency constraints and transaction controls. The active data dictionary dynamically manages both Guardian-based and OSS-based programs. Programs from either environment have equal access to SQL data.

You can also develop applications using the latest in PC and workstation client tools. NonStop SQL/MP supports a variety of industry-standard client-server APIs such as ODBC, DAL, EDA/SQL, SQL Server, and SQL*Connect. SQL/MX supports ODBC and JDBC.

Because many popular client applications are compatible with the APIs, you can, in many cases, use familiar software tools to access SQL data. Further, business-oriented end users do not have to know SQL, because HP API products such as the HP NonStop ODBC Server automatically translate their requests into SQL queries.

NonStop Remote Server Call/Massively Parallel (RSC/MP)

The HP NonStop RSC/MP product permits workstations to invoke NonStop TM/MP server processes residing on NonStop servers. By processing much of the transaction before it is sent to the server, RSC/MP can improve the performance of TS/MP applications while maintaining the application's ability to handle high transaction volumes. With RSC/MP, you leverage your investment in Pathway applications by taking advantage of powerful workstation clients.

RSC/MP offers the following features:

- Multiplatform support. Supported platforms include HP NonStop UX, HP9000, NCR, OS/2 (32-bit), RS6000, SCO UNIX, Solaris, Windows 3.1, Windows 95, Windows 98, Windows NT, and Windows 2000.
- Multitool support. Many languages, tools, and applications work with RSC/MP, including environments that generate standard C sequences, such as Microsoft C++ and Visual BASIC; development tools such as Blythe Omnis, Centura SQL-Windows, and Powerbuilder from Sybase; and applications such as POET and DDE Gateway from HP, DynaAccess from Cornerstone Software, and CirCA User Interface from CirCA Business Systems. Many other off-the-shelf tools are supported as well.
- Multiprotocol support. Supported communications protocols include TCP/IP, NetBIOS, asynchronous, X.25 over asynchronous, and IPX/SPX.
- Independent transport handling. I/O is nowaited and nonblocking. It allows users to send multiple requests without waiting for completion. The client can process data while the server is busy and retrieve replies as they complete.
- Transaction protection and database consistency. The RSC/MP client API works with TM/MP to supply protection for any message.
- Process persistence, reliability, and availability. NonStop servers provide HP fundamental strengths of reliability and availability. Also, multiple copies of the RSC/MP host component, Transaction Delivery Process (TDP), can be configured. That way, if the host computer is busy when a request comes in, the request is redirected to another copy of the host component.
- Security. Access control server (ACS) is used to control workstation access to host RSC services.

Types of Programming Interfaces

As explained in Section 2, Communications Product Concepts and Components, HP offers communications programming interfaces on several levels of complexity. When writing applications that use very high-level or high-level interfaces, programmers do not have to worry about the details of communications protocol. (The most extreme case of communications transparency is the Expand subsystem: the application needs no special code to refer to a remote resource and is generally unaware of the Expand subsystem, although in some cases special code is desirable for error-recovery in unusual situations.)

When an application requires the use of a communications protocol not supported by a high-level interface, programmers can use low-level interfaces, such as CP6100, Envoy, EnvoyACP/XF, or SNAX SNALU; to use such products, the programmer needs to have a good understanding of the protocol required by the target device or system.

Most HP communications subsystems provide programming interfaces based on file-system procedure calls. A few significant subsystems, however, can be used even by programmers who are not familiar with the NonStop Kernel operating system environment. These subsystems provide application programming interfaces based on computer industry standards.

The rest of this section describes these concepts in greater detail:

Using File-System Procedure Calls

The programmatic interfaces of most communications products consist of file-system procedures. To write an application program that uses a file-system interface, you must have some understanding of the environment and services provided by the NonStop Kernel operating system. This subsection gives a general description of file-system procedure calls used with communications subsystems. Refer to the for a more thorough description of programming on the NonStop Kernel operating system.

Files and Filenames

Not only disk files, but also processes and many other entities, are treated as files in the NonStop Kernel operating system. (A **file** is a logical construct subject to certain kinds of operations, like reading and writing.) Each file in a system has a unique filename; the name of a communications line or point-to-point device corresponds to that of the input/output process (IOP) controlling the line or device. Name extensions are available for referring to multipoint devices and other entities subordinate to the IOP—for communications products, subordinate entities are called **subdevices**—but those extensions are not meaningful to the file system.

When you use files on other NonStop servers in an Expand network, the **filename** includes the name of the system on which the file resides. Thus, when you refer to a line attached to some other system, you give the name of the system as well as the name of the line. For instance, a multipoint line of automated teller machines (ATMs) controlled by a NonStop S-series server in New York could have the name \NY.$MTATM. An ATM on that line could have the name \NY.$MTATM.#R86.

File-System Procedures

Your programs manipulate files by calling file-system procedures, which provide a uniform method for accessing to files. Interprocess communication is accomplished by procedures with names like READ, WRITE, and WRITEREAD. When the requested action is complete, the file system completes the call, informing the application of the success or failure of the request and delivering requested data.

Nowait Operation

Whether control returns to the application immediately or only after the requested action is complete depends on whether the application has requested **nowait operation**. Nowait operation is common for communications applications; it allows the application to issue a series of requests without waiting for each to complete before issuing the next, allowing the application to have multiple requests outstanding. If the application uses nowait operation, control returns to the application before the requested action is complete; status and data are returned in response to a special completion call.

Types of File-System Requests

File-system requests to communications subsystems fall into two categories. Some requests pertain to the *connection between the application and the subsystem*; for example, a request might allocate resources—such as control blocks or a communications line—to the application or report configuration or status information that the subsystem maintains. Other requests pertain to the *connection between the application and the line or remote device*; such requests result in protocol actions such as transfer of data or control information on the line. Some requests are for both kinds of functions.

Products vary somewhat in the range of file-system requests they support and in their treatment of specific requests. The following subsections describe the most common file-system calls and give general definitions. Requests pertaining to the connection between the application and the subsystem are listed as logical connection, request management, or general information requests; those pertaining to the connection between the application and the line or device are listed as data transfer, line, or subsystem-control requests.

Logical Connection

FILE_OPEN_	Gives the application access to the subsystem process and the communications line or subdevice and specifies various requirements of the interaction—for instance, exclusive access or nowait operation.
FILE_CLOSE_	Terminates the logical connection between an application and the subsystem process, line, or subdevice. Other applications can still use the line or subdevice. In some protocols, FILE_CLOSE_ terminates the physical connection if there are no remaining users.

Data Transfer

WRITE[X]	Transfers data or control information from the application to the subsystem process and, through the process, to the line or subdevice.
WRITEREAD[X]	Transfers data or control information from the application to the subsystem process and, through the process, to the line or subdevice or the protocol module controlling the line; receives a reply.
READ[X]	Receives data or other information from the process, line, or subdevice. READ is intended for use with 16-bit addresses while READX is intended for use with 32-bit extended addresses. In some protocols, READ[X] delivers unsolicited messages from the protocol module to the application. Some IOPs support a two-step READ[X] that allows the application to determine the length of the incoming message before requesting the data, making it unnecessary for the application to maintain a large, dedicated buffer while waiting for a READ[X] to be completed.

Line or Subsystem Control

SETMODE	Sets the state or configuration of the line or subdevice or specifies parameters for interaction between the application and the subsystem. For example, in some protocols you can use SETMODE to change the retry count or line speed.
CONTROL	Performs actions that alter the state of the line or subdevice, for example, by hanging up a dial-up line.

Request Management

AWAITIO[X]	Completes a request in cases of nowait access. Use AWAITIOX with the extended 32-bit (or X) versions of the I/O procedures such as READX, WRITEREADX, and so on. Use AWAITO with the 16-bit versions such as READ, WRITEREAD, and so on.
CANCEL	Cancels the oldest request pending for the process, line, or subdevice.
CANCELREQ	Cancels a specific request.

General Information

FILE_GETINFOBYNAME_	Reports the device type and physical record length of the line, as defined to the operating system.
FILE_GETINFOLISTBYNAME_	Reports the last file-system error and other information related to the line or subdevice.

Typical Order of Calls

The sequence of calls varies with the application, the process providing the application interface, and the protocol. Here is a typical sequence for the X25AM IOP:

1. FILE_OPEN_ to gain access to the line and the subdevice (in this case a virtual circuit), to determine whether access is exclusive or shared, and optionally to specify nowait access and the number of concurrent requests allowed.
2. SETMODE to set the destination address.
3. CONTROL to initiate an outgoing call request.
4. WRITE[X] to send data, and READ[X] to receive data.
5. CONTROL to issue a call clear request.

FILE_CLOSE_ when the application no longer needs access to the line.

Using Standards-Based Interfaces

Some communications products offer programming interfaces that do not consist of file-system procedure calls. Examples of such products are NonStop TCP/IP and Open Systems Interconnection/Application Services (OSI/AS). These and other similar products are described in more detail in NonStop TCP/IP and NonStop OSI/AS and OSI/FTAM, both on this page.

NonStop TCP/IP

HP NonStop TCP/IP Socket Library routines are based on the Berkeley Software Distribution (BSD) 4.3 implementation of the UNIX operating system. These routines allow programmers familiar with the BSD sockets interface to develop applications for the NonStop Kernel operating system. Applications that exist on other systems and use BSD sockets can be easily ported to the NonStop S-series server using this interface. NonStop TCP/IP is described in Section 10, TCP/IP Network Connections.

OSS sockets are not BSD and have their own set of functions. For more information about OSS sockets, see the *OSS Porting Guide* and the *OSS Programmer's Guide*.

NonStop OSI/AS and OSI/FTAM

In the OSI architecture, communication between applications and the OSI Application Layer, Presentation Layer, or Session Layer is through use of layer-specific primitives. The programmatic interface to OSI/AS is a set of procedures, called the Application, Presentation, and Session (APS) procedures, designed to resemble the primitives. The procedures are the same regardless of the layer the application is using; parameters are different for different layers. APS procedures handle all communication with the underlying subsystem processes, so the application programmer need not be concerned with those components. Because the interface is based on standards, you can conveniently port existing OSI applications from other systems to the NonStop S-series server. Section 8, Open Systems Interconnection (OSI) Network Connections, describes HP NonStop OSI/AS and includes a diagram of the OSI Reference Model.

HP OSI/FTAM also offers a programming interface in which the procedures correspond directly to primitives defined in the standard. OSI/FTAM is described in Section 8, Open Systems Interconnection (OSI) Network Connections.

NonStop IPX/SPX

HP NonStop Internetwork Packet Exchange/Sequenced Packet Exchange (HP NonStop IPX/SPX) allows Novell Netware clients to access HP OLTP or database services directly from their Novell network. IPX/SPX supports an open, standards-based program interface for custom network-based application development. The Sockets Library routines are based on those in the 4.3 BSD version, with HP extensions. IPX/SPX is described in Section 9, Local Area Network (LAN) Connections.

NonStop NBX and HP NonStop NBT

HP NonStop NBX provides legacy network basic input/output system (NetBIOS) support over IPX/SPX. HP NBT provides legacy NetBIOS support over NonStop TCP/IP.

Language Support

HP provides a number of programming languages for developing application software. The languages most commonly used for writing applications for NonStop S-series servers include Transaction Application Language (TAL), C, C++, and COBOL85. The language you use for the communications part of your application depends on the product or interface you are using. Very high-level interfaces are usually designed for COBOL programmers; other interfaces are likely to be designed for TAL or C programmers. Many HP compilers have a feature that lets you insert lines of TAL code into a program written in another language such as COBOL85. See the product-specific manuals for information about language support.

Part II. HP Networking Solutions

Part II consists of the following sections, which show how HP communications products can meet your connectivity requirements:

Each section begins with a brief overview of the terms and concepts related to the protocols discussed in the section. These overviews are for general readers—and users of very high-level interfaces—who want to have some idea of what the communications products do. The balance of each section describes the products used to achieve the connection.

4

Managing Communications Subsystems

As networks become larger and more complex, managing them becomes more critical —and more complicated. Users demand a consistent set of tools for managing large, centralized systems and networks of distributed systems, and they want to be able to tailor the tools to their sites. A management system must allow not only interactive operator query and control but also automation.

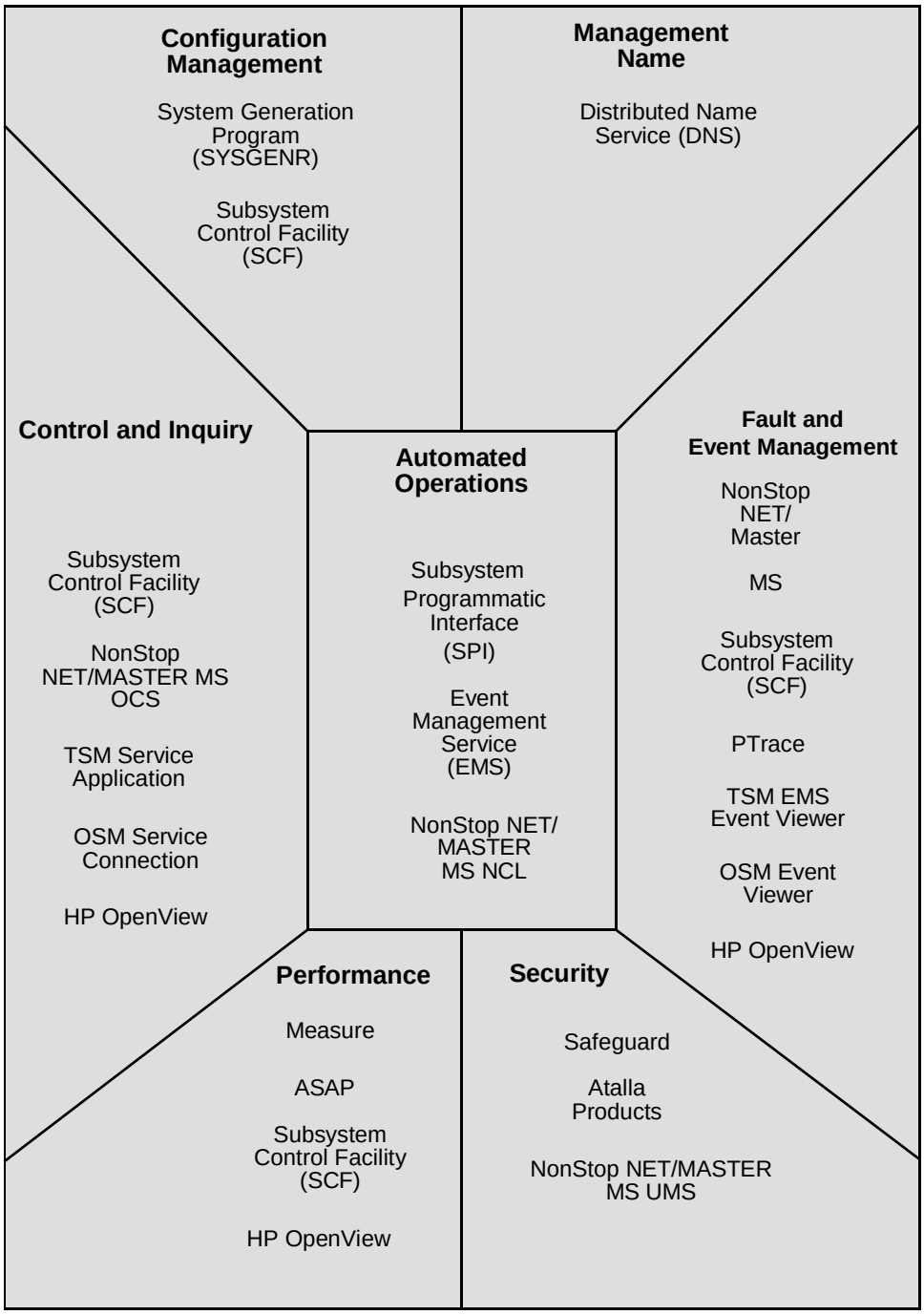
Distributed Systems Management (DSM) is the HP NonStop architecture for system and network management. DSM defines a set of products that provides an integrated management view of system and network resources and operations. You can use DSM tools and interfaces to manage most HP communications subsystems (and most other HP subsystems). You can also develop your own interfaces, allowing your applications to be managed with DSM tools.

Beginning on page 4-3, Management Model is an overview of DSM concepts that relate to communications subsystems. It includes the following subsections:

Management Tools, which begins on page 4-8, introduces several specific tools that you use to manage communications subsystems. It includes the following subsections:

Figure 4-1 illustrates the communications management tasks and tools described in this section.

Figure 4-1. Communications Management Tasks and Tools



Management Model

One of the most important characteristics HP communications products share is a **management model**—the approach taken and the mechanisms used to support such tasks as resource control and inquiry and fault management. This uniform approach makes it possible for you to use the same tools to manage many different products.

Distributed Systems Management (DSM)

The name DSM applies to the management model and also to a set of products consistent with that model. DSM products provide centralized or distributed management of HP NonStop S-series servers and Expand networks. DSM also lets you build interfaces that allow your applications to be managed as subsystems in the DSM environment.

DSM provides you with the following benefits:

- Integration of the network, the systems, and your own applications
- Automation of operator functions
- Distribution or centralization of network control

DSM is not used exclusively for managing communications. You can use DSM tools to manage most other HP hardware and software—such as processors, peripherals, the HP NonStop Kernel operating system, and the Transaction Management Facility (TMF) subsystem—and your own applications.

Subsystems

An important concept in DSM is that of the **subsystem**. A subsystem is a process or collection of processes giving users access to a set of related functions. A subsystem typically controls a cohesive set of resources. For example, X.25 Access Method (X25AM) is a subsystem that controls X.25 lines and related entities, such as virtual circuits; the TMF subsystem controls application transactions and related entities, such as audit-trail files.

DSM tools and interfaces let you operate on subsystems individually, allowing you a fineness of control that is often desirable, and supporting the distribution of operations functions among operators specializing in particular aspects of the system or network. For instance, one person might be responsible for managing the communications lines, lines of a particular type, or lines within a specific geographic section of the network.

Several DSM tools also let you operate on subsystems collectively; this capability is important in cases where you want a broad view of resource usage or are trying to locate a problem and don’t know in which subsystem it occurred. (As described in Section 2, Communications Product Concepts and Components, most applications use the services of multiple subsystems, even if they are using just one subsystem directly.)

Objects

For management purposes, the resources of a subsystem are defined as **objects**. Examples of objects are data capture devices, input/output processes (IOPs) or other processes, disk files, a group of devices or data communications lines, or anything else that can be identified as an independent entity in the subsystem. By manipulating objects, you can perform the following types of management functions:

- Removing resources from service and restoring them to service
- Changing the configuration of devices and processes
- Adding, deleting, or moving files and processes
- Collecting statistics on subsystem activities
- Storing information for use in recovering from a system or network failure

Multiple subsystems can control the same physical entity. For example, the Pathway and SNAX/XF subsystems can both control a Systems Network Architecture (SNA) device; the device is defined as an object to each subsystem.

Each object has an **object type** and an **object name**. The object type describes the class of the object: for example, CONTROLLER, LINE, DEVICE, SU (subdevice), and PROCESS are object types. The object name uniquely identifies the object within the system. The names of data communications objects must conform to certain standards for the subsystem.

Management Interfaces

Every communications subsystem has an interactive command interface through which you can control and inquire about subsystem resources. Many communications subsystems also have programmatic and event management command interfaces.

Interactive Command Interface

Subsystems that support DSM have an interface called the Subsystem Control Facility (SCF) as their interactive command interface. There are also other applications that help you perform specific management tasks.

SCF is a command interpreter for managing the configuration and operation of communications lines and devices. SCF includes commands for starting, stopping, suspending, and activating lines; for defining, altering, and discovering the configurations of lines and devices; for displaying statistics and initiating traces; and for performing a wide variety of other control functions. SCF also supports features such as aliases, programmable function keys, a customizable prompt, command history buffers, and a Help key.

There is more discussion of SCF and other interactive utilities in Management Tools on page 4-8.

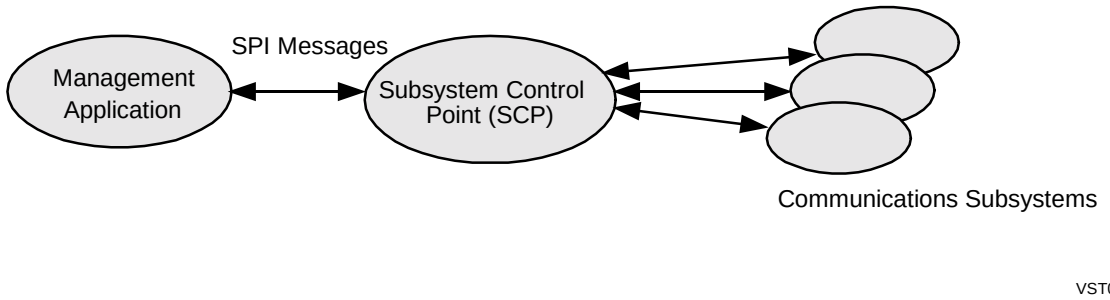
Programmatic Command Interface

Many communications subsystems have programmatic command interfaces based on a set of procedure calls, definitions, and conventions known collectively as the **Subsystem Programmatic Interface (SPI)**. The programmatic commands available through SPI parallel those available in the interactive interface, so you can write applications that automate operator functions you would otherwise perform interactively, such as issuing subsystem commands or retrieving event messages.

Your application uses SPI to build and decode management messages. It exchanges those messages with a process called the Subsystem Control Point (SCP), which interacts with the communications subsystems. Specifically, SCP is a data communications management process. It provides the management interface to all communications subsystems, so a management application can control multiple subsystems without the overhead of establishing multiple process-to-process relationships.

Figure 4-2 illustrates the relationships among SPI, SCP, and management applications.

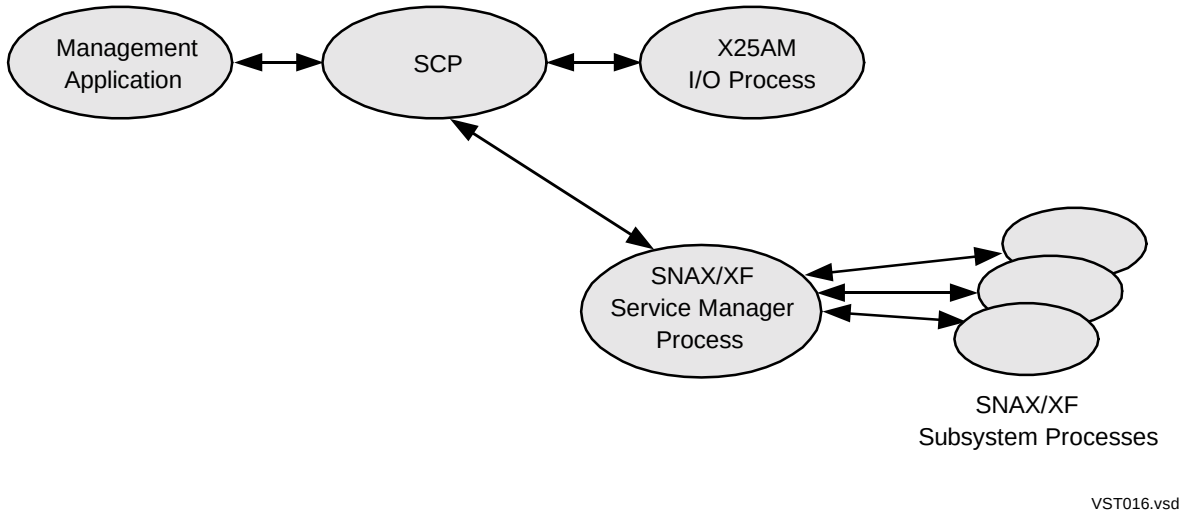
Figure 4-2. SPI Messages Flow Between a Management Application and SCP



SCP can communicate directly with an IOP such as X25AM, or it can communicate with a manager process, which in turn interfaces with one or more IOPs. A **manager process** is likely to exist where multiple subsystems share management services. For example, the Port Access Method (PAM) manager process, PAMMAN, performs management services for the PAM subsystem in the DSM environment. Complex subsystems like SNAX/XF are also likely to include manager processes.

Figure 4-3 illustrates SCP interfaces to IOPs and to a manager process.

Figure 4-3. SCP Interfaces to Subsystem Processes



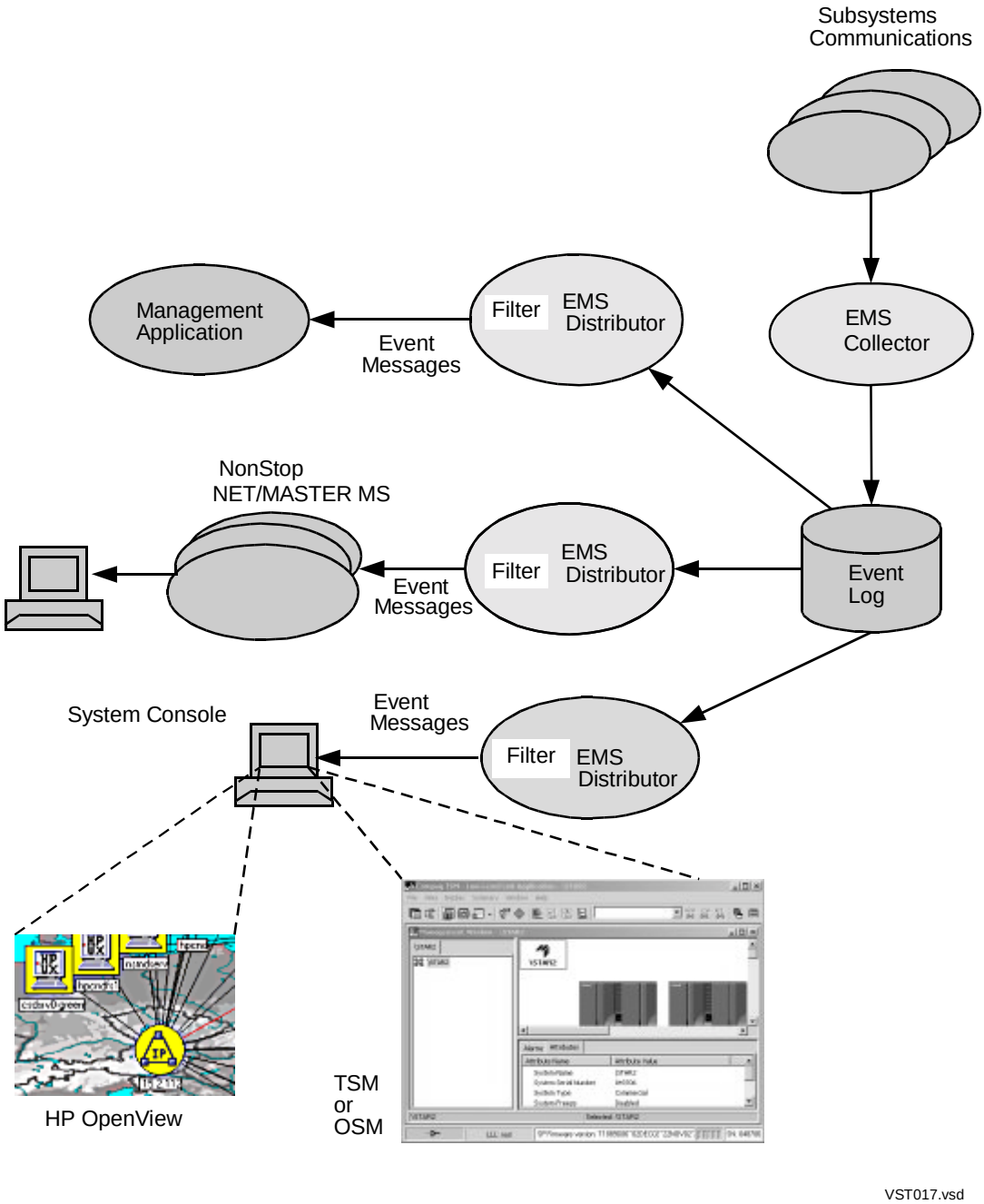
Event Management Service (EMS)

Communications subsystems that support DSM report events (abnormal or significant occurrences) to the Event Management Service (EMS). EMS provides a way for subsystems to report important occurrences like hardware malfunctions, availability for service, or the need for routine operator intervention (for instance, to put paper in a printer or money in an ATM).

Subsystems report events to an EMS **collector process**, which places event messages in a log. EMS components called **distributors** read the messages from the logs and distribute them to applications, terminals, printers, or remote nodes. Operators or applications can monitor events as they occur or review events that have occurred in the past.

Operators see event information in the form of text messages on a screen or on a printer. Management applications retrieve the information in the form of SPI messages. The operator or application can use a filter to specify the types of events that a distributor retrieves. Figure 4-4 illustrates the process of event logging and event-message retrieval.

Figure 4-4. Event Logging and Monitoring With the Event Management Service (EMS)



Management Tools

The rest of this section describes some of the tools you use to manage communications products.

HP Tandem Advanced Command Language (TACL)

TACL is the basic command interpreter provided with the NonStop Kernel operating system. From TACL, you can issue commands that allow you to define new users, control and monitor running processes, and communicate with subsystems. You can also use TACL to initiate other programs that run on the NonStop S-series server.

In addition to its functions as command interpreter, TACL offers facilities for writing sophisticated command files, including full management applications or prototypes of management applications to be written later in other languages.

NonStop SNMP

SNMP originated in the Internet community in the late 1980s as a means for managing TCP/IP and Ethernet networks. SNMP is the industry-leading standards-based method for managing all devices in a network, including hubs, routers, workstations, and servers. Many vendors offer SNMP-compliant applications that run on several workstation platforms. These applications manage devices attached to various kinds of networks when the devices are instrumented with SNMP-compliant software known as SNMP agents.

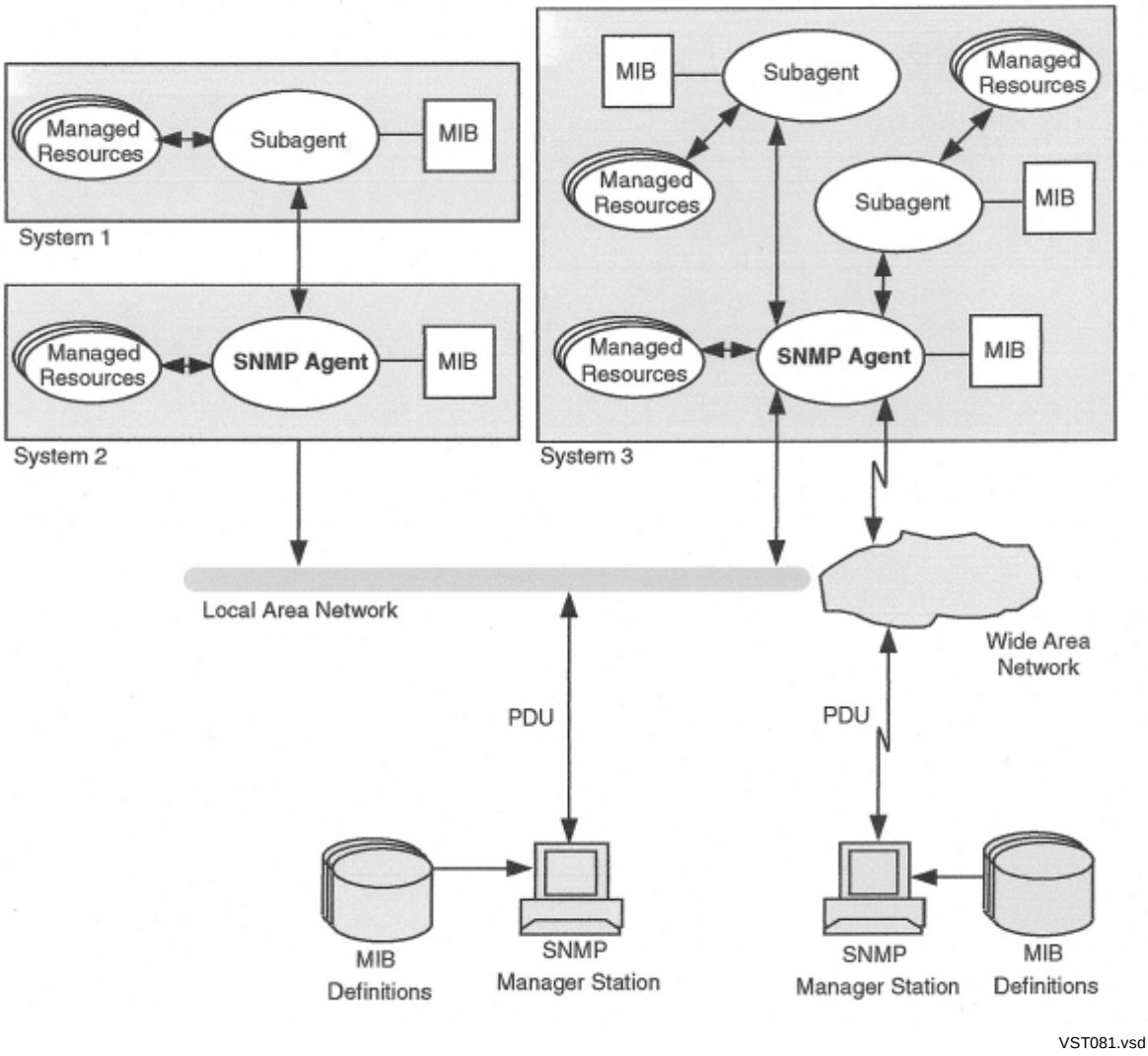
HP has implemented SNMP to facilitate management of its NonStop systems from SNMP-compliant applications known as managers.

Table 4-1 describes some of key components of an SNMP environment. Figure 4-5 on page 4-10 illustrates these components.

Table 4-1. Key Components of an SNMP Environment

Component	Description
SNMP Manager Station	Device on which the SNMP manager runs.
SNMP Manager	Application that automates the management of network elements (**managed resources**) under the control of one or more SNMP agents. HP provides an SNMP agent on its NonStop Integrity systems. The SNMP manager sends and receives responses from SNMP agent through either of the following two methods: ● NonStop TCP/IP subsystem which supports LANs and WANs. ● Calls to the NonStop Kernel interprocess communication (IPC) procedures, either locally or over Expand, when the manager resides on NonStop Kernel systems.
Protocol Data Units (PDU)	Defined in RFCs, PDUs retrieve or change values or send unsolicited notifications known as **traps** to an SNMP manager.
Management Information Base (MIB)	Information exchanged between managers and agents. An MIB describes a collection of manageable objects. An example of an MIB object is “the physical location of a node.” MIBs are described in a language known as **Abstract Syntax Notation One** (**ASN.1**). Some MIBs are Internet MIBs defined in RFCs. Other MIBs are vendor defined.
SNMP Agent	SNMP agents access and modify values for MIB objects on behalf of SNMP managers. An SNMP manager can interpret MIB values when the SNMP manager has access to a compiled version of the ASN.1 MIB definition. The SNMP agent acts as a server for any SNMP network-management requester, providing information about HP resources. Two MIB-II groups are supported (System and SNMP) defined by RFC 1213, *Management Information Base for Network Management of TCP/IP-Based Internets: MIB-II*, and a private group (zagInternal) that is defined by HP.
SNMP Subagent	SNMP subagents handle a particular collection of resources. Some subagents are implemented as independent processes, and some are bound into other processes, such as the agent process.

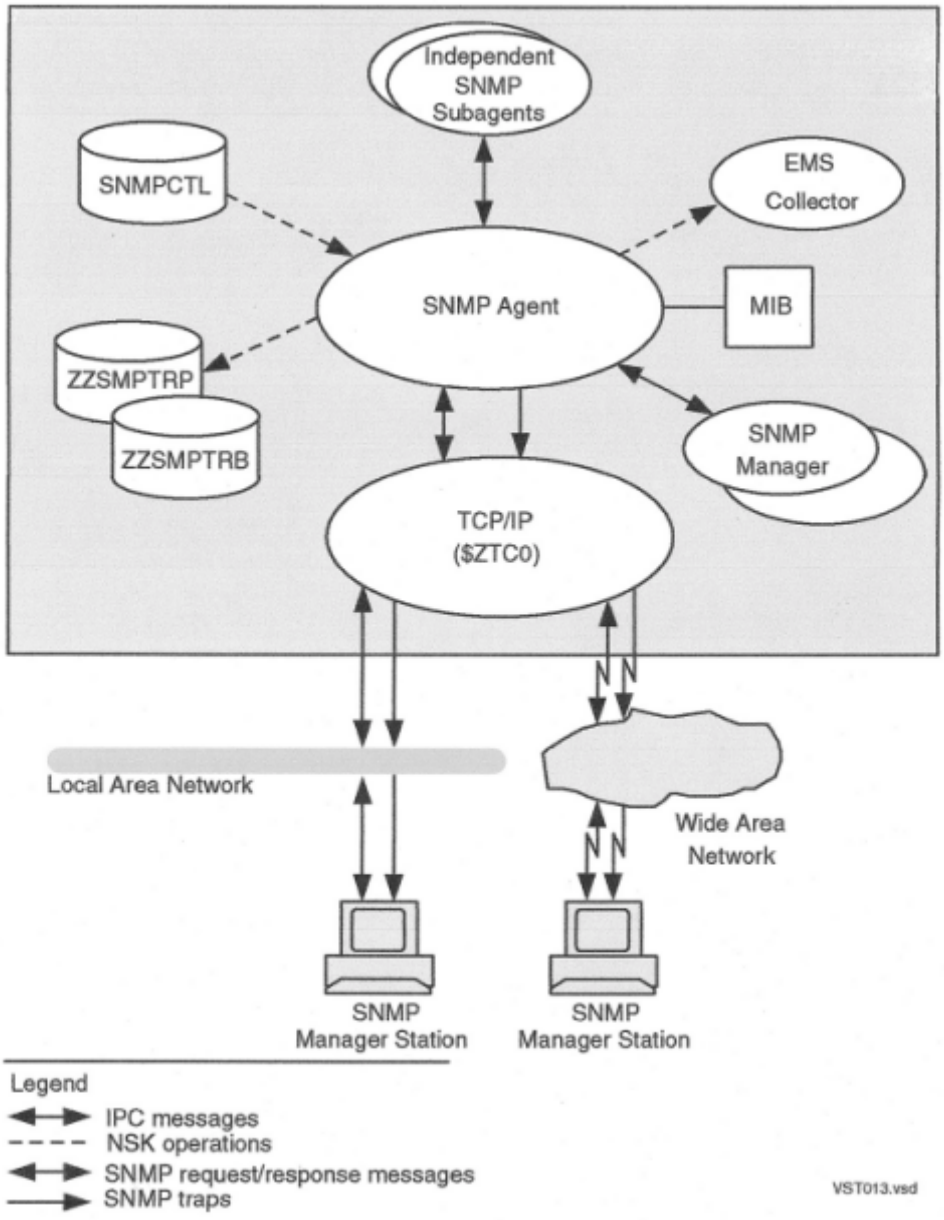
Figure 4-5. The SNMP Environment



HP offers a Subagent Toolkit that helps programmers generate subagents that interoperate with the SNMP agent. Subagents make customer-written NonStop applications manageable by SNMP managers. HP also offers a Manager Services toolkit that allows C and C++ programmers to create SNMP managers that run as NonStop Kernel processes in either the Guardian environment or the Open System Services (OSS) environment.

Figure 4-6 on page 4-11 illustrates the NonStop SNMP architecture:

Figure 4-6. NonStop SNMP Architecture



When the primary SNMP agent process is active, it writes trace records to the file ZZSMPTRP. When the backup process becomes active, it writes to the file ZZSMPTRB.

HP OpenView

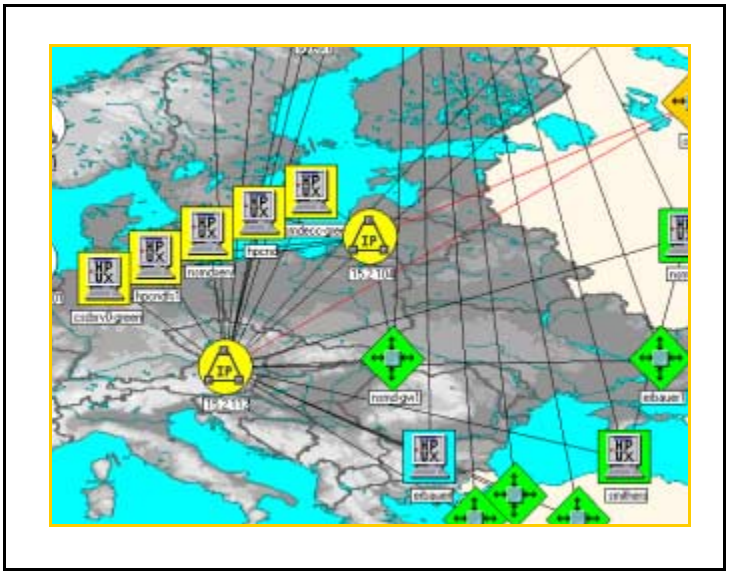
By using SNMP, you can manage NonStop servers with HP OpenView software. NonStop servers can forward EMS messages using the SNMP trap converter to OpenView Operations software to provide a consolidated enterprise event display.

Network Node Manager software supports a variety of management functions for NonStop servers, including

- Auto-discovery of NonStop servers
- Event viewing
- TCP/IP packet activity

HP OpenView Network Node Manager automatically discovers your network and provides customizable maps and submaps so you can see visually what is happening. Network Node Manager software also enables event management and allows remote access via the Web.

Figure 4-7. HP OpenView (Example)



VST025.vsd

HP OpenView Network Node Manager software includes support for HP NonStop servers using the following components:

- SNMP agent
- TCP/IP subagent
- Event Management System (EMS)
- Web ViewPoint software

The SNMP agents and EMS subsystem are included with the operating system.

NonStop NET/MASTER Management Services (MS)

NonStop NET/MASTER Management Services (MS) is a network management system that allows you to monitor and manage a single NonStop S-series server or an entire network, composed of both HP and IBM systems, from a single terminal. With NonStop NET/MASTER MS you can:

- View event messages generated by both local and remote systems throughout a network
- Issue commands to remotely control and gather information about any peer system in the network, and have the responses displayed on your local terminal
- Run system utilities, TACL routines, and other external conversational mode and page-mode applications
- Write and execute custom applications and operations management automation procedures with the NonStop NET/MASTER Network Control Language (NCL), a high-level language created specifically for automating system and network management tasks
- Browse local log files containing messages that report activity occurring throughout the network
- Tailor your operations environment to suit the needs of your own system and network

TSM and OSM Packages

The TSM package is a client-server application that provides troubleshooting, maintenance, and service tools. The TSM package consists of software components that run on the NonStop S-series server and on a PC-compatible workstation. The TSM software on the workstation features a GUI that contains extensive online help.

Some of the tasks that can be performed using the TSM software include:

- Starting the NonStop S-series server
- Identifying system components and configurations
- Displaying physical and logical views of the system configuration
- Checking the current status of system components and browsing event logs
- Performing maintenance actions on specified customer-replaceable units (CRUs) and field-replaceable units (FRUs), such as the Ethernet 4 ServerNet adapter (E4SA), Fast Ethernet adapter (FESA), Gigabit Ethernet ServerNet adapter (GESA), Gigabit Ethernet 4-port ServerNet adapter (G4SA), and the ServerNet/FX adapter
- Sending problem and configuration information to a service provider

- Monitoring system resources, including implementation of remote monitoring and maintenance

For G06.21 and later RVUs, the OSM product replaces TSM as the system management tool of choice for NonStop S-series systems. OSM offers a browser-based interface that improves scalability and performance and overcomes other limitations that exist in TSM. TSM is still supported; however, OSM is required to support new functionality in G06.21 and later, such as G4SA and IOAM hardware.

For more information about OSM, see the *OSM Migration Guide* and the *OSM User's Guide*.

Configuration Management

Configuration management is the task of defining and maintaining records of system and object configurations. Before you can use a resource, someone must define its configuration. After a failure, its configuration must be restored. Various kinds of problems—for example, performance problems—can often be solved by adjustments to object configurations.

DSM/SCM and SYSGENR

To install a new RVU of the operating system, you must run the Distributed Systems Management/Software Configuration Manager (DSM/SCM), a GUI-based program that guides you through the complete software installation process. DSM/SCM automatically runs the system generation program for G-series systems, SYSGENR.

SYSGENR configures the system variables listed in the ALLPROCESSORS paragraph of the CONFTEXT configuration file. These entries are built by SYSGENR and stored in the operating system image file, OSIMAGE.

Subsystem Control Facility (SCF)

SCF is the HP online configuration facility for G-series RVUs. After you run SYSGENR to create the basic configuration, you must use SCF to configure the rest of the operating system objects. The only type of off-line configuration change that requires bringing your system down is a change to an ALLPROCESSORS paragraph entry in the CONFTEXT file. SCF is the tool you use for configuring and controlling all communications products.

The two main SCF interfaces used to configure local area network (LAN) and wide area network (WAN) connections are as follows:

SCF interface to the WAN subsystem	This SCF interface is used to configure and manage WAN and LAN connections for the following communications subsystems. It is also used to control access to the ServerNet wide area network (SWAN) concentrator. • AM3270 • ATP6100 • CP6100 • Envoy • EnvoyACP/XF • Expand • SNAX/APN • SNAX/XF • TR3271 • X25AM
SCF interface to the ServerNet LAN systems access (SLSA) subsystem	This SCF interface is used to configure components of the 6763 Common Communication ServerNet Adapter (CCSA), Ethernet 4 ServerNet adapters (E4SAs), Fast Ethernet ServerNet adapters (FESAs), Gigabit Ethernet ServerNet adapters (GESAs), Gigabit Ethernet 4-port ServerNet adapters (G4SAs), and Token-Ring ServerNet adapters (TRSAs) that connect a NonStop S-series server to an Ethernet or token-ring LAN. It is also used to configure the E4SAs that are used to connect the SWAN concentrator to the NonStop S-series server.

The following communications subsystems also have SCF interfaces:

- AM3270
- ATM
- ATP6100
- CP6100
- Envoy
- EnvoyACP/XF
- Expand
- NonStop IPX/SPX
- OSI/AS
- OSI/FTAM
- OSI/MHS
- OSI/TS
- PAM
- QIO
- ServerNet/FX adapter subsystem
- ServerNet Cluster subsystem
- External ServerNet SAN Manager subsystem
- SNAX/APN

- SNAX/XF
- SNAX/APC
- NonStop TCP/IP, NonStop TCP/IPv6, and Parallel Library TCP/IP
- TR3271
- X25AM

Subsystem-Specific Management Utilities

Certain communications subsystems, such as SNAX/HLS, Exchange/SNA, and EM3270, have their own management utilities, which are not described in this section. For more information about the utilities, consult the manuals for the products they control.

Name Management

In a complex system or network, it is important for operators to be able to manage subsystem resources without necessarily knowing the current names, locations, and relationships of large numbers of objects. Rather, operators must be able to find out about resource attributes and relationships—or be relieved of this burden by high-level management applications.

On NonStop S-series servers you can store object names and other information about objects in a database defined by the Distributed Name Service (DNS). DNS lets you define

- The subsystem with which an object is associated.
- The management process that controls the object.
- Object aliases that enable reference to the object by other than subsystem-defined names, including local aliases for remote objects.
- Groups of related objects. You decide which objects make up a group.
- Composite objects (objects known to multiple subsystems) and attributes such as which subsystems control the composite object and what those subsystems call the object.

You can distribute the DNS database to provide for centralized or distributed network control and to ensure the autonomy of any node in case the control node becomes temporarily inaccessible. DNS is useful to operators and to developers of management applications that integrate management of multiple products.

Control and Inquiry

To control the operational states of subsystem resources and to inquire about current status—such as whether a line is up or down—you use the same tools that you do to control the configuration; that is, you use SCF.

Fault and Event Management

There are several tools you can use to identify and manage problems and be alerted to other significant events that occur in your network.

Monitoring EMS Messages

Event Management Service (EMS) on page 4-6 introduces the EMS product. You can see displays of event messages on the system console by using the OSM Event Viewer or TSM EMS Event Viewer. Also, other applications can retrieve messages directly from EMS. You can use filters to programmatically select the subset of messages that interest you by using NonStop NET/MASTER MS.

For example, if you are running HP NonStop TCP/IP over the SLSA subsystem, you might want to monitor messages only from those two subsystems. If a certain device seems to be malfunctioning, you can review the most recent events pertaining to that device. You also have the option to monitor events as they occur or to review events that have occurred since a specific time. The event logs that EMS maintains are useful not only for day-to-day event management but also for longer-term network analysis.

EMS Analyzer

The EMS Analyzer product selects events from EMS log files. You specify parameters, such as subsystem ID, event number, text, start time, and stop time. EMS Analyzer allows you to examine and analyze information about the devices, subsystems, and applications on your server, without having to write or compile you own filters using the EMS filter language.

NonStop NET/MASTER MS

With NonStop NET/MASTER MS you can also view event information from SNA systems on your network. SNAX subsystems support a mechanism called SNAView, which allows passage of event information between NonStop S-series servers and SNA systems. SNAView is described in Section 7, HP NonStop S-Series Systems Network Architecture (SNA) Network Connections.

TSM and OSM Notification Applications

The TSM Notification Director and OSM Notification applications receive notifications from the NonStop S-series server and display them in the form of incident reports, allowing you to take action or dial-out the incident reports to your service provider for resolution.

HP OpenView

By using SNMP, you can manage NonStop servers with HP OpenView software. NonStop servers can forward EMS messages using the SNMP trap converter to OpenView Operations software to provide a consolidated enterprise event display.

Trace and PTrace

SCF includes a TRACE command that allows you to trace line and protocol events for any communications subsystem. The trace options vary with the product. Once the trace log is created, you use a program called PTrace to interpret the data. PTrace displays data from the trace log with labels on individual fields so that operators need not be familiar with the trace record format. (They must, however, be familiar with the protocol being implemented.)

Example 4-1. PTrace Display

```
15:19:01:570 >000.130 #91             TAPS L5 PROV
L5 I/O Completion  Su Name #Z000016  Session ID  23
File ID %H00011FA8  Tag %H00000005  DCB Addr %H001AD7DA
Count Transferred 00081  FS Error 00000  MCW %H0000
CN(Connect) SPDU
  Cxn Id(Calling):        (6)      4154 5441 4348
  Protocol Options: %H00           unable to receive extended concatenated
SPDUs
  Version Number: %H01             Vsn 1
  Token setting Item: %H01
    Release     MajorSync   MinorSync   Data

    initiator   initiator   initiator   responder
  Session User Rqmnts: %H0001
    HalfDuplex
  Calling S-Sel:          (3)      5555 02
  Called S-Sel:           (3)      5555 03
  User Data:              (40)     436F 6E6E 6563 7420 5265 7175 6573 7420
                            (40)     Connect Request
```

Performance Management

HP offers a growing set of performance tools. One of the most fundamental of these tools is Measure, which collects performance statistics from a wide range of products, including many communications subsystems. The operator specifies the objects to be measured and the sampling interval. The results are available to applications; in addition, operators can use the HP Enform report writer to query the log that Measure produces.

SCF also has features that support performance management. For example, you can use SCF to obtain statistics related to performance and resource consumption. You can use SCF to improve performance by adjusting the values of object attributes. Because several of the subsystems that support SCF have equivalent programmatic interfaces, you can also perform these functions programmatically.

The Availability Statistics and Performance (ASAP) monitoring tool provides graphical and tabular displays of system performance and network-object performance, object state, and entity threshold information. The Availability Statistics and Performance Extension (ASAPX) product integrates and extends ASAP monitoring capabilities to single and multinode application environments. For more information about ASAP, refer to the following manuals: *ASAP Client Manual*, *ASAP Server Manual, ASAP Extension Manual*, and *ASAP Migration Guide for NSX and OMF Users*.

Security Management

HP and Atalla Corporation, a HP subsidiary, also offers products that protect the security of some system and network resources. Atalla offers encryption products for NonStop S-series servers. For more information about Atalla products, see your HP or Atalla representative and product literature.

The Safeguard product lets you secure running processes and devices by granting access authority to only a specified set of users. Safeguard also prevents unauthorized users from logging onto the system.

NonStop NET/MASTER MS includes User ID Management Services (UMS), which maintains an encrypted profile that allows your system manager or security administrator to control operator access to functions and commands. Individual operator profiles can be set up to limit access to specific subsystem commands; UMS automatically tailors individual operator menus to display only authorized functions. Operators can even be restricted from using specific commands at certain times of the day or be limited to certain terminals. NonStop NET/MASTER MS software also maintains a detailed audit trail of operator commands, responses, and sign-on attempts entered from a terminal or through NCL procedures.

Other management products also have security features. For instance, SCF uses sensitive commands, which only certain users can perform. (In general, a sensitive command is one that affects the state or configuration of an object.) SCF also lets you log commands and responses for later review.

Finally, the Distributed Name Service (DNS) lets you specify the domain of a name, that is, the list of nodes that have copies of the name and related information. You can use this feature to restrict the set of users who can refer to an object or find information about it.

5 Expand Network

The Expand subsystem enables you to connect as many as 255 geographically dispersed HP servers to create a network with the reliability, capacity to preserve data integrity, and potential for expansion of a single HP server.

This section provides a high-level overview of the Expand subsystem by describing the following major features and capabilities:

Network Transparency

To a user or an application, every server in an Expand network appears to be part of a single server. When accessing a file or other resource on a server in an Expand network, a user or an application does not need to know which route to take to reach the destination or whether the destination is local or remote.

Interactive Access

When accessing a remote file or another resource interactively on an Expand network, you use the same command or utility that you would normally use to perform the task on your local server.

Programmatic Access

When accessing a file or another resource programmatically across an Expand network, you use the same procedure calls you would use when writing a local application. With a few exceptions, applications that were written to run in a local environment can be used virtually unchanged in a network environment.

Expand Subsystem and the HP NonStop Kernel

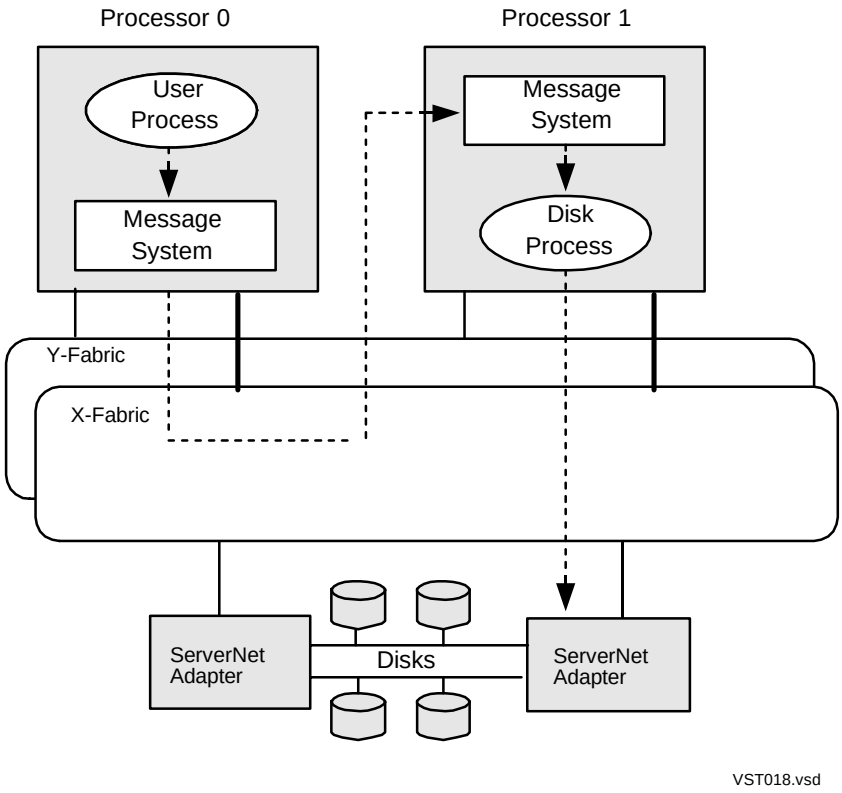
The Expand subsystem is an extension of the NonStop Kernel operating system. You can use the same methods for remote and local file access because the NonStop Kernel and the Expand subsystem provide a uniform, message-based interface between applications and operating system processes on different servers. The message-based interface has two parts: the file system and the message system.

The size of the message sent between Expand processes is determined by many factors.

Single-Server Process Communications

Figure 5-1 illustrates how a process on one processor uses the file system to make an inquiry of a process residing on another processor in the same server. The message system relays the request through the ServerNet system area network (ServerNet SAN).

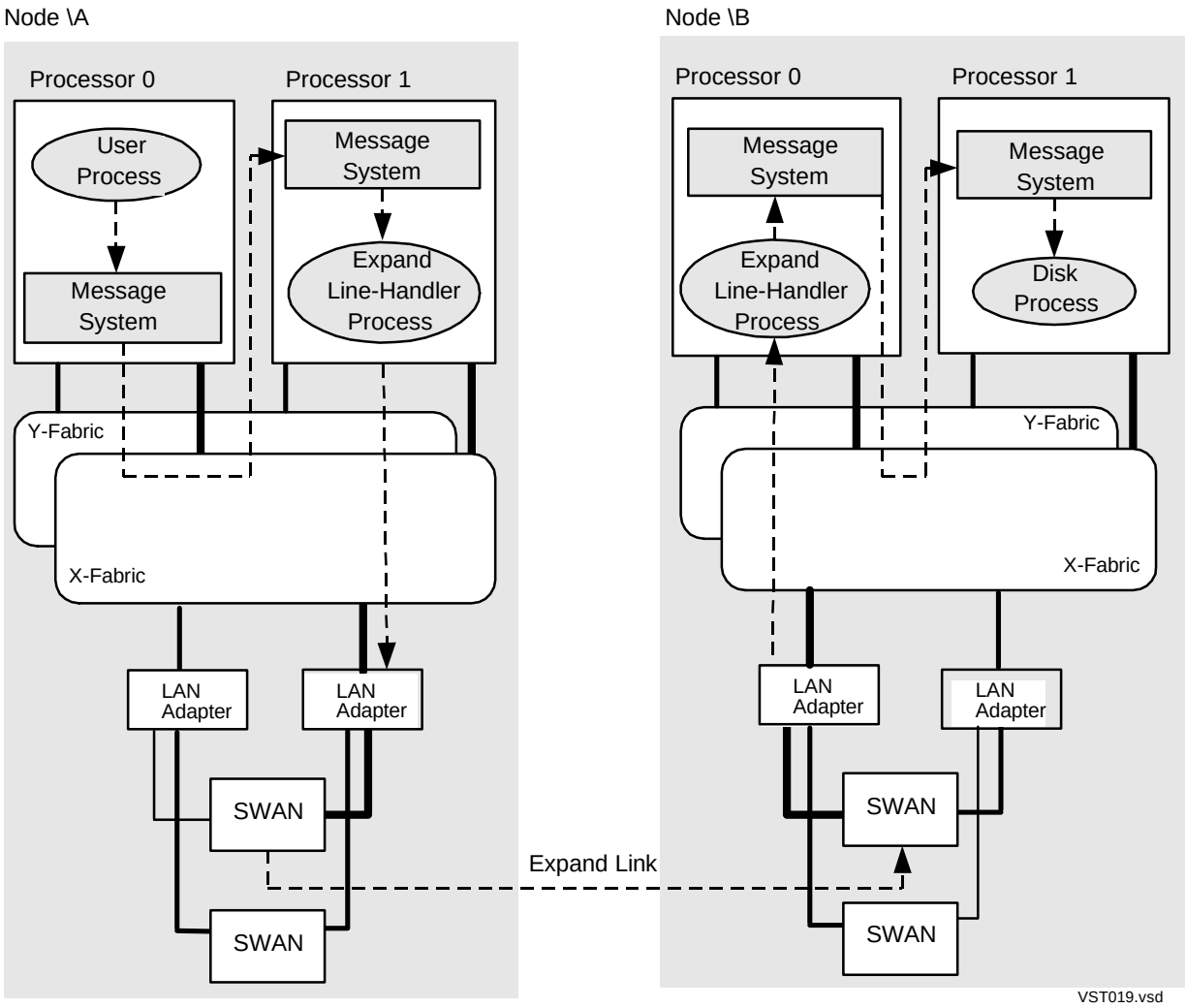
Figure 5-1. Single-Server Process Communications



Multinode Process Communications

Figure 5-2 illustrates the same file-system request as Figure 5-1, except that the disk process resides on another node in the network rather than on another processor in the same server.

Figure 5-2. Multinode Process Communications



Multinode process communications is the same as single-server process communications, with the following exceptions:

- The Expand subsystem redirects the file-system request to a hardware communications device.
- A communications line rather than the ServerNet SAN carries the message to the remote process.

Note. Incoming and outgoing messages usually bypass the Expand line-handler process and are handled directly by the ServerNet fabrics and the ServerNet/Fiber eXtension (ServerNet/FX) adapters when servers are connected by fiber-optic cables in a FOX ring. FOX rings are explained in Fiber-Optic Cables on page 5-5.

Multiple Communications Environments

Nodes in an Expand network can be connected using a variety of data communications technologies and protocols. A single network can consist of any combination of these different data communications methods.

Nodes in an Expand network can be connected by

- Full-duplex leased lines or satellite connections using the High-Level Data Link Control (HDLC) protocol
- X.25 virtual-circuit connections to a packet-switched data network (PSDN)
- Connections to IBM Systems Network Architecture (SNA) networks
- Local area network (LAN) or wide area network (WAN) connections to networks that use the Internet Protocol (IP)
- Local area network (LAN) or wide area network (WAN) connections to Asynchronous Transfer Mode (ATM) networks
- Multimode fiber-optic cables (FOX rings)
- Single-mode fiber-optic cables (ServerNet clusters)

Leased and Satellite Connections

You can connect Expand nodes with leased or satellite lines using either the HDLC Normal protocol or the HDLC Extended Mode protocol.

- The HDLC Normal protocol is provided for use with conventional voice-grade leased-line and switched-line facilities.
- The HDLC Extended Mode protocol is a satellite-efficient version of HDLC and is provided for use with satellite connections.

Note. There is no automatic dialing function within the Expand subsystem for dial-up lines.

X.25 Packet-Switched Networks

X.25 is a standard for private and public networks that use packet-switching technology. Some examples of packet-switched networks include SPRINTNET, TELENET, and TYMNET in the United States; DATAPAC in Canada; DATEX in Germany; TRANSPAC in France; and PSS in Great Britain.

Expand-over-X.25 connections are provided with the HP X.25 Access Method (X25AM) product. The Expand subsystem uses the NETNAM protocol to communicate with an X25AM line-handler process. X25AM is described in Section 8, Open Systems Interconnection (OSI) Network Connections.

Systems Network Architecture (SNA) Networks

SNA was developed by IBM for connecting IBM systems and networks. Expand-over-SNA connections are provided with the HP SNAX/Advanced Peer Networking (SNAX/APN) product. The Expand subsystem uses the NETNAM protocol to communicate with the SNAX/APN line-handler process. SNAX/APN is described in Section 7, HP NonStop S-Series Systems Network Architecture (SNA) Network Connections.

Internet Protocol (IP) Networks

An IP network adheres to the Internet Protocol—a computer-industry standard protocol. An ever-increasing number of public and private networks are based on IP, including the Internet itself. Expand-over-IP connections are provided with the NonStop TCP/IP product. NonStop TCP/IP is described in Section 10, TCP/IP Network Connections.

Asynchronous Transfer Mode (ATM) Networks

ATM is a cell-switching and multiplexing technology that combines the benefits of circuit switching (constant transmission delay and guaranteed capacity) with those of packet switching (flexibility and efficiency for intermittent traffic). Expand-over-ATM connections are provided with the ATM subsystem.

Fiber-Optic Cables

A **FOX ring** consists of two separate, bidirectional, fiber-optic rings and can connect as many as 14 servers in a limited geographical area. The ServerNet/Fiber eXtension (ServerNet/FX) adapters allow you to connect a NonStop S-Series server to an existing FOX ring. The existing FOX ring can consist of NonStop K-series and Cyclone systems.

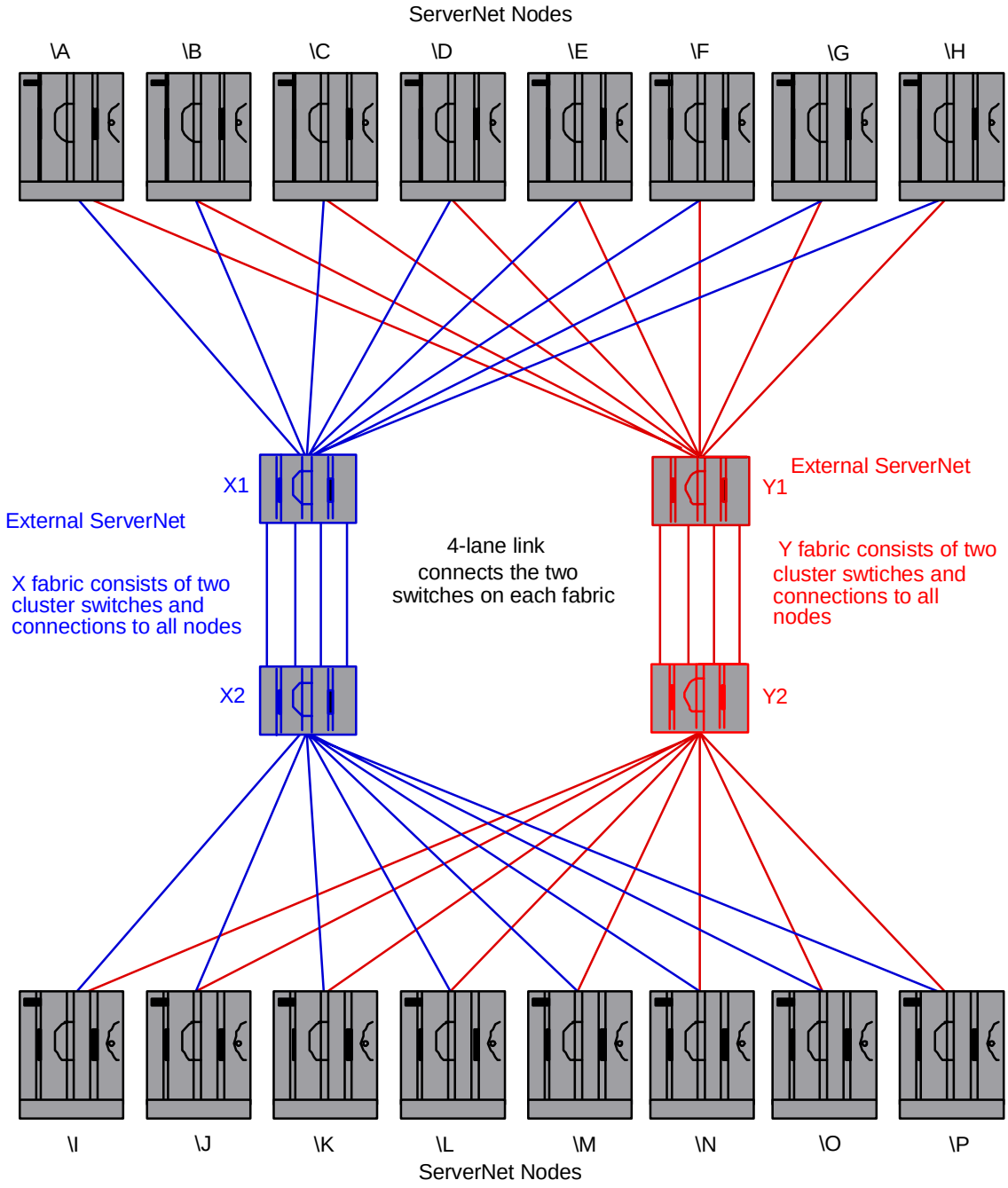
Note. FOX is an abbreviation for Fiber Optic eXtension. The term **FOX ring** is used in this manual to refer to networks that are connected using FOXII, TorusNet, or ServerNet/FX hardware.

ServerNet Clusters

ServerNet clusters use Expand to provide high-speed interconnections between servers. Cluster switches route messages between the ServerNet nodes. Coexistence between networking technologies such as ATM, IP, and FOX and ServerNet clusters is also supported. For more information about mixing networking technologies in an Expand network, see the *Expand Configuration and Management Manual*. For information about ServerNet cluster topologies, see the *ServerNet Cluster Manual* or the *ServerNet Cluster 6780 Planning and Installation Guide*.

Figure 5-3 shows a 16-node ServerNet cluster.

Figure 5-3. ServerNet Cluster Using Split-Star Topology



Two important subsystems are used to manage a ServerNet Cluster. The ServerNet Cluster (SCL) subsystem is the system configuration environment that enables ServerNet communication between processors in different nodes of a ServerNet Cluster. The external SAN manager (SMN) subsystem is the software environment that enables control of the external ServerNet fabrics.

Distributed Control

The control function of the Expand subsystem is distributed throughout the network. Unlike a hierarchical network, in which a central computer, or host, controls the communications environment, nodes in an Expand network communicate with each other as peers. Distributed networks have the following additional advantages:

- Distributed applications. Applications can be distributed so that multiple nodes share the processing load.
- Flexible network topologies. The network topology can be designed without regard to host or controlling processors.
- Network reliability. Failure of one node does not necessarily affect the operation of other nodes in the network.

Automatic Message Routing

The Expand subsystem's routing facilities ensure that a message sent from any node in the network will arrive at its destination as long as there is at least one active communications path available. The Expand subsystem's routing capabilities also include the following:

- Passthrough
- Best-path
- Priority

Passthrough Routing

The Expand subsystem uses a sophisticated routing scheme that permits intermediate nodes to route, or pass through, data packets to the destination node. This scheme reduces the number of lines required between nodes because nodes do not have to be directly connected in order to exchange data.

Best-Path Routing

When a message is sent over an Expand network, the Expand subsystem determines the best-path route to the destination node by calculating time factors (TFs) and the number of intermediate nodes (or hops) to the destination node. A TF is calculated for a line, path, or route. The best-path route is the route with the lowest TF and hop count (HC).

The Expand subsystem dynamically revises its best-path route determination if a node or path status changes when nodes or paths become operational or nonoperational. TF calculation and best-path route selection are discussed in the *Expand Configuration and Management Manual*.

Priority Routing

You can assign different priorities to messages sent over an Expand network. Priority routing allows an important message to reach its destination even when the network is congested.

Fault-Tolerant Operation

Using careful configuration and network-topology design, you can configure an Expand network to be continuously available.

You can configure as many as eight lines between the same two nodes using the Expand subsystem's **multiline path** feature. The Expand subsystem can simultaneously transmit data over all of the lines, thus increasing overall bandwidth, and will automatically reroute data over remaining lines if one or more lines fail.

You can configure as many as 16 paths between the same two nodes using the **Expand multi-CPU** feature. The Expand multi-CPU feature enables you to spread the communications load over multiple processors by connecting multiple Expand line-handler processes on separate processors at one node to Expand line-handler processes on separate processors on another node. The Expand subsystem transmits data between neighbor nodes over all of the paths in a multi-CPU path, and will automatically reroute data over remaining paths if one or more paths fail. The Expand subsystem also uses a rebalancing algorithm to ensure that the average communications load of all the paths in a multi-CPU path is close to equal.

You can also configure lines to be controlled by different communications hardware devices to ensure that a single hardware failure will not disable a connection between two servers.

Network Management

Network management involves several tasks, including

- Monitoring, modifying, and controlling the network
- Resolving network problems
- Analyzing and tuning network performance

The Expand subsystem supports a variety of network-management utilities and tools to help you perform these tasks:

- Subsystem Control Facility (SCF)
- Event Management Service (EMS)
- Availability Statistics and Performance (ASAP)
- Measure

Note. Refer to the *Expand Configuration and Management Manual*, for information on managing Expand using SCF.

Subsystem Control Facility (SCF)

SCF is a Distributed Systems Management (DSM) interface that can be used interactively to control, configure, and monitor the Expand subsystem. The SCF interfaces to the Expand and wide area network (WAN) subsystems are used to configure and manage the Expand subsystem. The SCF interface to the Expand subsystem is described in the *Expand Configuration and Management Manual*. The SCF interface to the WAN subsystem is described in the *WAN Subsystem Configuration and Management Manual*.

Event Management Service (EMS)

EMS is a DSM interface that provides event collection, logging, and distribution facilities. Both the Expand and ServerNet adapter subsystems report events to EMS. Event messages are described in the *Operator Messages Manual*.

Availability Statistics and Performance (ASAP)

The Availability Statistics and Performance (ASAP) monitoring tool replaces NSX and provides graphical and tabular displays of system performance and network-object performance, object state, and entity threshold information. The Availability Statistics and Performance Extension (ASAPX) product integrates and extends ASAP monitoring capabilities to single and multinode application environments. For more information about ASAP, refer to the following manuals: *ASAP Client Manual*, *ASAP Server Manual, ASAP Extension Manual*, and *ASAP Migration Guide for NSX and OMF Users*.

Measure

Measure is a tool for monitoring the performance of HP servers. In an Expand network, Measure can help determine node-to-node activity and processor and line use by Expand line-handler processes. Measure is described in the *Measure User's Guide.*

Online Expansion and Reconfiguration

You can add a new node or new lines to a network or move an existing node to a different location without disrupting network activity.

You can make changes to your Expand configuration online using the Subsystem Control Facility (SCF) interfaces to the Expand and WAN subsystems. Table 5-1 shows the online expansion and reconfiguration tasks that can be performed with these interfaces.

Table 5-1. Online Reconfiguration Tasks

Task	SCF for Expand	SCF for WAN
Adding the network control process	No	Yes
Adding an Expand line-handler process	No	Yes
Reconfiguring the network control process	Yes[1]	Yes[2]
Reconfiguring an Expand line-handler process	Yes[1]	Yes[2]
Deleting the network control process	No	Yes
Deleting an Expand line-handler process	No	Yes

1. Changes made with SCF for the Expand subsystem are temporary; they do not remain across system loads.
2. Changes made with SCF for the WAN subsystem are permanent; they do remain across system loads.

The SCF interface to the Expand subsystem is described in the *Expand Configuration and Management Manual*. The SCF interface to the WAN subsystem is described in the *WAN Subsystem Configuration and Management Manual*.

Network Security

The Expand subsystem provides security features to control access to remote servers and files.

Remote Passwords

To access a remote server, you must have a username and user ID on the remote server that is identical to those on the local server. You use the REMOTEPASSWORD command to set up two remote passwords for the local username and user ID: one to establish a remote password for the local server, and one to establish a remote password for the remote server. You again use the REMOTEPASSWORD command to set up remote passwords for the remote username and user ID.

Note. Setting up remote passwords is explained in the *Guardian User's Guide*.

Before you can access a file on a remote server, you must have the proper security as well as remote passwords for both the local and remote servers. Each file has associated security attributes that can be changed with the FUP SECURE command.

Enhanced Security Techniques

The Safeguard security system enhances the security provided by both the Expand subsystem and the NonStop Kernel operating system. Safeguard enables you to set password expiration dates, create access control lists, and audit file access.

For an even greater level of security, data encryption devices are available from the HP Atalla subsidiary. Atalla offers Network Security Processors (NSPs) that use industry-standard encryption routines to protect financial transactions.

6 Device-Specific Connections

Data communications permits the exchange of information among systems and devices that work together to perform a business function. The devices can range from workstations to automated teller machines, to factory robots, to gasoline pumps, to hand-held devices. Each device is likely to be manufactured by a different vendor, and each can follow a unique set of protocols for physically and logically connecting to other devices and systems.

An HP NonStop S-series server supports a wide range of device connectivity protocols, protecting your investment in existing equipment and allowing you to use those devices best suited to your particular application. This section describes the HP products that enable you to connect a wide range of devices to an HP NonStop S-series server. A Brief Look at Communications Protocols on this page discusses the communications protocols that govern the transmission of data between a device and a host computer. Following that subsection, types of connections are covered in the following order:

A Brief Look at Communications Protocols

Before addressing device connectivity, you should be acquainted with the communications protocols that govern the transmission of data between a device and a host computer.

Data-link control protocols are sets of rules that define how data is transferred and received between devices on a data link and how errors are handled. There are three main groups of data-link control protocols—asynchronous, byte-synchronous, and bit-synchronous—that correspond to two types of data transmission, which are described in the following subsections:

Asynchronous Data Transmission

In **asynchronous data transmission**, data is transmitted and received one character at a time, with each character preceded by a start bit and followed by one or more stop bits. The start bit tells the receiver that a character has arrived, and the stop bits tell the receiver where the character ends. Some asynchronous devices have a **block mode** in which the device saves characters, transmitting them only when the Enter or Return key is pressed.

Asynchronous protocols are most commonly used to connect a host system with devices that have limited buffer space (memory). Most of these protocols support

asynchronous, **half-duplex** (one way at a time) transmission of data across point-to-point links.

Synchronous Data Transmission

In **synchronous data transmission**, the data is transmitted in **blocks** (also called **frames** in some protocols). The beginning and end of the block are marked by special synchronization characters, but individual characters are not separated by special bits.

Byte-Synchronous Protocols

Byte-synchronous protocols use synchronous transmission; some similar byte-oriented protocols can also use asynchronous transmission. Among the typical characteristics of byte-synchronous protocols are two-way alternate (one way at a time) operation and the presence of control characters in the data stream. For instance, control characters delimit messages and message headers. The most common byte-synchronous protocol is IBM Binary Synchronous Control (BSC), of which there are three versions: 3270 BSC, 2780/3780 BSC, and conversational BSC.

Bit-Synchronous Protocols

Bit-synchronous protocols are the most efficient and flexible: they are synchronous and often operate in two-way simultaneous mode. (That is, messages can be traveling in both directions at the same time.) A message is a stream of bits delimited by bit patterns called **flags**. Control information, addresses, and data occur at known locations in a frame, so there is no need for control characters to label the information. Bit-synchronous protocols are typically used for high-speed communications.

Asynchronous, byte-synchronous, and bit-synchronous data-link control protocols vary in several essential characteristics, and a given protocol can offer a variety of options for

- The method that a device uses to gain access to the link, such as polling by the host system
- Whether the device is a peer to all other stations on the link or a secondary station to the host
- The method that a device uses to detect and recover from errors in transmission
- The format of the data for transmission on the link
- Whether transmission on the link is half-duplex or full-duplex

HP supports many industry-standard data-link control protocols. Still, there are devices that do not follow any of the protocols provided. HP offers interfaces that let you develop support for such devices; see Other Devices on page 6-13 for more information.

Industry-Standard Connections and HP Terminals

HP provides high-level software that permits communication between HP applications and various popular devices. These devices include asynchronous character-mode terminals, Systems Network Architecture (SNA) devices, and IBM batch terminals.

Table 6-1 lists some kinds of standard device connections and examples of software applications or interfaces that provide the communications protocol support. Appendix B, Communications Products by Type of Connection, also lists products that support various kinds of connections.

Table 6-1. Examples of Industry-Standard Connections

Type of Connection	Software Product or Interface
Standard asynchronous terminals	SWAN concentrator with ATP6100 subsystem AWAN servers with HP NonStop TCP/IP, NonStop TCP/IPv6, Parallel Library TCP/IP subsystem, and Telserv software
Standard serial printers	SWAN concentrator and SWAN 2 concentrator with WANPRINT printer software AWAN access server with HP FASTPTCP Spooler print process software
Asynchronous devices through X.25 PSDN	X25AM
IBM BSC 3270 devices	AM3270
3270-type SNA devices	SNAX 3270 interface

HP also provides products that allow operators and applications in the HP environment—for example, operators at terminals or applications running on workstations—to use applications on other vendors' systems and networks. Those products are described in IBM Hosts on page 6-9, Workstations on page 6-11, and Other Devices on page 6-13.

ServerNet Wide Area Network (SWAN) Concentrator Connections

The SWAN concentrator can support a combination of up to six synchronous and asynchronous lines, but it is optimized to perform best on locally attached Ethernet local area networks (LANs) in synchronous connections. The SWAN concentrator is designed for high-speed synchronous communication.

The ATP6100 subsystem provides the means for an application program to use asynchronous point-to-point terminals, printers, and other devices connected through the SWAN concentrator.

The SWAN 2 concentrator is a next-generation SWAN concentrator. The SWAN 2 concentrator is based on a faster processor.

Asynchronous Wide Area Network (AWAN) Server Connections

AWAN servers are optional products that provide local and remote asynchronous access to an HP NonStop S-Series server or K-series server, and other LAN-based resources. An AWAN server establishes a TN6530 session for 6530 applications or a standard TELNET session for OSS applications on behalf of the asynchronous terminal. The HP NonStop TCP/IP subsystem and Telserv software are required for such sessions. AWAN servers also support serial printers using HP FASTPTCP Spooler print process software. Serial printers are connected using RS-232 direct connections.

There are two families of AWAN servers that are available:

- AWAN Access Servers (3883, 3884, 3885)—are local area network (LAN)-based communications devices that provide asynchronous connections to HP 6530 terminals, 6530-compatible terminals, VT-series terminals, serial printers, and workstation-based 6530 and VT-series terminal emulators for NonStop S-Series and K-series servers. These servers supports multiple protocols, enabling users to connect to the AWAN access server simultaneously using different types of protocols.

  For more information about these servers, see the *AWAN 3883/4/5 Access Server Configuration and Management Manual* and the *AWAN 3883/4/5 Access Server Installation and Support Guide*.

- 3886 AWAN Servers (3886-08, 3886-16, 3886-32)—are similar in function to the AWAN Access Servers; the 3886 AWAN Servers are a local area network (LAN)-based communications devices that provide asynchronous connections to terminals, serial printers, and workstation-based 6530 and VT-series terminal emulator for NonStop S-Series and K-series servers. A 16-port current loop module for AWAN 3886-16 and 3886-32 servers is also available. AWAN support is enabled by inserting a 3886-6530 flash RAM card.

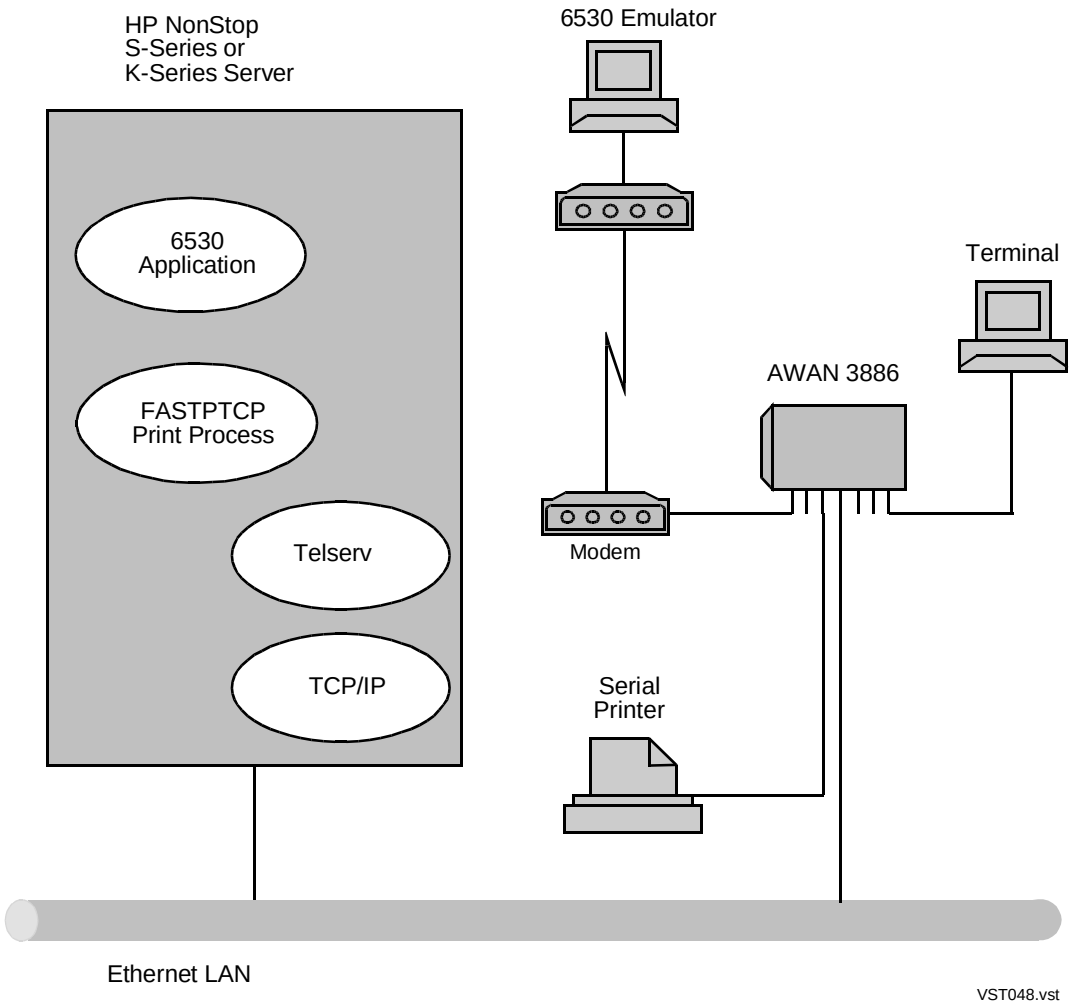
  For more information on AWAN 3886 servers, see the *AWAN 3886 Server Installation and Configuration Guide.*

Both families of AWAN servers support:

- The HP Tandem Transparent Protocol (TTAP)
- Non-TTAP printers
- NonStop K-series and NonStop S-Series systems
- Current loop

All AWAN servers also support HP ATP6100 *if* GAP, a third-party product, is used. GAP was developed by Gemini Communications (http://www.geminic.com).

Figure 6-1. Typical Network Configuration with an AWAN 3886 Server



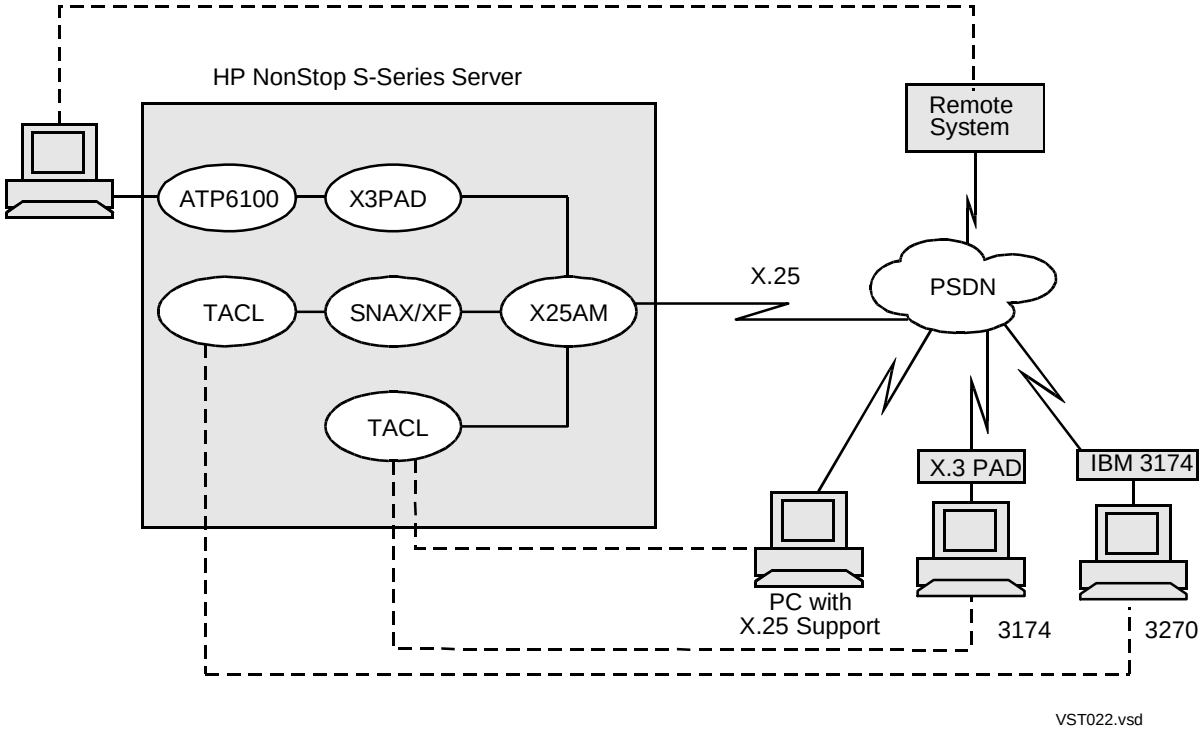
X.25 PSDN Connections

You can connect NonStop S-series servers with other systems and devices, including asynchronous terminals, on an X.25 **packet-switched data network (PSDN)** by using X25AM. X25AM supports full-duplex communications. Each X25AM line can support approximately 230 active connections; multiple terminals can be supported through a **packet assembler/disassembler (PAD)**, which then connects to a NonStop S-series server through a single line. X25AM is described in Section 8, Open Systems Interconnection (OSI) Network Connections.

X3PAD helps you to connect asynchronous terminals with X25AM. X3PAD is a software application that emulates a conversational terminal attached to a PAD. It allows a terminal connected to a NonStop S-series server to connect to X25AM software, which in turn allows access to a system other than a NonStop S-series server (or other type of NonStop server) across an X.25 PSDN. The terminal can operate only in conversational mode.

Figure 6-2 on page 6-7 shows terminals connected to remote systems across an X.25 PSDN using X25AM and X3PAD. You can also use X3PAD to transfer information between a Guardian file and a system other than a NonStop server across an X.25 PSDN. The figure also shows various ways that applications on NonStop S-series servers can communicate with terminals across an X.25 PSDN. In fact, X25AM can be configured to communicate with X.25-compatible terminals without an intervening PSDN.

Figure 6-2. Terminal Access to X.25 PSDN



IBM BSC 3270 Devices

You can use the AM3270 input/output process (IOP) to connect IBM 3270 devices to your NonStop S-series server. The devices must be connected to a point-to-point or multipoint line controlled by the BSC protocol. AM3270 allows application programs on a NonStop S-series server to communicate with terminals and printers on the line by using file-system procedure calls. When used in conjunction with the TR3271 IOP, it supports a passthrough configuration in which data is transferred transparently between an IBM host and 3270 terminals attached to the NonStop S-series server. (TR3271 controls the line to the host, and AM3270 controls the line to the terminals.)

HP page-mode products such as Pathway/TS and PS Text Edit (TEDIT) support 3270 terminal formatting, making it easy to use those devices with NonStop S-series servers. An AM3270 IOP can support up to 64 devices.

3270-Type SNA Devices

SNA devices such as 3270-type terminals and printers can be connected with HP applications through the high-level 3270 interface of the SNAX/XF and SNAX/APN software products. (The interface is functionally equivalent to AM3270 and TR3271 but supports devices using bit-synchronous protocol.) For more information about connecting SNA devices, see Section 7, HP NonStop S-Series Systems Network Architecture (SNA) Network Connections.

HP 6530-Family Terminals and Terminal Emulators

HP 6530 terminals and terminal emulators interact with a NonStop S-series server in two different modes:

Conversational mode	The terminal interacts with the host character by character.
Block mode	The terminal transmits and receives blocks of characters. Up to 12 individually addressable pages of data can be stored in memory at one time.

You can connect HP terminals to your NonStop S-series server using X25AM for X.25 connections, or SNAX/XF for multipoint connections, in addition to LAN connection methods using the AWAN access server or the AWAN 3886 family of servers.

Finally, HP offers a product called EM3270, which allows an HP terminal or HP workstation to emulate an IBM 3270 terminal. This product is suitable when you want the same HP terminal or workstation attached to a NonStop system to use applications on both the NonStop S-series server and the IBM host.

IBM Hosts

NonStop S-series servers can connect with IBM host computers in several ways: by emulating a cluster controller or host node (SNAX/APN), via a SDLC, a token-ring, or an Ethernet connection. Additionally, a 3270 emulator lets users at HP 6530 family of terminals use applications on an IBM host. Section 7, HP NonStop S-Series Systems Network Architecture (SNA) Network Connections, describes products that support connection with IBM hosts.

Batch Mode

Users and applications on NonStop S-series servers can communicate with IBM hosts in batch mode using the Exchange products, which emulate various batch devices.

Exchange/RJE (remote job entry) emulates an IBM 2780/3780 binary synchronous workstation or its equivalent. It supports connection with IBM hosts that use binary synchronous communications. Exchange/RJE uses the Envoy or CP6100 IOP for link-level functions.

Exchange/SNA emulates an SNA workstation, supporting simultaneous transmission of multiple data streams. It supports connection with IBM hosts that use the SNA protocol. Exchange/SNA requires SNAX/XF.

Cluster Controller Emulation

Two products enable NonStop S-series servers to communicate with IBM hosts as if the NonStop S-series server were an IBM cluster controller: TR3271 and SNAX/XF.

TR3271 is an IOP that gives the NonStop S-series server the appearance of an IBM binary synchronous cluster controller. With TR3271, applications on the NonStop S-series server can communicate with the IBM host, or you can set up a passthrough configuration with AM3270, allowing IBM 3270 terminals attached to the NonStop server to communicate transparently with the IBM host.

SNAX/XF is an IOP that gives the NonStop S-series server the appearance of an SNA cluster controller to an SNA host. Using passthrough configuration, SNA devices attached to the NonStop S-series server can communicate with the SNA host. Section 7, HP NonStop S-Series Systems Network Architecture (SNA) Network Connections, describes SNAX/XF in detail.

Host Node Emulation

Advanced peer-to-peer networking (APPN) is an extension of SNA that enables a variety of SNA systems to communicate as peers, without the control of a host. The peer systems must all have the requisite software to function as type 2.1 nodes. There are three types of type 2.1 nodes, with increasing capabilities:

- Low-entry networking (LEN) node
- End node
- Network node

The base SNAX/APN product enables a NonStop S-series server to participate in this environment as a LEN node; the extended version, SNAX/APN-EN, enables a NonStop S-series server to act as an end node. Section 7, HP NonStop S-Series Systems Network Architecture (SNA) Network Connections, describes SNAX/APN in detail.

SNAX Token-Ring Connections

You can connect a NonStop S-series server to a token-ring LAN using SNAX/XF or SNAX/APN. SNAX/XF supports token-ring connections; SNAX/APN supports non-switched token-ring connections. The Port Access Method (PAM) subsystem and a Token-Ring ServerNet adapter (TRSA) are required for token-ring connections.

SNAX Ethernet Connections

The QIO and SLSA subsystems and either an Ethernet 4 ServerNet adapter (E4SA) or a Fast Ethernet ServerNet adapter (FESA) are required for SNAX/XF and SNAX/APN Ethernet connections. Pure SNA over TCP/IP is not supported.

Workstations

Workstations—including personal computers (PCs), UNIX workstations, and others—have the ability to process data using applications residing in their local memory. HP offers products that support the integration of the more popular types of workstations with NonStop S-series servers. This integration is achieved through the following methods:

Cooperative processing	The workstation and NonStop S-series server function as peers; separate applications running in each computer together provide transaction-processing (TP) functions.
Terminal emulation	The workstation emulates a supported terminal; the workstation user logs onto a NonStop S-series server and issues Guardian commands. A terminal emulator on the workstation communicates with software on the NonStop S-series server.
File transfer	Files may be transferred from the workstation to the NonStop S-series server for file backup and archiving or to enable file access by other users. Guardian files may also be downloaded to workstations for user modification.

Table 6-2 lists types of workstation connections provided by HP for the NonStop S-series server and the software products that together provide each connection.

Table 6-2. Workstation Connections

Type of Connection	Software Products Required
System consoles	None*
UNIX workstations	HP NonStop TCP/IP over SLSA or X25AM

*The networking hardware and software required to connect to a system console workstation is provided with your NonStop S-series server.

System Consoles

A **system console** is an HP-approved personal computer used to run maintenance and diagnostic software for HP NonStop S-series servers. A system console requires additional HP software and third-party software plus an HP-approved modem to use all the functionality provided by the OSM and TSM applications.

Only PCs provided by HP can be used as system consoles. Starting with G06.22, PCs provided by HP for use as system consoles come preloaded with the software necessary to run OSM applications (TSM applications can be installed from the HP NonStop System Console Installer CD).

System consoles configured as the primary and backup dial-out points are referred to as the primary and backup system consoles, respectively.

System consoles communicate with NonStop S-series servers over a dedicated local area network (LAN) or a nondedicated (public) LAN.

UNIX and Other Workstations

NonStop TCP/IP includes a component called TELNET, which allows workstations on an Ethernet LAN, or over the entire internet, that have implemented the TCP/IP protocols to log onto HP applications in conversational mode. NonStop TCP/IP also allows users on a NonStop S-series server to log onto workstations and hosts on the LAN and run remote applications.

NonStop TCP/IP also supports a variety of terminal emulators, which allow UNIX workstations to emulate an HP terminal. This feature enables a user on a Sun workstation, for example, to log onto a Pathway page-mode application and execute transactions. Other workstation users can log onto and use Pathway applications in conversational mode. Emulators are available for Sun workstations and PCs and for UNIX workstations or LAN servers supporting the X-Windows system.

The TN3270 server product supports the standard TN3270 TCP/IP protocol used by IBM 3270 emulators running on workstations.

NonStop TCP/IP supports both Ethernet LANs and X.25 packet-switched data networks (PSDNs). NonStop TCP/IP is described in Section 10, TCP/IP Network Connections.

Other Devices

If the device you need to connect to a NonStop S-series server is not supported by the IOPs already described, HP provides additional products that allow you to develop customized device-handling applications. Table 6-3 shows products for supporting other types of devices on the HP NonStop S-series server. Many custom device-handling applications are currently available from HP Alliance partners.

Table 6-3. Other Device Connections

Type of Connection	Software Product or Interface
Non-3270 SNA devices	SNAX/APC (LU 6.2), SNALU, SNAX/HLS
Bit-synchronous (ADCCP, SDLC, HDLC) devices	EnvoyACP/XF, CP6100
Byte-synchronous, asynchronous devices	Envoy, CP6100
General device support	Extended General Device Support (GDSX)

Non-3270 SNA Devices

HP provides three interfaces that allow you to connect non-3270 SNA devices (including IBM hosts and intelligent devices) with HP applications:

- SNAX Advanced Program Communication (SNAX/APC)
- SNAX High-Level Support (SNAX/HLS)
- SNAX Application Logical Unit (SNALU)

These interfaces are available for use with the SNAX Extended Facility (SNAX/XF) and SNAXAPN. Section 7, HP NonStop S-Series Systems Network Architecture (SNA) Network Connections, describes SNAX/XF and SNAX/APN. Figure 2-6 on page 2-16 is a diagram of SNAX products and their relationships.

SNAX/APC

SNAX/APC is a high-level interface that uses SNA LU 6.2 protocols and allows applications on a NonStop server to communicate with other devices running LU 6.2 applications.

SNAX/HLS

SNAX/HLS is a high-level interface that allows HP applications to communicate with LU types other than LU 6.2 in non-3270 SNA devices.

SNALU

SNALU provides a lower-level interface than SNAX/HLS, letting you develop applications to communicate with other non-3270 SNA devices. Using SNALU requires that you have a complete understanding of the SNA protocols for the device.

Bit-Synchronous Protocol Support

HP provides two products that you can use to support bit-synchronous devices other than SNA devices: EnvoyACP/XF and CP6100. The first is described here; the second in General-Purpose Protocol Support on page 6-14. The two products have different programmatic interfaces; both products use the SWAN concentrator.

EnvoyACP/XF supports the following bit-synchronous protocols on either a point-to-point or multipoint, switched or leased line:

- Synchronous Data-Link Control (SDLC)
- High-Level Data Link Control (HDLC)
- Advanced Data Communications Control Procedures (ADCCP)

Developing an application that uses EnvoyACP/XF requires that you have detailed knowledge of the protocol.

General-Purpose Protocol Support

HP provides three products that you can use to support a wide range of protocols. Two of them are IOPs and are described here. The third is a higher-level product that you use with an IOP and is described in Developing Your Own Front-End Process on page 6-15.

Envoy is an IOP pair that supports a large number of byte-synchronous and asynchronous protocols, including IBM BSC, SWIFT, ADM-2, and Burroughs, in addition to full-duplex binary synchronous communications, and a generalized asynchronous supervisor. Envoy is a low-level interface that requires that you have detailed knowledge of the protocol you need.

CP6100 is a general-purpose IOP pair that supports asynchronous, byte-synchronous, or bit-synchronous protocols. CP6100 can be used for system-to-system data transmission or for transmission between a NonStop S-series server and various devices.

CP6100 passes application data to protocol modules on the communications line interface processor (CLIP) of the SWAN concentrator. Each protocol module controls a single communications line. The following protocol modules are available from HP:

- **6100 BSC Point-to-Point**. Allows a NonStop S-series server to be either a primary or secondary station on a binary synchronous point-to-point line.
- **6100 BSC Multipoint Supervisor**. Allows a NonStop S-series server to act as supervisor on a binary synchronous multipoint line.

- **6100 BSC Multipoint Tributary.** Allows a NonStop S-series server to act as a tributary on a binary synchronous multipoint line.
- **6100 ADCCP**. Allows a NonStop S-series server to be a supervisor, tributary, or combined station on an ADCCP, HDLC, or SDLC bit-synchronous line.
- **6100 Multipoint Supervisor Burroughs**. Allows a NonStop S-series server to act as a supervisor on a multipoint line for terminals using the Burroughs Basic Poll/Select protocol, the NCR Multipoint protocol, or the protocol for Lear-Siegler ADM-2 Data Display Terminals with the polling option.
- **SWIFT.** Allows a NonStop S-series server to be either a primary or secondary station on a SWIFT I or SWIFT II line.
- **Generalized Full-Duplex Protocol**. Allows the NonStop S-series server to act as supervisor of a full-duplex asynchronous or synchronous line.

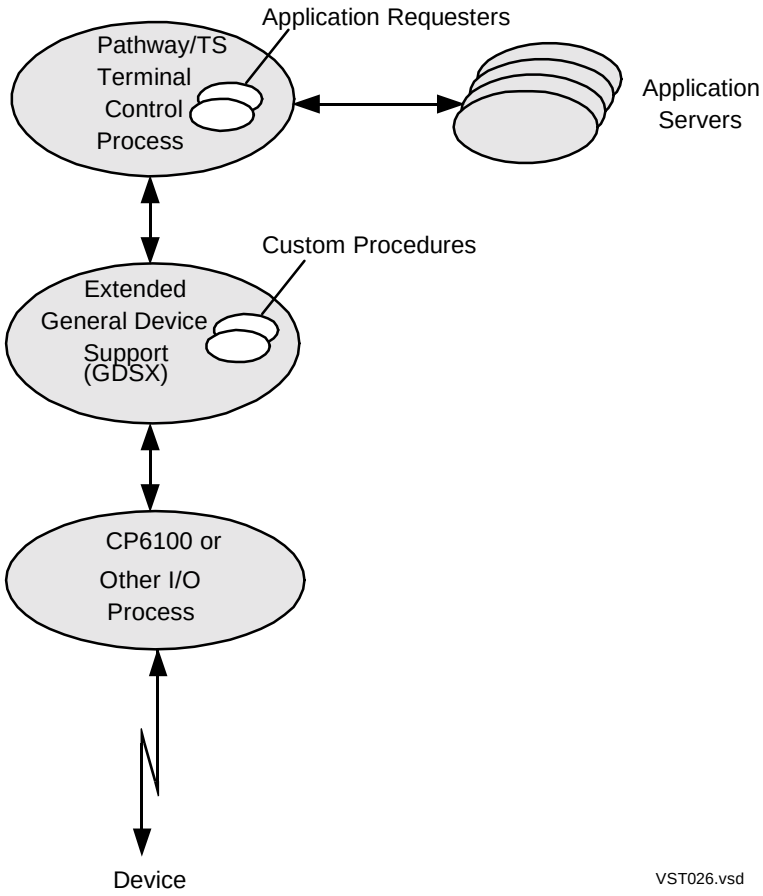
Envoy and CP6100 differ in a few important respects. They have different programming interfaces and run on different hardware. Also, there are some differences in the selection of protocols supported. In general, CP6100 supersedes Envoy.

Developing Your Own Front-End Process

Extended General Device Support (GDSX) is a skeleton process that you fill in to support nonstandard devices. A GDSX process acts as an interface between an application execution environment, such as Pathway/TS, and an IOP such as CP6100, ATP6100, or X25AM. The GDSX process simulates a supported terminal type and converts data to and from the required protocol format. The GDSX product consists of generic routines and services that allow you to create a multithreaded process pair; you add procedures that provide specific communications functions.

Figure 6-3 illustrates the structure of GDSX and its typical role in a Pathway environment.

Figure 6-3. Extended General Device Support (GDSX)



Device-Connection Application Example

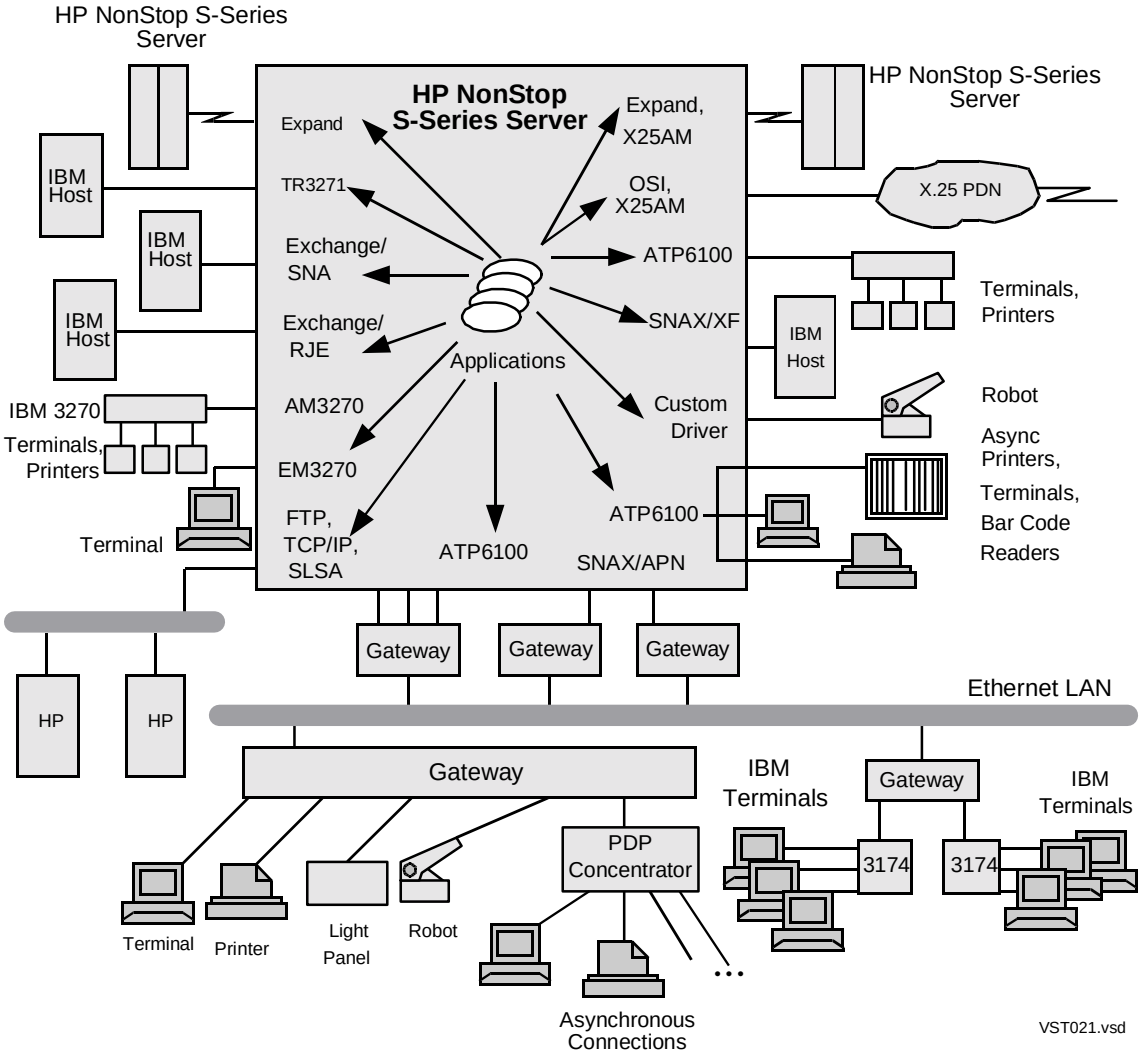
Figure 6-4 on page 6-18 is an example of how an automobile manufacturer might use a network of NonStop S-series servers for three related applications. One application schedules production, monitors the assembly process, and issues component supply instructions; it communicates with a central site to receive production requirements and report actual output. The second application manages the parts inventory, tracking components through receipt, quality control, and ultimate use; it communicates with an accounting program to ensure that the company pays only for accepted parts. The second application also maintains an inventory of stock locations and issues choose orders to satisfy component supply instructions. The third application is a messaging system for transferring documents among the sites and between the company and its suppliers.

The three applications require connection between the NonStop S-series servers at the three assembly plants and between those systems and many other kinds of devices and networks including:

- Asynchronous terminals, printers, bar code readers, light panels, and robots
- IBM 3270 devices and IBM 3770 and 3780 remote job entry (RJE) terminals
- Ethernet LANs
- X.25 PSDNs
- Various gateway devices

In addition to supporting all the required connections, the NonStop S-series servers offer the reliability and expandability critical to this large and growing manufacturing operation.

Figure 6-4. Device-Connection Application Example



7

HP NonStop S-Series Systems Network Architecture (SNA) Network Connections

HP is a recognized leader in providing system interfaces to IBM Systems Network Architecture (SNA) networks. These interfaces include batch and interactive SNA device emulation, distributed online transaction processing (OLTP), and network management services through NonStop NET/MASTER Management Services (MS) software. The HP SNAX product family is the group of products that lets you incorporate HP OLTP applications into an existing SNA network.

This section describes the products and facilities that allow HP NonStop S-series servers and HP NonStop networks to communicate with IBM SNA systems and networks. After A Brief Look at SNA on page 7-1 and Advantages of the SNAX Product Family on page 7-4, the section discusses three types of interaction that SNAX products support:

- SNA Devices Using HP Applications on page 7-6
- HP Devices Using SNA Applications on page 7-14
- Cooperative Processing With SNA Systems on page 7-14

The remainder of the section covers the following topics:

- SNA Subsystem Management on page 7-16
- SNA Application Example on page 7-18

A Brief Look at SNA

To satisfy requirements for connection of dissimilar devices and sharing of resources such as terminals, lines, and applications, IBM introduced SNA in 1974. Since that time, SNA has been a major factor in networking: a large proportion of existing networks include systems and devices based upon the IBM SNA model. SNA is a layered architecture, with each layer corresponding to a specific set of communications functions.

Node Types

Systems and some other devices in an SNA network are called **nodes**. Nodes are characterized by their unique functions. There are four node types as follows:

Node type 5	This node type, which is also referred to as a **host node**, contains an SNA access method, such as Advanced Communications Function/Virtual Telecommunications Access Method (ACF/VTAM), and controls all network components; in a network with multiple hosts, each host node controls a subset of the network, called a **domain**.
Node type 4	This node type, which is also referred to as a **communications controller node**, runs Advanced Communications Function/Network Control Program (ACF/NCP) under the direction of a host node and controls the attached links and workstations.
Node type 2	This node type, which is also referred to as a **peripheral node**, can be a workstation, a cluster controller and connected workstations, or a distributed processor.
Node type 2.1	Nodes of this type, which include **low-entry networking (LEN) nodes**, **end nodes**, and **network nodes**, can communicate as peers, without the control of a host.

Network Addressable Units (NAUs)

Each node contains **network addressable units (NAUs)**—logical entities that allow control and manipulation of node resources. There are three kinds of NAUs:

Logical units (LUs)	An LU provides end users, including applications, with access to the network; a node can have multiple LUs, one LU, or none at all. (A node that does not support end users need not have an LU.)
Physical units (PUs)	A PU manages resources of its node and supports communication between nodes; PUs correspond, in general, to kinds of physical devices—for example, a host node, a communications controller, or a terminal.
System service control points (SSCPs)	An SSCP resides in a host node and provides services for controlling network resources. An SNA domain consists of an SSCP and the resources it controls.

Different types of LUs and PUs are distinguished by number. For example, a PU of type 4 resides in a communications controller. An LU of type 6.2 is a particular type of SNA LU that provides a connection between its transaction programs and network resources. Each LU 6.2 makes a set of resources available to its transaction programs, thus facilitating interprogram communication and making it possible to distribute

portions of a transaction among multiple programs within a network. The programs coordinate the distributed processing by exchanging control information or data.

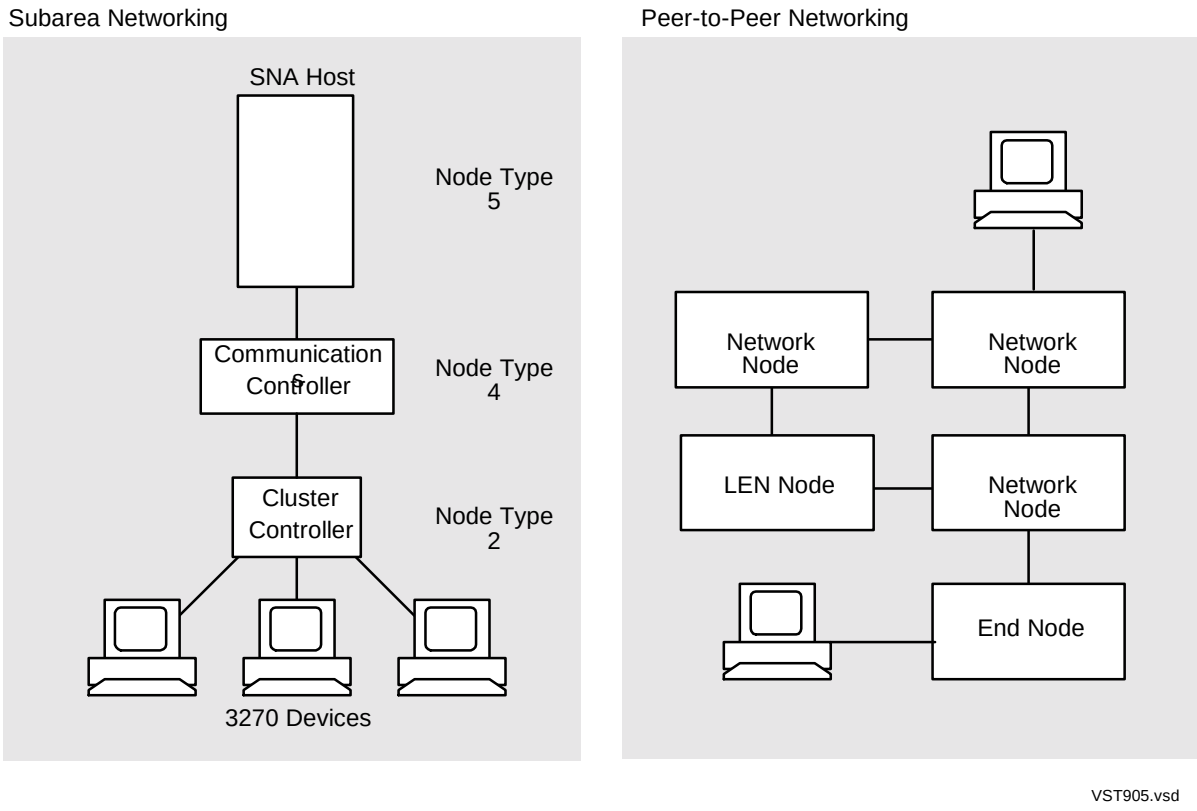
Subarea Networking

An SNA network can have multiple **subareas**; each subarea has an address, and all addresses within a subarea are unique. A subarea can consist of either a host (node type 5) and its resources or a communications controller (node type 4) and its resources. Thus, a domain that includes a communications controller can include multiple subareas: the host is defined as one subarea, and the controller and its resources are defined as another subarea.

Peer-to-Peer Networking

Advanced peer-to-peer networking (APPN) is an extension of SNA that enables a variety of SNA systems (such as PS/2, AS/400, System/38, System/370, and System/390) to communicate as peers, without the control of a host. The peer systems must all have the requisite software to function as type 2.1 nodes.

Figure 7-1. SNA Terminology Illustrated



Advantages of the SNAX Product Family

The SNAX product family is noteworthy for its support for large configurations, and for the ease with which you can develop new applications or convert existing ones to run on an HP NonStop S-Series server. Several key features of the SNAX product line are described in the following subsections:

SNA Host Functions

Using the SNAX Advanced Peer Networking (SNAX/APN) product, the NonStop S-series server can function as a host (node type 5) when interacting with terminals or can serve as an SNA type 2.1 node. With the base SNAX/APN product, the NonStop S-series server acts as a LEN node; with the extended version, SNAX/APN-EN, it acts as an end node.

Comprehensive Session and Protocol Support

SNAX products support a large range of SNA sessions and protocols. They support LU types 0, 1, 2, 3, 4, 6.2, and 7. SNAX Extended Facility (SNAX/XF) supports sessions with many kinds of SNA applications and devices attached to a NonStop S-series server.

Transmission Options

Not only do SNAX products support many kinds of sessions, but they also give you flexibility in transmission options. For instance, transmission options for SNAX/XF include the ability to run over switched lines, leased lines, token-ring and Ethernet local area networks (LANs), or X.25 network connections. X.25 support implies that the NonStop S-series server communicates with the IBM NCP Packet Switching Interface (NPSI) on the SNA communications controller.

Flexible Requester-Server Roles

With SNAX products, the part of your application that runs on the NonStop S-series server can open and use external systems or devices as application resources or can wait for an initiation request from a remote system or device. SNAX subsystems communicate with the SNA requester even if no application is running on the NonStop S-series server. HP applications can be either requesters or servers with respect to SNA devices.

Integration With Existing Networks

With SNAX products, NonStop S-series servers can be added to SNA networks with minimal changes to the system configurations in the SNA network. You need not install any software on the IBM host. With the base SNAX/APN product, the NonStop S-series server can function as a LEN node; with the extended version, SNAX/APN-EN, it acts as an end node.

Online Reconfiguration

Once the physical hardware is defined, you can dynamically change the configuration of SNAX products using the Distributed Systems Management (DSM) Subsystem Control Facility (SCF). You can add, delete, start, and stop most resources dynamically and can change session parameters such as device or LU type.

High-Level and Low-Level Interfaces and Development Tools

To facilitate application development, the SNAX product set offers numerous programmatic interfaces: a high-level interface for communicating with 3270 terminals; a low-level interface (SNALU) that lets you control SNA message flows; a high-level interface—SNAX Advanced Program Communication (SNAX/APC)—for communicating with LU 6.2 applications; and a high-level interface—SNAX High-Level Support (SNAX/HLS)—for communicating with LU types 0, 1, 2, 3, 4, and 7. The SNAX/APC and SNAX/HLS products include application prototypes services and other program-development aids.

SNAX Common Programming Interface for Communications (SNAX/CPI-C) works with SNAX/APC and uses the LU 6.2 protocol. SNAX/CPI-C provides an easy-to-use, platform-independent programming interface for transaction programs (TPs) that require program-to-program communication.

Passthrough and Application Switching

To facilitate integration of NonStop S-series servers into SNA networks and to support migration of applications to NonStop S-series servers, one SNAX product, SNAX/XF, supports a feature called **passthrough**. This feature allows a 3270 terminal attached to the NonStop S-series server to switch between HP and IBM applications. SNAX/XF supports session network services: users log onto HP applications using IBM procedures. No IBM host resources are required once the user has logged on. Passthrough facilitates migration because it makes it easy for you to add HP applications while maintaining the IBM style of user interface and access to SNA applications that still run in other domains.

SNA Devices Using HP Applications

The SNAX/XF, SNAX/APN with the extended logon facility (XLF), and the SNAX/APN-EN with either XLF or the enhanced logon facility (ELF) products allow you to use existing SNA devices—such as 3270-type terminals, ATMs, intelligent controllers, and manufacturing-floor terminals—with applications running on NonStop S-series servers. The same devices you use with applications on NonStop S-series servers can also use applications in the SNA environment.

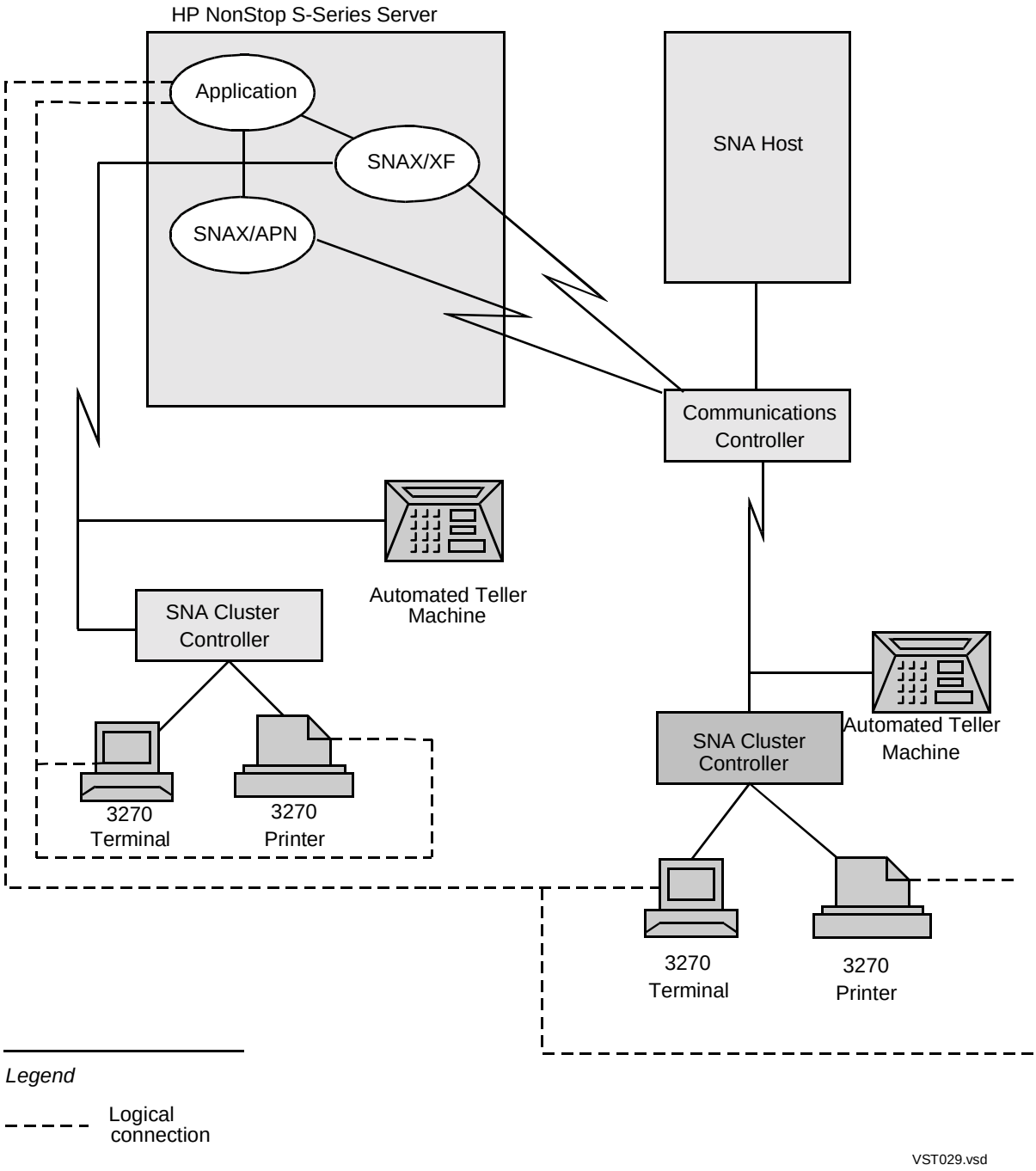
SNAX/XF software enables a NonStop S-series server to both serve and control attached SNA type 2.0 and type 1 nodes. For example, the attached node might be an SNA cluster controller, branching to multiple 3270 display stations and printers. Another example of an attached node might be an IBM personal computer (PC) in 3270 emulation mode. The SNA devices can log onto, or be acquired by, applications running anywhere in the Expand network.

SNAX/XF, SNAX/APN, and SNAX/APN-EN provide solutions for serving SNA devices that are controlled by a separate SNA host. The NonStop S-series server and SNA devices can be in the same SNA network, directly connected SNA networks, or remotely connected SNA networks. This provides, for example, an easy method of giving an existing network of SNA devices access to HP applications. The SNA devices can log onto, or be acquired by, applications running anywhere in the Expand network.

If you require HP applications to be started dynamically when devices log on, you need SNAX Creator-2 software (for SNAX/XF or SNAX/APN). This software starts the requested HP application, typically a TACL process or Pathway application that uses one of the SNAX/XF or SNAX/APN APIs.

Figure 7-2 shows an HP application used by SNA devices using SNAX/XF and SNAX/APN.

Figure 7-2. SNA Devices Using HP Applications



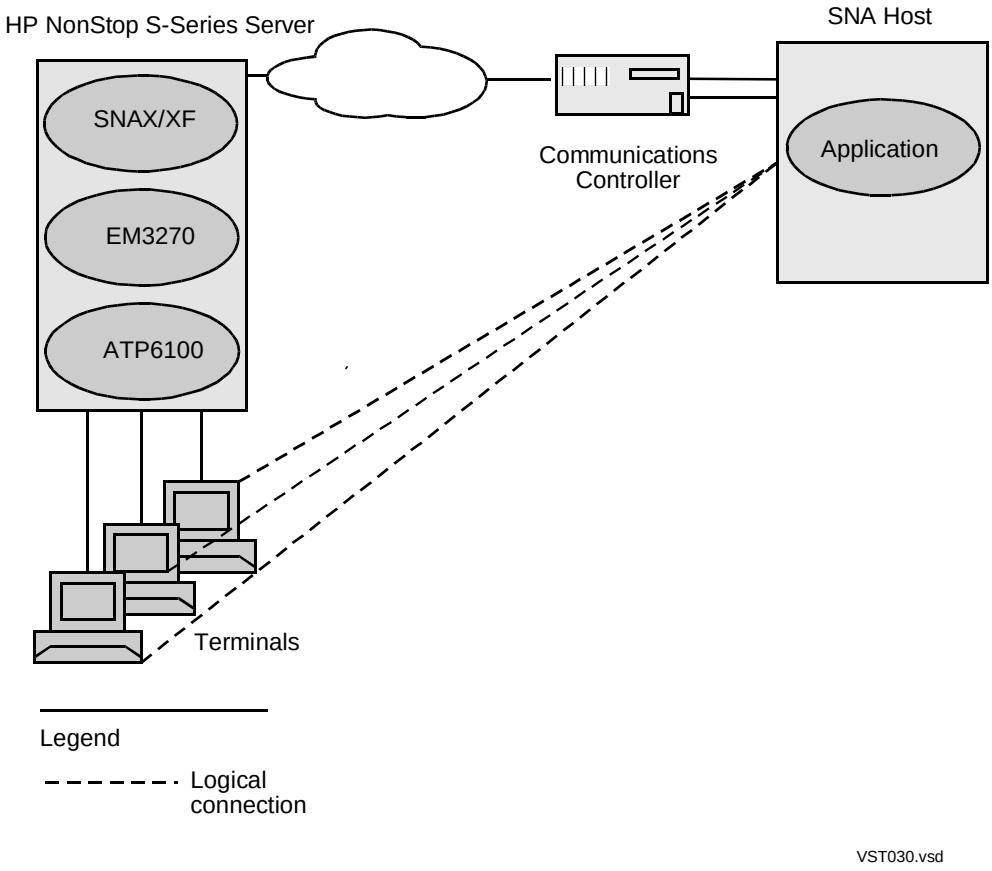
SNAX/XF

SNAX/XF allows SNA devices attached to the NonStop S-series server through switched lines, leased lines, token-ring or Ethernet LANs, or X.25 network connections to use HP applications. When used with the Pathway/TS product or certain other HP applications, the NonStop S-series server provides SNA presentation and session services for attached 3270 devices. You can also write your own applications to provide these services.

SNAX/XF includes a passthrough option, which lets terminals connected to a NonStop S-series server through node type 2 devices (cluster controllers) use HP applications without losing their access to applications in the SNA network. The passthrough feature lets node type 2 devices communicate transparently with SNA host applications; it also permits transparent downloading of microcode or other files from the IBM host. A user switches between the HP and IBM applications simply by logging off one application and onto the other.

Figure 7-3 illustrates the SNAX/XF passthrough feature. With SNAX/XF, a NonStop S-series server is connected to the SNA host through an SNA communications controller. The NonStop S-series server appears as an SNA host (node type 5) to SNA devices and as a cluster controller (node type 2) to SNA hosts. EM3270 software is required to provide SNA 3270 device emulation. The ATP6100 terminal access method is also required and either a SWAN concentrator or an AWAN must be used.

Figure 7-3. SNAX/XF Passthrough



ES Connect

ES Connect enables NonStop S-Series processors to communicate with IBM mainframes through IBM's ESCON channel. Use of the channel means that bulk data transfer to and from IBM machines will be significantly faster.

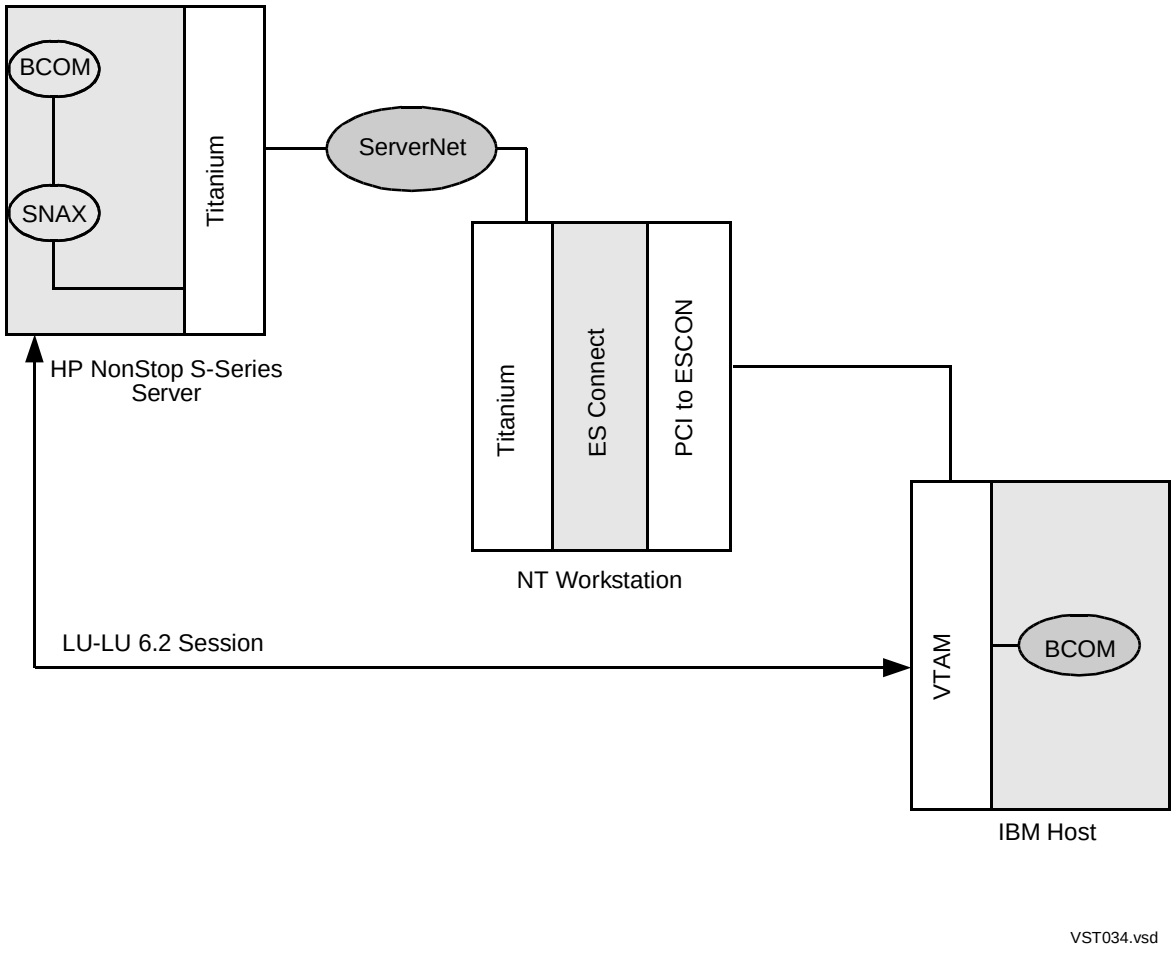
ESCON stands for Enterprise Systems Connection, the major high-speed channel of IBM's ES9000 series of mainframes. The channel to I/O connection operates at a theoretical data rate of up to 17 megabytes per second (MBps).

Figure 7-4 on page 7-11 is a general diagram of the components that make up the ES Connect product. Three computers are depicted: a NonStop S-Series server, a Windows NT platform, and an IBM mainframe. The Windows NT platform contains an ESCON card and the ES Connect software. ES Connect acts as an intermediary, receiving and forwarding traffic from both HP and IBM.

In this example, a high-level application (BCOM, a file transfer program) running on an HP server and its counterpart (BCOM) running on the IBM mainframe are used to communicate with each other.

Stirling Software's NetDirect product, the Network Data Mover (NDM), and ETI's product BCOM are the two major file-transfer programs used by HP customers in an IBM environment. This example could have used either of these products.

Figure 7-4. ES Connect Architectural Overview



HP to IBM

To send information to its counterpart on IBM, BCOM on the HP computer interfaces with SNAX. SNAX is in session with the Virtual Telecommunications Access Method (VTAM) on the IBM mainframe via the Windows NT platform. SNAX does not send the data directly; it uses the services of Titanium to provide a high-speed link between NonStop S-Series servers and Windows NT workstations.

ES Connect running on the NT platform receives all traffic from SNAX via Titanium and forwards the traffic to the appropriate VTAM session using a peripheral component interconnect (PCI) to ESCON card.

VTAM hands off the information to the BCOM application running on the IBM mainframe.

IBM to HP

To send data to BCOM on the NonStop S-Series server, BCOM on the IBM system passes the data to VTAM. VTAM places the data on the ESCON channel.

The PCI/ESCON interface card on the NT platform takes the data off the ESCON channel and gives the data to ES Connect. ES Connect saves the data until SNAX makes a request for it.

When Titanium gives the data to SNAX, SNAX forwards it to the application.

SNAX/APN

SNAX/APN enables a NonStop S-series server to act as an SNA type 2.1 node. The base product acts as an LEN node; the extended version, SNAX/APN-EN, can act as an end node. Using SNAX/APN, a NonStop S-series server can

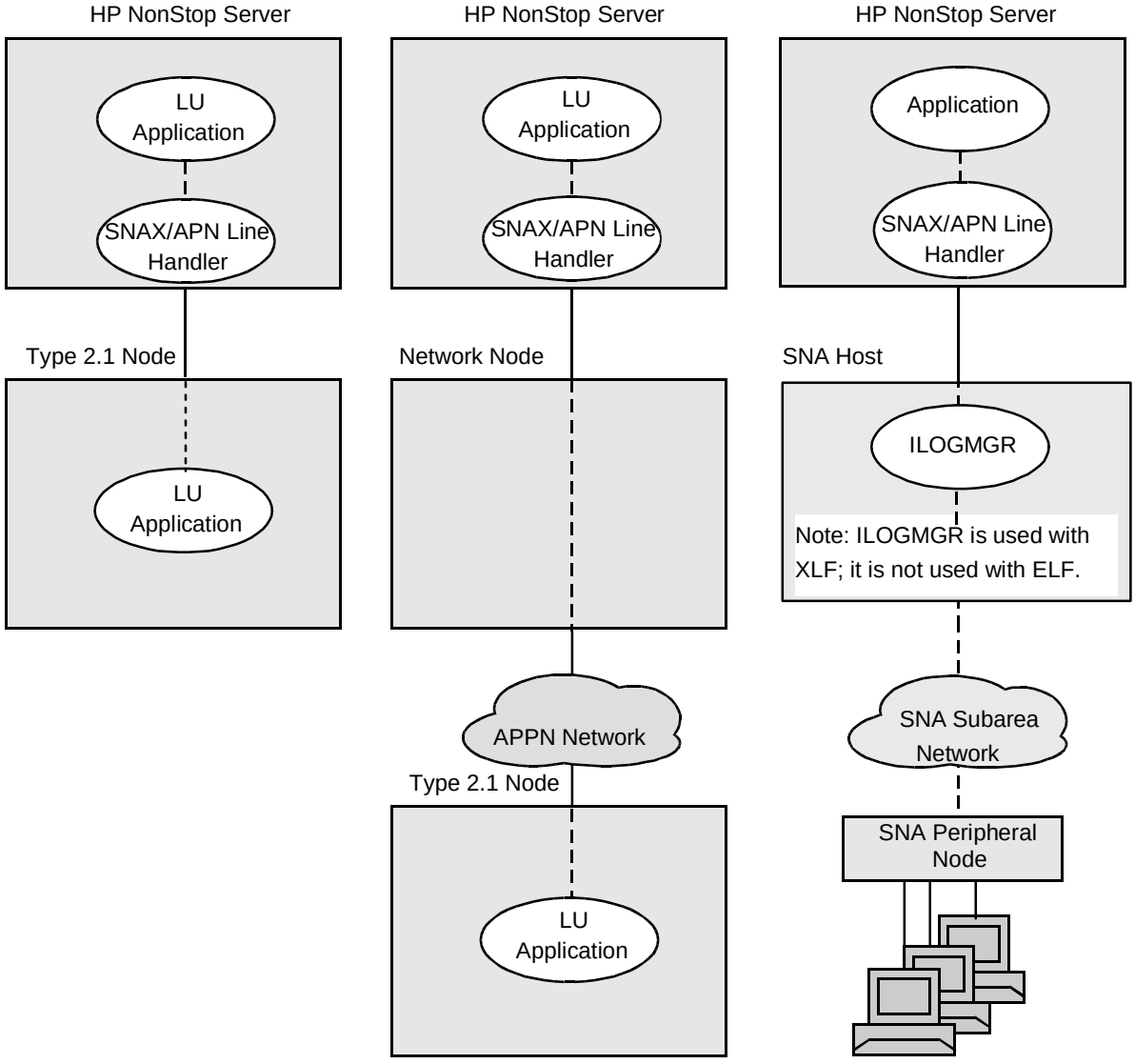
- Communicate with SNA type 2.1 nodes using advanced program-to-program communication (APPC). The type 2.1 nodes can be attached directly or can be accessible through an attached APPN network node server. HP applications can use logical units (LU) sessions, typically through SNAX/APC.
- Attach to either a subarea or APN network. (Note that SNAX/APN End Node can only attach to an APPN network.)

Figure 7-5 on page 7-13 shows SNAX/APN connectivity.

For simplicity, the SNAX service manager processes, ServerNet wide area network (SWAN) concentrator, and SNA communications controllers are omitted. Also, the process shown in a single NonStop S-series server can be distributed across an Expand network.

If a NonStop application sends a LOGON request to another application, XLF is required, and if the NonStop applications wants to receive LOGON requests then XLF or ELF is required.

Figure 7-5. SNAX/APN Connectivity



1. APPC with Attached Type 2.1 Node

2. APPN

3. Extended Logon Facility (XLF) or Enhanced Logon Facility (ELF)

VST103.vsd

HP Devices Using SNA Applications

To allow NonStop S-series servers and attached devices to use SNA applications, HP provides software that emulates IBM batch devices (batch mode) or display terminals (interactive mode).

Batch Mode

Remote job entry (RJE) is the process of submitting data processing jobs to a host computer from a remote system or device and then receiving the processed output back from the host. Exchange/SNA permits a NonStop S-series server to emulate an SNA 3770 RJE workstation, allowing transmission of multiple data streams to and from an SNA host running JES2 or JES3. Exchange/SNA requires either SNAX/XF or SNAX/APN.

Interactive Mode

EM3270 is an HP product that enables HP printers, workstations, and terminals to emulate IBM 3270 printers and terminals in order to communicate with applications on an IBM host. Users can switch between HP and IBM applications without exiting from either one, by pressing a special function key. Up to six different IBM host applications can be used from a single HP terminal or workstation. An EM3270 template and set of key caps provide easy correlation between 653x and 3270 keys.

Cooperative Processing With SNA Systems

SNAX/XF lets you develop distributed program-to-program cooperative processing applications for NonStop S-series servers and intelligent SNA devices (such as 4700, 3600, and S/36 devices). The SNAX applications use file-system procedure calls and can communicate with IBM environments including IMS and CICS. The HP NonStop SQL/MP NonStop S-series server brings added value to such applications through products like the HP NonStop SQL/MP relational database management system.

Several SNAX interfaces and companion products are especially well suited to cooperative processing: SNAX/APC, SNAX/HLS, and the SNALU interface.

SNAX/APC and SNAX/HLS

SNAX/APC and SNAX/HLS are products that implement high-level SNA protocols and provide high-level application interfaces. SNAX/APC uses SNA LU 6.2 protocols and allows you to develop applications that communicate with other LU 6.2 applications in an SNA network. SNAX/HLS allows you to develop applications that communicate with LU types 0, 1, 2, 3, 4, and 7. Both products use the services of either SNAX/XF or SNAX/APN, depending on the connection requirements.

SNAX/APC and SNAX/HLS both have features that simplify application development and management:

- They are integrated with the Pathway environment, which provides a COBOL-like application language, screen design aids, and resource-management features such as online load balancing. Alternatively, you can write your application in any other language supported by HP.
- They allow application prototyping, which enables you to simulate application functions during code development.
- They include features that provide for specification and formatting of trace information along with commands for control and error analysis.

Additionally, the SNAX/HLS product is designed to let you split the task of development so that most programmers need little specific knowledge of SNA. To establish a session, for instance, a programmer merely specifies the name of a session partner and the name of an HLS Resource Definition Table profile (maintained by a system administrator to describe the characteristics of the HLS-to-application interface and the BIND and INIT-SELF parameters used in SNA sessions), and SNAX/HLS retrieves the appropriate SNA parameters.

SNAX Application Logical Unit (SNALU)

The SNALU interface provides SNAX/HLS and SNAX/APC with lower-level SNA data-link control and path control functions. The SNALU interface is also directly available to your applications, giving you direct control of SNA message flows.

Note. The same SNAX/HLS, SNAX/APC, or Exchange/SNA application can run without change over SNAX/XF or SNAX/APN. A SNALU application sensitive to the contents of the SNA session initiation command might require modification, however.

SNA Subsystem Management

HP provides utilities for configuring and managing SNAX products, including the means for sending management information to an SNA host.

Integration With DSM

The SNAX product family is integrated with DSM. (DSM is described in Section 4, Managing Communications Subsystems.) You can use NonStop NET/MASTER Management Services (MS) or SCF to control SNAX/XF, SNAX/APN, and SNAX/APC. (You use a product-specific utility, HLSCOM, for SNAX/HLS, however.) You can also write applications that use Subsystem Programmatic Interface (SPI) messages to control the SNAX/XF and SNAX/APN subsystems.

SNAX/XF, SNAX/APN, SNAX/APC, and SNAX/HLS subsystems report noteworthy events to the Event Management Service (EMS). Operators can use NonStop NET/MASTER MS, or the OSM Event Viewer or TSM EMS Event Viewer to display the event messages, and management applications can retrieve those messages programmatically.

Integration With NetView and NET/MASTER

HP offers two ways to integrate HP systems with NetView or NET/MASTER on IBM systems in an SNA network: NonStop NET/MASTER MS software and DSM/SNAView software.

NonStop NET/MASTER MS Inter-NET/MASTER Connection (INMC)

NonStop NET/MASTER MS software allows you to both send commands to and receive messages from either NET/MASTER or (with additional third-party software) NetView on an IBM mainframe or host computer. Its Inter-NET/MASTER Connection (INMC) provides a peer-level, logical connection to remote management applications, regardless of the underlying communications protocols used to connect the computers on which the applications execute.

The INMC link not only supports the exchange of solicited and unsolicited messages for console displays, but it also allows authorized users to log onto remote NonStop NET/MASTER or NET/MASTER management applications.

A single INMC link to a remote NonStop S-series server can use SNA, X.25, and Expand lines simultaneously, enabling you to achieve the maximum level of data transfer using your hardware and software.

DSM/SNAView Software

DSM/SNAView software is an application that sends formatted SNA alerts—either Network Management Vector Transport (NMVT) request/response units or Record Format Maintenance Statistics (RECFMS) request/response units—to an SNA host for display on an IBM NetView or NET/MASTER console. The version of NetView must be release 2 or higher; the version of NET/MASTER must be 2.1 or higher.

DSM/SNAView software was the primary means of integration with NetView prior to the development of NonStop NET/MASTER MS. It continues to be available for use on systems that have not yet migrated to NonStop NET/MASTER MS.

DSM/SNAView software can send alerts from SNA devices attached to the NonStop S-series server. It can also send alerts from other HP subsystems or even from other applications running on the NonStop S-series server. In the case of your applications, the messages are formatted as network management vector transport (NMVT) request/response units. The alerts correspond to EMS events, but the message format is converted by the DSM/SNAView software.

SNAX/XF CNM Interface

SNAX/XF Communication Network Management (CNM) is a programmatic interface to the SNA system services control point (SSCP) in the SNAX/XF subsystem. SNAX/XF CNM allows you to develop an application on a NonStop S-Series server to perform SNA network management functions. Through this interface, the application can have access to SNA network management messages—either NMVT request/response units or record format maintenance statistics (RECFMS) request/response units—that flow between the NonStop S-series server and attached SNA controllers. A CNM application can also respond to requests for SNA statistical information from SNA host systems.

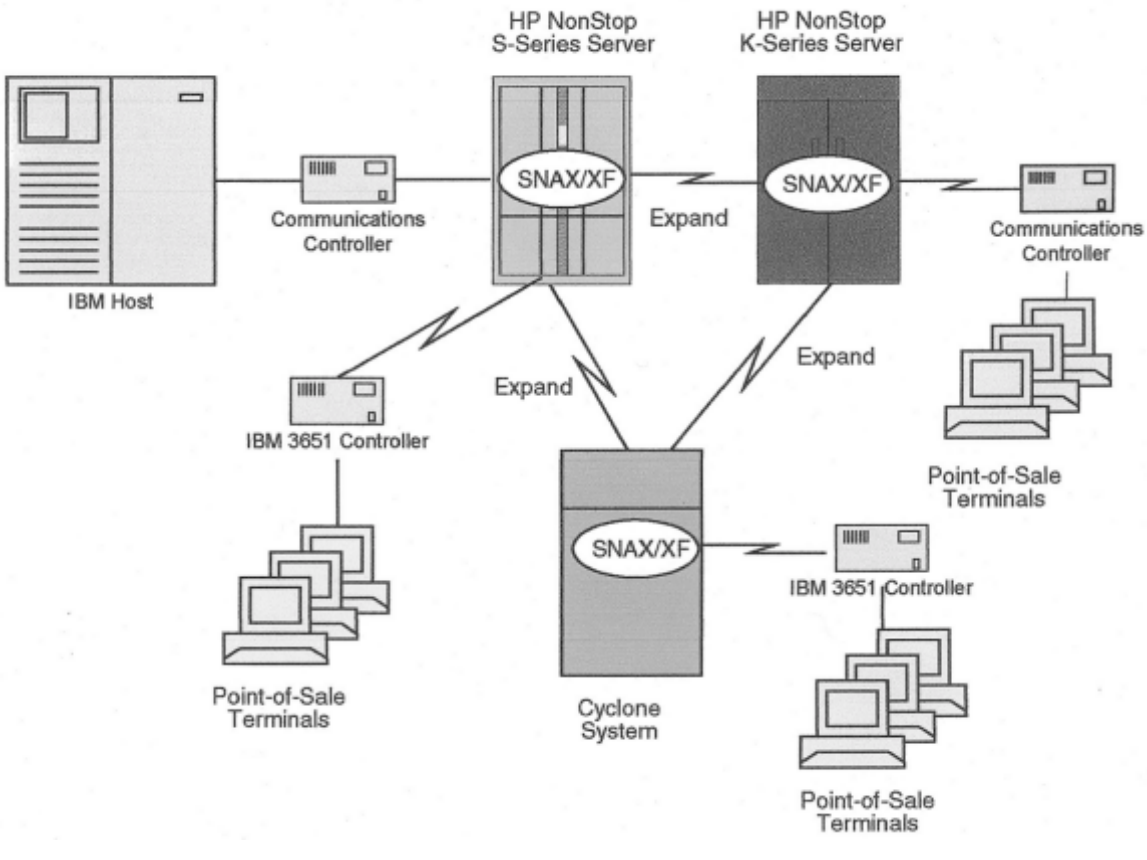
SNA Application Example

Figure 7-6 is an application example of a retail chain that has thousands of SNA point-of-sale (POS) terminals. The terminals in each store are controlled by an IBM 3651 store controller.

The company has connected the 3651 controllers to a network of NonStop S-series servers and other HP NonStop servers running SNAX/XF. Through SNAX/XF, POS applications (such as credit and check-authorization applications) running in the Expand network can be used from the SNA POS terminals. Applications on the NonStop servers also collect and forward a variety of labor and sales data from the SNA terminals to an IBM mainframe at corporate headquarters.

In addition to the POS and store support applications, the NonStop servers support such applications as inventory control, materials handling, and shipping. For the retailer, the NonStop servers provide the benefits of reliability, convenient growth and reconfiguration, and integration with the SNA network and its applications.

Figure 7-6. SNA Application Example



8

Open Systems Interconnection (OSI) Network Connections

This section describes HP products that implement the standards of the Open Systems Interconnection (OSI) architecture, including the International Telecommunications Union–Telecommunications (ITU–T) Recommendation for packet-switched data networks (PSDNs). These products enable HP networks to integrate with systems and devices of other vendors providing OSI, X.25, and TCP/IP implementations.

This section discusses the following topics:

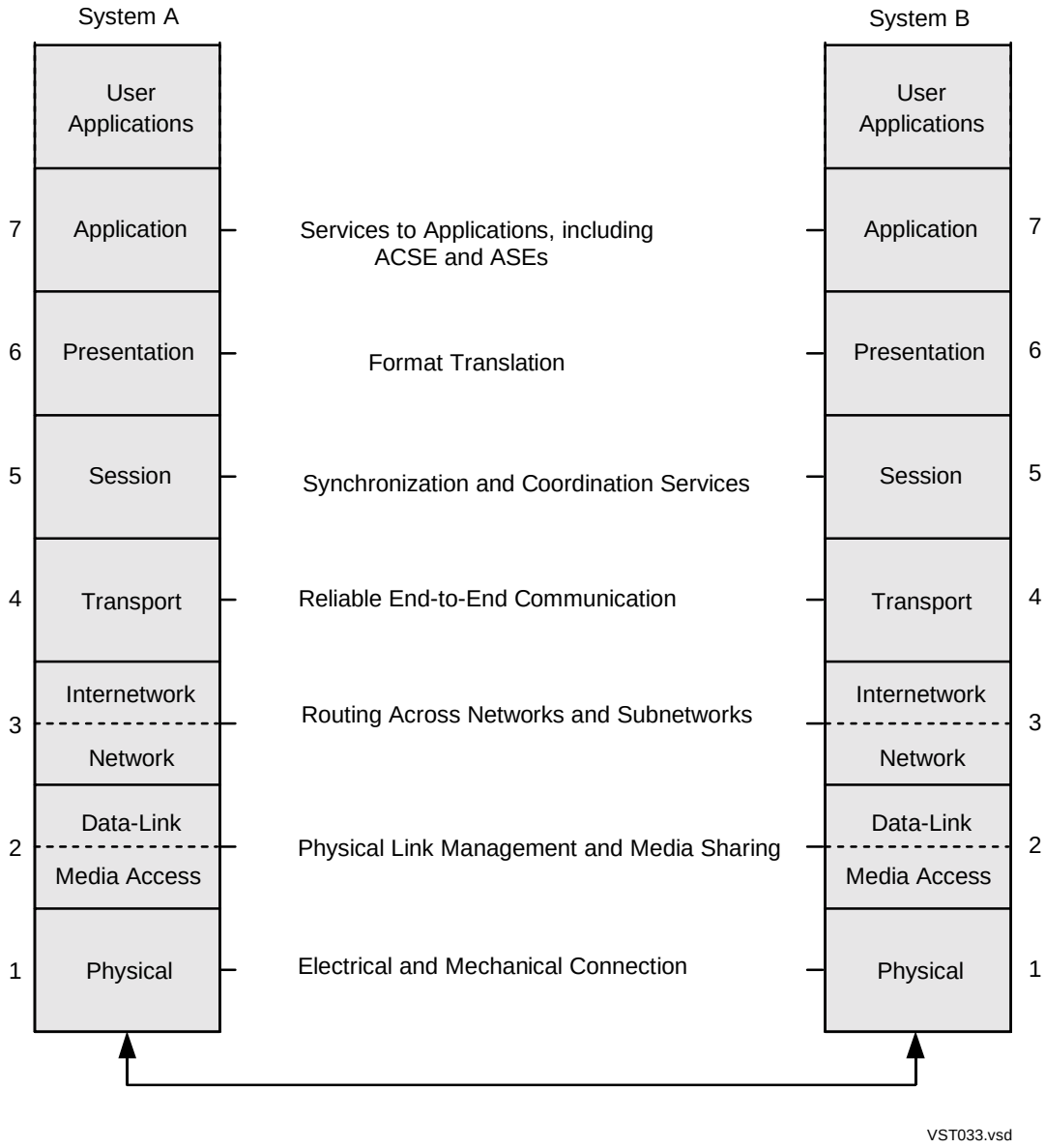
A Brief Look at OSI

Most of the complexity in networking computer systems is caused by the incompatibility of hardware and software produced by different manufacturers. In 1977, the International Organization for Standardization (ISO) and the International Telegraph and Telephone Consultative Committee (CCITT) began collaborating on a set of standards based on the Reference Model for Open Systems Interconnection, more commonly known as the **OSI Reference Model** (see Figure 8-1). The OSI Reference Model is an architecture that enables different vendors' systems to communicate by using a common set of protocols.

HP and other major computer vendors have adopted the OSI protocol standards as a strategy for achieving interconnectivity of systems in multivendor environments. Many large organizations have also adopted the OSI Reference Model, both for the range of functions it provides and because of the long-term flexibility of standards-based solutions.

Note. CCITT is now known as the International Telecommunications Union (ITU). The standards for telecommunications are known as the International Telecommunications Union–Telecommunications (ITU–T) standards.

Figure 8-1. OSI Reference Model



Each of the seven layers performs a distinct function, described briefly below:

Application Layer	Gives an application program access to the OSI network. This layer consists of two kinds of service elements: Those common to many applications constitute the Association Control Service Element (ACSE); those used for specific applications are called Application Service Elements (ASEs), of which FTAM and X.400 are examples. The term **association** refers to an Application-Layer connection.
Presentation Layer	Defines the format and encoding of information sent over the communications medium. Compensates for differences in data representation among communicating systems and devices.
Session Layer	Enables an application program to organize and synchronize the exchange of information with other application programs.
Transport Layer	Provides reliable transfer of data between systems. Selects among available Network Layer services and defines transport classes, which tailor the responsibilities of the layer to different network environments.
Network Layer	Accomplishes the routing of information through the network, including functions to support transfer of data across different subnetworks. In connection-oriented service, the Network Layer establishes a long-term connection between communicating entities and maintains information to relate the messages, ensuring that pieces of the same message arrive at their destination in sequence and without error. In connectionless service, the Network Layer transfers data without retaining context information.
Data-Link Layer	Manages the flow of data over physical links and performs link-level error-recovery and synchronization. Includes media access control (MAC) procedures, which coordinate the sharing of a communications medium by stations on a local area network (LAN).
Physical Layer	Specifies connections between physical entities, such as type of cabling or electrical interface.

Each layer communicates with its corresponding (**peer**) layer on a connected system, using a layer-specific protocol. Each layer of the OSI Reference Model uses the services provided by the layer below it and provides services to the layer above it. Interfaces between layers are defined in terms of primitives (sometimes called **service primitives**); a primitive is the smallest unit of action that can be requested of the layer or the smallest unit of response the layer can make. Higher-level operations can entail the exchange of many request and response primitives.

The primitives are well-defined, and the internal workings of a layer are independent of other layers. As a result, you can replace or modify any layer without changing layers above or below.

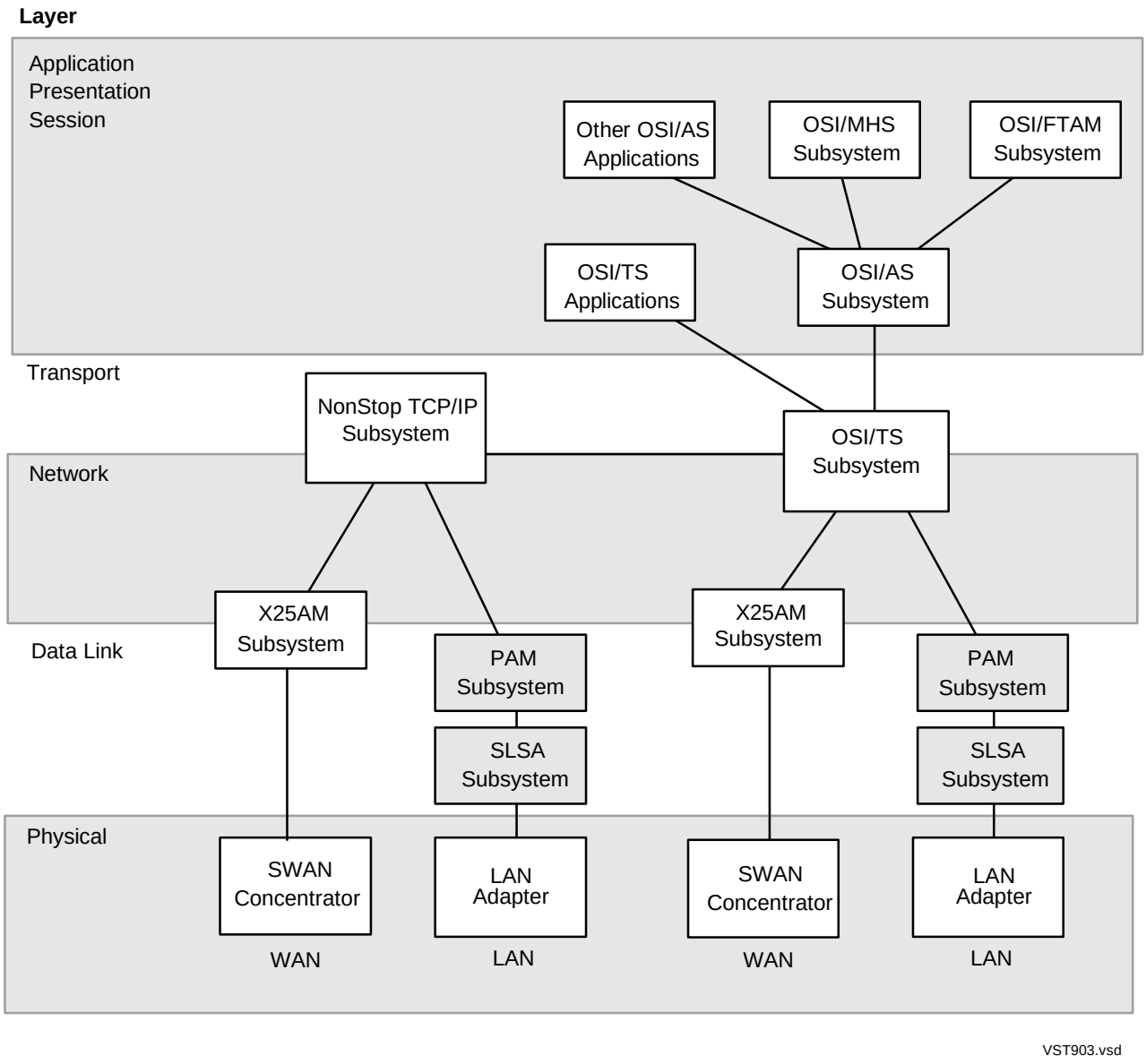
Layers 1 through 4 deal with the communication, flow control, routing, and error-handling needed to transport data end to end across the network. Below the Transport Layer, there can be many different types of physical networks—for example, an X.25 packet-switched data network (PSDN) or a local area network (LAN).

Layers 5 through 7 deal with the coordination of applications across the network and the way that information is presented to the applications. A wide range of application programs providing various types of end-user services can be supported by a common Transport Layer implementation.

The HP NonStop OSI product line includes five products: OSI File Transfer, Access, and Management (OSI/FTAM), OSI Message Handling System (OSI/MHS), ActionView.400, OSI/Application Services (OSI/AS), and OSI/Transport Services (OSI/TS). Network and Data-Link Layer interfaces are provided by the HP X.25 Access Method (X25AM) or the Port Access Method (PAM) subsystem.

Figure 8-2 shows the HP NonStop OSI products, X25AM, PAM, HP NonStop TCP/IP, and the ServerNet LAN systems access (SLSA) subsystems.

Figure 8-2. HP NonStop OSI Products



HP NonStop OSI Advantages

HP NonStop OSI products have several key features that make them a strong platform for OSI applications—including application services such as X.400, electronic data interchange (EDI), and FTAM. Some of the features that make HP NonStop OSI a good choice are summarized here.

General-Purpose Session Implementation

HP NonStop OSI products include a general-purpose implementation of the Session Layer. (Some Session Layer products available elsewhere are specialized for certain applications. HP NonStop OSI is suited to a very large range of applications.) The HP product supports both versions of the session protocol—called versions 1 and 2—and all but one functional unit (session expedited data) defined for the Session Layer.

Support for All Transport Classes

HP NonStop OSI products also include a robust implementation of the Transport Layer, including support for all five transport classes defined in the standard. This feature makes HP NonStop OSI compatible with many kinds of network environments.

RFC-1006 Standard Implementation

HP NonStop OSI/AS and OSI/TS implement the Request for Comments (RFC) 1006 standard entitled *ISO Transport Service on Top of the TCP*, Version 3. This standard, developed for the Internet community, defines how the ISO transport service can be implemented on top of the Transmission Control Protocol (TCP), which is a Transport Layer protocol.

Using the RFC-1006 standard, OSI applications such as X.400 and FTAM (and other OSI/AS or OSI/TS applications) that communicate over OSI/AS and OSI/TS can communicate with other servers and clients over a TCP/IP network connection.

Configuration Flexibility

HP NonStop OSI products provide a great variety of configuration options, such as a wide range of line attributes and operational parameters. Because of this flexibility, your applications can interoperate with applications and services running on other, less flexible, systems.

Transparent Support for LANs and WANs

HP NonStop OSI products can run over either the PAM or X25AM subsystems. With PAM, HP NonStop OSI provides access to networks complying with the Institute of Electrical and Electronics Engineers (IEEE) 802.4 standard. With X25AM, you gain access to X.25 packet-switched data networks (PSDNs). You use the same application program interface (API) regardless of the underlying network type.

FTAM Implementation

HP NonStop OSI includes an implementation of the ISO standard for FTAM. HP NonStop OSI/FTAM provides a low-level programmatic interface that supports the vast majority of FTAM primitives. It also supports access to structured text files, access to rows in Structured Query Language (SQL) tables, and reading of directory files (as defined by the National Bureau of Standards, or NBS).

Message Handling Systems (X.400)

HP NonStop OSI includes an implementation of the 1988 version of ITU–T (formerly CCITT) Recommendation X.400 and the ISO standard for Message Handling Systems (MHSs). HP NonStop OSI/MHS is suited to large-scale messaging networks, allowing exchange of messages among diverse proprietary messaging systems, X.400-defined User Agents (UAs), and applications such as electronic data interchange (EDI) and electronic funds transfer (EFT). OSI/MHS includes interfaces that give Local User Agents (LUAs) and Remote User Agents (RUAs) access to an X.400 Message Store (MS), and OSI/MHS also provides a standards-based gateway programmatic interface (GPI).

HP NonStop OSI/MHS has features that distinguish it from some other MHS implementations. For example, message-transfer functions are performed by multiple identical processes that work in parallel for load-balancing and high throughput. In addition, OSI/MHS includes sophisticated management facilities that provide not only a wide range of configuration options but also specific support for accounting and billing applications.

HP provides a graphical X.400 message-management solution with the ActionView.400 product from Insider Technologies Limited. ActionView.400 is a client-server application for HP NonStop S-series servers and IBM-compatible personal computers (PCs) using Microsoft Windows. Its modules provide system and performance monitoring, configuration management for OSI/MHS objects, administrative functions such as chargeback for system usage, and operator alerts when user-defined thresholds are exceeded.

Familiar Application Program Interface (API)

The APIs to the upper layers of OSI and the FTAM product consist of procedures that correspond directly to primitives defined in the OSI standards. This feature makes it convenient to adapt existing applications to use HP NonStop OSI and to develop application services to run, with minor interface differences, on various kinds of systems.

HP Fundamentals and Software

HP NonStop OSI products offer fundamental HP software characteristics such as fault-tolerance and modular growth. For example, your OSI applications will continue to work even through a failure in one of the processors in which an HP NonStop OSI

product is running. In fact, the OSI configuration is preserved through the failure; the application need only reestablish the connection with the remote system.

In addition to the HP fundamentals, your applications have access to other software on the NonStop S-series server, for example, HP NonStop SQL/MP. (See Figure 8-5 on page 8-17.)

File Transfer, Access, and Management (OSI/FTAM)

HP NonStop OSI/FTAM is an implementation of the ISO FTAM standard. It is also consistent with the Government Open Systems Interconnection Profile (GOSIP), which specifies standards an OSI implementation must meet to be used for government applications. (HP FTAM complies with U.S. GOSIP versions 1 and 2 and United Kingdom GOSIP version 3.0, supporting the A1, M1, and T2 profiles of versions 1 and 2 and the A122, A3, and A112 profiles of version 3.0.)

With HP FTAM your applications can exchange and manage files across an OSI network, with record-level access to structured text files, including row access to SQL tables. You can copy, move, and delete the following kinds of files, and discover and modify a range of file attributes:

- Unstructured text files (called FTAM-1 files)
- Structured text files (called FTAM-2 files)
- Binary files (called FTAM-3 files)

Your applications can find and read specific records and insert records at the end of FTAM-2 files. They can also read directory files (called NBS-9 files).

HP FTAM includes **initiator** and **responder** processes. The initiator process accepts requests from applications on the NonStop S-series server and sends the requests to remote systems where the target files are located. The responder receives requests from FTAM processes on other systems in the network and performs the operations on files stored on the NonStop S-series server. The set of functions you can perform on remote files is the same as the set of functions remote applications can perform on HP files (unless the other system is more restrictive in the functions it supports).

The API to the initiator process consists of procedures that correspond directly to FTAM primitives and allows your application direct control of the FTAM protocol. The interface supports all standard FTAM primitives except F-Recover, F-Check, and F-Restart.

The FTAM standard groups primitives in two major ways. **Functional units** are collections of primitives supporting specific types of operations. HP FTAM supports the following functional units: kernel (which includes the basic services for establishing and releasing FTAM associations), read, write, file access, limited and enhanced file management, and grouping (which lets several primitives be combined in a single request message to the remote system). **Service classes** specify the range of functions available to applications during their association. HP FTAM supports the

following service classes: file transfer, file management, file transfer and management (which includes subsets of file transfer and file management), and file access.

Additionally, FTAM defines two groups of attributes: **file attributes**, which are characteristics of the file itself (such as who created it and when it was last modified), and **activity attributes**, which apply only during an association (for instance, the identity of the current requester of FTAM services). HP FTAM supports a range of attributes in both these groups.

The manuals describing HP FTAM provide much more detailed specifications of the implementation.

Unlike most HP subsystems, HP FTAM is managed through two Subsystem Control Facility (SCF) interfaces: the HP NonStop OSI/Application Manager (APLMGR) subsystem and the FTAM subsystem itself. The APLMGR subsystem allows you to configure and manage HP FTAM processes, and the FTAM subsystem allows you to monitor initiator and responder processes and manage the subdevices of those processes.

Message Handling System (OSI/MHS)

HP NonStop OSI/MHS is an implementation of the ITU–T X.400 (formerly CCITT) Recommendation and the ISO standard for Message Handling Systems (MHSs). It complies with the 1988 versions of the CCITT standards and can interoperate with systems that follow the 1984 standards. It also complies with GOSIP and the equivalent European standards for MHSs.

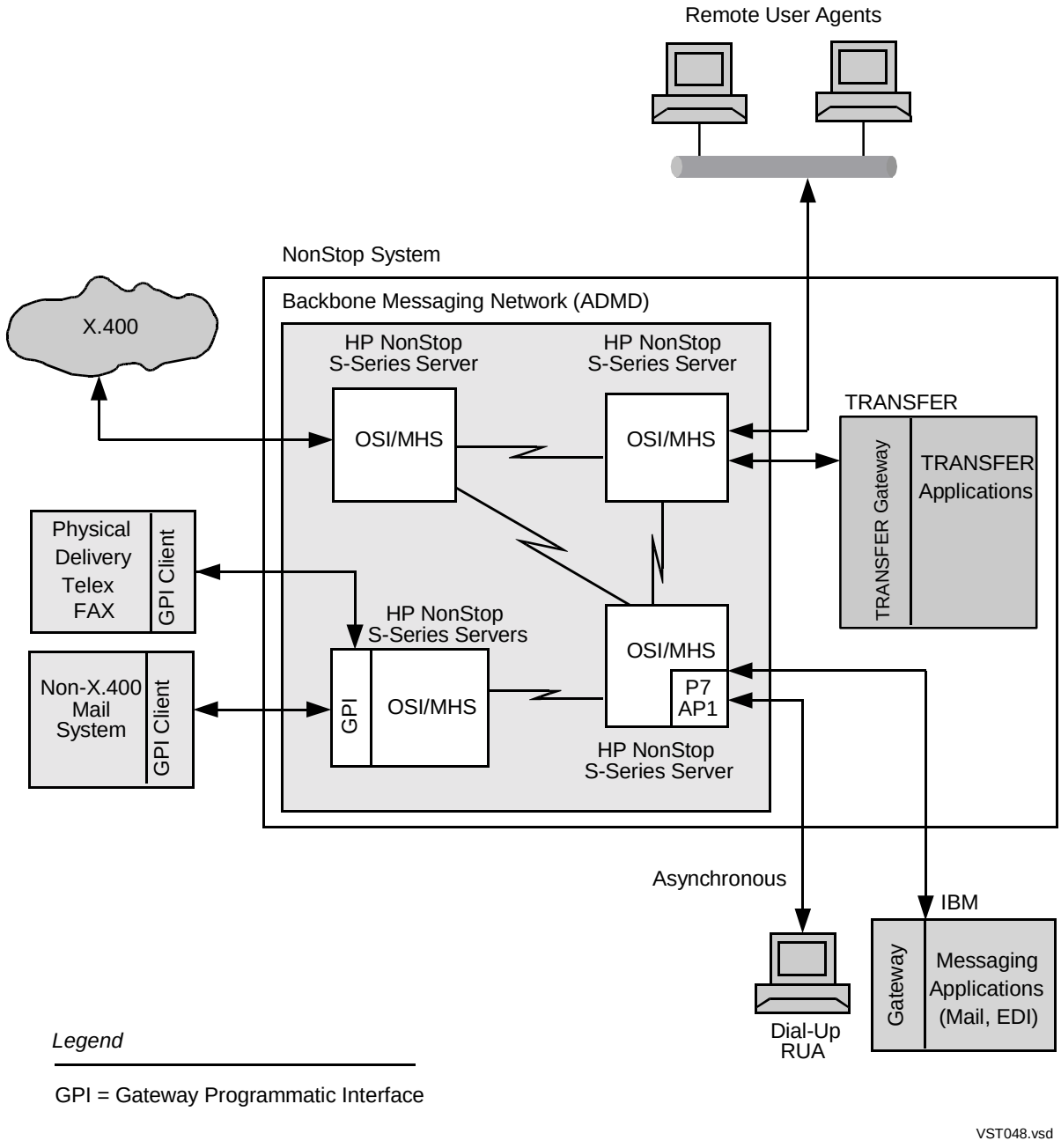
Note. Figure 8-3 on page 8-10 shows HP NonStop S-series servers connected by OSI rather than by the Expand subsystem. You can also run the Expand subsystem between the systems—even on the same physical circuits—for use by management applications and others that require continuous availability.

The protocols for communication among OSI/MHS components are listed and described below:

Protocol	As Used by OSI/MHS
P1	The protocol between two Message Transfer Agents (MTAs)
P2	The protocol between two User Agents (UAs) for the exchange of interpersonal messages and notifications across the network (1984 or 1988)
P3	The protocol between a UA and an MTA when the UA directly requests MTA services
P7	The protocol between a UA and a Message Store (MS)
P22	The protocol between two UAs (1988)
Pedi	The protocol between two UAs when objects are used for electronic data interchange (EDI)

With OSI/MHS, applications on NonStop S-series servers can exchange messages with proprietary and standard messaging systems on an OSI network, or a network of NonStop S-series servers can serve as a backbone messaging network for other systems, as shown in Figure 8-3.

Figure 8-3. OSI/MHS as a Backbone Messaging Network



Message handling, or messaging, is the computing function that allows exchange of electronic messages among users in a network. Several kinds of messages are explicitly defined by the standard, and many more are conceivable. Among the most familiar ones are **interpersonal messages**—equivalent to interoffice memoranda—and **electronic data interchange (EDI)** messages, which convey other kinds of business data in a prescribed format.

An MHS includes the following major components:

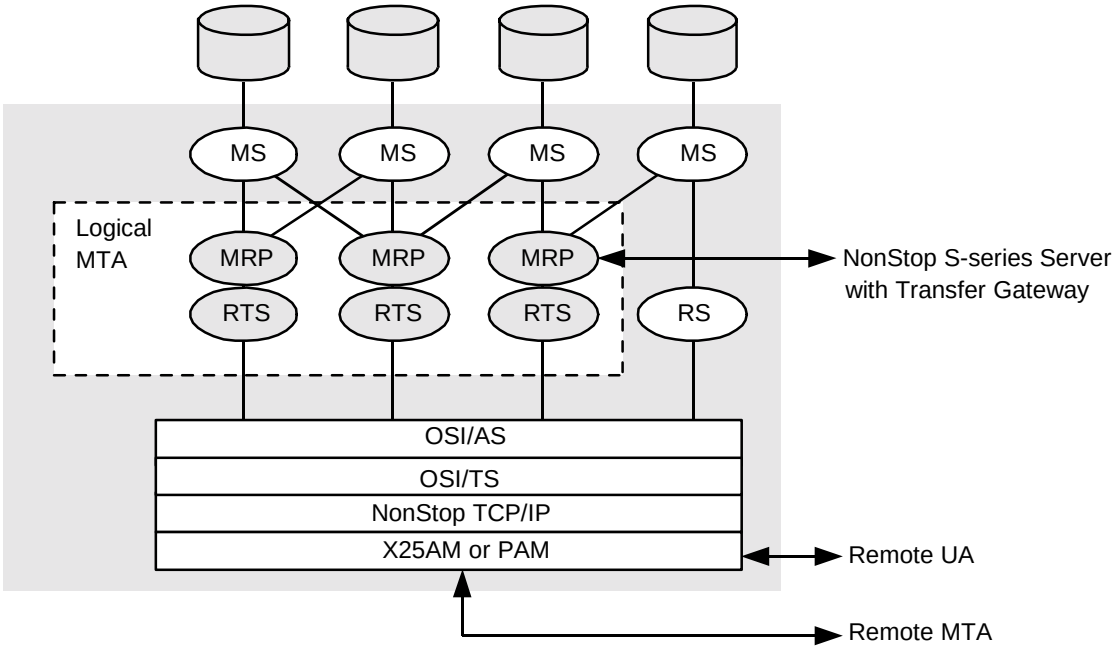
- **User Agents (UAs)**. A UA is a processing entity that acts on behalf of a person or an application to submit and receive messages, either directly (through an **MTA**) or indirectly (through a **Message Store**, or **MS**).
- **Message Transfer Agents (MTAs)**. MTAs are processing entities that accept messages from UAs (or from other MTAs) and relay the messages across the network to their destinations. At its destination, a message is either delivered directly to a UA or is deposited in an MS for later retrieval. A message can pass through any number of MTAs on its route through the network.

A user who sends a message is called the originator, and a user who receives a message is called the recipient. Each user—and therefore the UA—has a unique name called an **Originator/Recipient (O/R) name**. Several standard forms are possible for an O/R name.

OSI/MHS consists of several kinds of processes and interfaces; Figure 8-4 on page 8-12 illustrates some of the major ones. Multiple, identical processes operate in parallel as a single logical MTA. A requester has access to MTA functions through any one of the **Message Relay (MR)** processes. Each MR process uses another process called the **Reliable Transfer Service (RTS)**, which provides an interface to the HP NonStop OSI stack. RTS is defined as a standard service within X.400; the HP implementation is compatible with the 1988 and 1984 definitions of that service.

A third kind of process is a **Message Store (MS) process**; each MS process controls multiple X.400 message stores: that is, a single MS process serves multiple X.400 users. There can be many MS processes, each serving a different set of users. Another kind of process, called a **Remote Operations Service (RS) process**, gives a remote UA access to an MS on the NonStop S-series server.

Figure 8-4. OSI/MHS Processes and Interfaces



Legend

MS	=	Message Store	OSI/AS	=	OSI Application Services
MTA	=	Message Transfer Agent	OSI/TS	=	OSI Transport Services
MRP	=	Message Relay Process	X25AM	=	X.25 Access Method
RTS	=	Reliable Transfer Service	PAM	=	Port Access Method
RS	=	Remote Operations Service			

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HP NonStop OSI/MHS includes five interfaces for sending and receiving messages.

- The first interface allows a remote X.400 MTA (or a messaging system with an X.400 gateway) to interact with OSI/MHS across an OSI network, using the standard protocol P1.
- The second interface is a gateway for the TRANSFER product, the HP proprietary messaging system. Through the TRANSFER gateway, users of the HP electronic mail (e-mail) application can exchange messages with users of other messaging systems on the network. TRANSFER includes an API, so you can also write your own applications to send and receive messages through the gateway. (This gateway supports only the 1984 functions of MHS.)
- The third interface is to an MS through an RS process on the NonStop S-series server; the requester must be a remote UA using the standard protocol P7.
- The fourth interface, the P7 API, provides a similar capability for a local UA.
- The fifth interface, the gateway programmatic interface (GPI), allows you to integrate an existing messaging system with OSI/MHS by developing a gateway to translate messages between X.400 and another format. The GPI includes a procedural interface that can be called from applications and is based on specifications defined by the X.400 Application Program Interface Association (XAPIA).

In addition to these messaging interfaces, OSI/MHS includes a set of management interfaces that support the HP Distributed Systems Management (DSM) model. One important management feature of OSI/MHS is that information pertinent to accounting and billing is reported to the Event Management Service (EMS); accounting and billing applications can use EMS filters to retrieve this information as it is reported or to extract it later from EMS logs.

OSI/MHS offers a range of configuration options, including support for LANs and WANs and management control over the number and distribution of OSI/MHS processes. You control the total number of associations, the checkpoint and window sizes, recovery times, timers, and other parameters. OSI/MHS also offers a selection of routing options, including classes 1, 2, and 3 as defined by the OSI Implementor’s Workshop sponsored by the National Bureau of Standards; support for numerous standard naming and addressing schemes, including O/R names and X.121 addresses; assignment of priorities to routes; rerouting to alternate routes in the event of a failure; and dynamic programmatic or interactive changes to routes. A manager process monitors the other OSI/MHS processes and restarts processes that have failed.

OSI/MHS supports all message transfer functions that the MHS standards define as essential. (In MHS terminology, OSI/MHS supports all basic and essential optional elements of service.) It supports the interpersonal message format and associated protocols, as well as other types of messages defined in the standards.

Upper Layer Interfaces (OSI/AS)

HP NonStop OSI/AS is an implementation of the OSI Session and Presentation Layers (layers 5 and 6) and the Association Control Service Element (ACSE) in the Application Layer (layer 7). It provides the means for an application running on a NonStop system to communicate with other applications in a multivendor OSI network.

OSI/AS gives your application direct access to layer 5 (Session), layer 6 (Presentation), or layer 7 (Application) functions through a single, standards-based programmatic interface. The OSI/AS API consists of procedures modeled after OSI primitives, allowing you to port existing OSI applications onto NonStop systems. OSI/AS lets you develop applications for cooperative processing with systems from HP or other manufacturers such as DEC or Honeywell-Bull.

OSI/AS uses the services of other HP NonStop OSI products for network access. These products are described in Transport Layer Interface (OSI/TS) on this page and Network and Data Link Interfaces on page 8-15.

Transport Layer Interface (OSI/TS)

HP NonStop OSI/TS is an implementation of the OSI Transport Layer (layer 4). It provides reliable transport of data over a wide range of network types and data links.

NonStop OSI/TS gives OSI/AS applications access to LAN and WAN environments, including the Internet. Applications can use the same OSI/AS interface for all environments, simplifying application development and minimizing maintenance. You can also write applications that use OSI/TS processes directly for specialized application functions.

NonStop OSI/TS supports all Transport Layer classes defined in the OSI Reference Model. It also supports the Connectionless Network Layer Protocol (CLNP) for use over either a LAN or an X.25 packet-switched data network (PSDN). CLNP is used automatically when you run OSI/TS on a LAN; in the case of an X.25 network, you can choose CLNP as a configuration option.

Note. CLNP is sometimes called the OSI Internet Protocol (IP). It is similar, but not identical, to the internet protocol defined by TCP/IP.

OSI/TS can also connect to the NonStop TCP/IP subsystem at the Transport Layer in order to provide communication with other servers and clients over a TCP/IP network such as the Internet.

Network and Data Link Interfaces

WAN and LAN connectivity for HP NonStop OSI is provided by the HP X.25 Access Method (X25AM) subsystem and the Port Access Method (PAM) subsystem, respectively. TCP/IP connectivity for HP NonStop OSI is provided by either X25AM or PAM. OSI/TS can run over either X25AM or PAM; it also implements the Internet Protocol (IP) for use over the PAM or X25AM subsystem. Additionally, X25AM and PAM both offer programmatic interfaces, so you can develop applications that directly use WAN or LAN services.

X.25 Access Method (X25AM)

X25AM enables a NonStop S-series server to connect to a public or private PSDN that supports ITU–T (formerly CCITT) X.25 Recommendations. These networks include TELENET and TYMNET in the United States, DATAPAC in Canada, PSS in the United Kingdom, DATEX-P in Germany, European Telecommunications Standard NET 2, and many more.

NonStop S-series servers communicate over X.25 networks using the High-Level Data Link Control (HDLC) bit-synchronous protocol. A NonStop S-series server can support multiple connections to one or more X.25 networks. X25AM supports communications with networks that support features defined in either the 1980 or the 1984 CCITT standard for PSDNs. It can also be used for direct connections without packet-switching.

A product related to X25AM is X3PAD, which is an application that emulates an X.3 packet assembler/disassembler (PAD). X3PAD enables a terminal connected to a NonStop S-series server to use X25AM software, which in turn allows the terminal to communicate with a system other than a NonStop system across an X.25 network. The terminal can operate only in conversational mode. See Section 6, Device-Specific Connections, for more information about X3PAD.

Port Access Method (PAM)

The PAM subsystem is an independent interface that allows applications access to Ethernet and token-ring LANs. PAM provides access to Ethernet LANs through the ServerNet LAN systems access (SLSA) subsystem and Ethernet 4 ServerNet adapters (E4SAs), Fast Ethernet ServerNet adapters (FESAs), Gigabit Ethernet ServerNet adapters (GESAs), and Gigabit Ethernet 4-port ServerNet adapters (G4SAs). It provides access to token-ring LANs through the SLSA subsystem and Token-Ring ServerNet adapters (TRSAs).

Using the PAM subsystem, an application can access two different types of port interfaces: Link Level Control Type 1 (LLC1) and Ethernet. The PAM subsystem views the OSI/AS and OSI/TS subsystem as **PAM clients**. PAM clients are subsystems or use applications that need to use the port interface using file-system calls. The OSI/AS and OSI/TS subsystems use the LLC1 port interface.

The PAM subsystem is also described in Section 9, Local Area Network (LAN) Connections.

OSI Subsystem Management

HP NonStop OSI products are fully integrated with HP Distributed Systems Management (DSM) tools. (DSM is described in Section 4, Managing Communications Subsystems.) All subsystems use the Event Management Service (EMS), a DSM management interface. When an error occurs, the subsystem sends an event message to EMS. You can view event messages using the OSM Event Viewer or TSM EMS Event Viewer, HP OpenView, or NonStop NET/MASTER Management Services (MS).

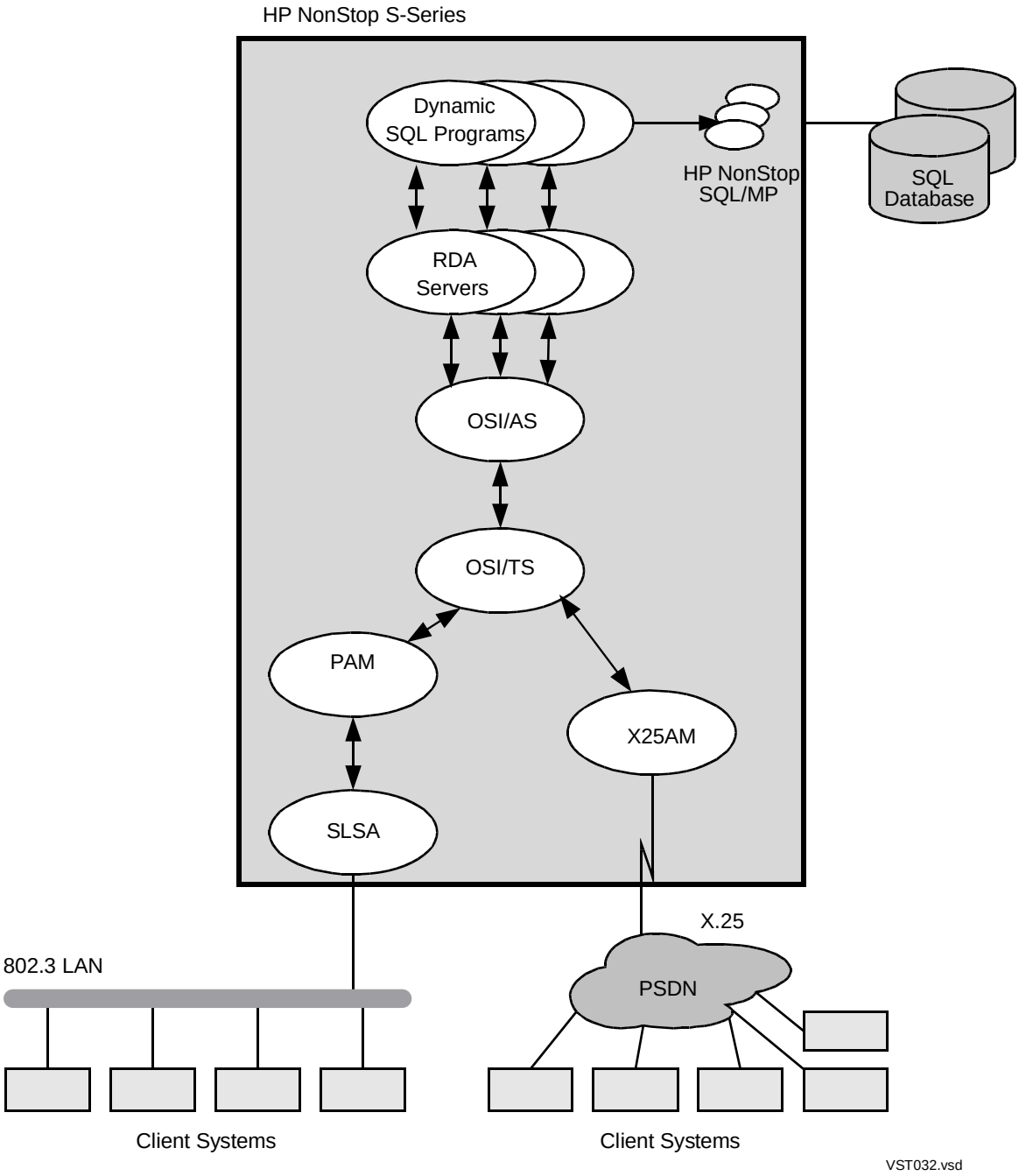
All subsystems can be configured and controlled interactively using the services of the Subsystem Control Facility (SCF).

OSI Application Example

Figure 8-5 on page 8-17 is an application example of the NonStop S-series server acting as a fault-tolerant file server in an OSI network. The application servers have been written to conform to Remote Database Access (RDA), an Application Layer standard. Database requests originate on client systems on either a LAN or an X.25 PSDN. The application, called the RDA server, uses the Application Layer interface of HP NonStop OSI/AS to receive requests from client systems.

The OSI products use the services of the PAM subsystem or X25AM, depending on the underlying network environment. Having received the database requests, the database server formulates Structured Query Language (SQL) statements, which it passes to the SQL program.

Figure 8-5. OSI Application Example



9

Local Area Network (LAN) Connections

This section describes HP products that allow HP NonStop S-series servers, workstations, and other systems and devices to communicate across local area networks (LANs).

HP offers LAN interface products based on industry-standard and *de facto* LAN protocols. HP LAN connectivity products allow you to integrate NonStop S-series servers and Expand networks with existing LANs. Programmatic interfaces support cooperative processing between personal computers (PCs) and NonStop S-series servers; your applications benefit from the economics and ergonomics of workstations and from the fault-tolerance, high performance, and other advantages of NonStop S-series servers for online transaction processing (OLTP).

A Brief Look at LANs

A **local area network (LAN)** is an interconnection of computer systems, workstations, or devices in a limited geographical area, such as within a building or a group of buildings like a campus or manufacturing plant. A LAN can provide services either for an entire organization or for a single department as part of a larger, enterprise-wide network. LANs typically offer high data-transmission speeds [1 to 16 megabits per second (Mbps) for Ethernet, token-ring, and token-bus LANs—defined below—or up to 100 Mbps for fiber-optic implementations], low transmission-error rates, and sharing of resources such as files and printers by users on the LAN.

The interconnection of devices in a LAN consists of physical communication lines that connect the devices and a software interface between these devices and the network. There are industry standards for LAN hardware interfaces and software interfaces.

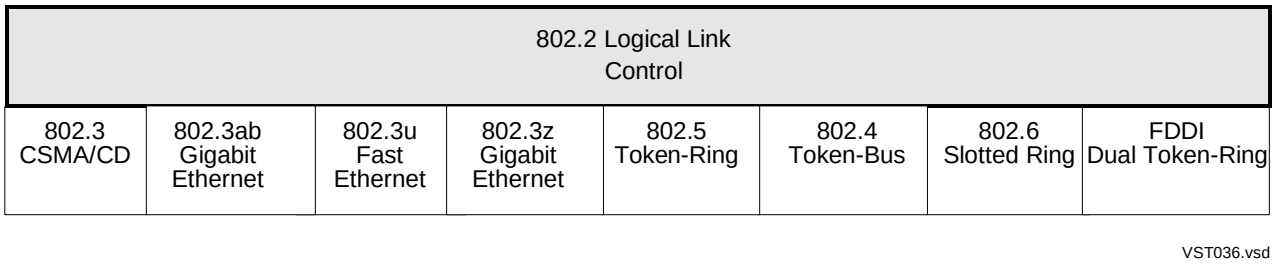
LAN hardware interfaces have been codified in Institute of Electrical and Electronics Engineers (IEEE) 802 standards, which are based on the OSI Reference Model:

802 Standard	**Description** (page 1 of 2)
802.1	Defines a general architecture for LANs.
802.2	Defines a Logical Link Control (LLC) protocol, a uniform set of services to the OSI Network Layer for support of LAN topologies and access methods. The standard defines two LLC types: type 1 is a connectionless service, and type 2 is a connection-oriented service.
802.3	Defines a media access control (MAC) protocol known as carrier sense multiple access/collision detection (CSMA/CD) for baseband coaxial cable configured in a bus topology. Derived from and similar to the Ethernet protocol.
802.3ab	Defines a standard for Gigabit Ethernet (1000 Base-T standard).

802 Standard	Description (page 2 of 2)
802.3u	Defines a standard for Fast Ethernet.
802.z	Defines a standard for Gigabit Ethernet (1000 Base-SX standard).
802.4	Defines a MAC protocol known as token-bus for token passing in a bus topology, using broadband or baseband cable.
802.5	Defines a MAC protocol known as token-ring for token passing in a ring network, using baseband twisted-pair wire, coaxial cable, or fiber optics.
802.6	Defines a MAC protocol known as slotted ring for metropolitan area networks (MANs).
802.9	Defines an architecture for integrating voice and data.
802.10	Defines encryption and key distribution mechanisms for LANs.

Figure 9-1 illustrates the relationships among these standards, with an emphasis on those products that HP currently supports.

Figure 9-1. IEEE 802 LAN Interface Standards



Besides the IEEE, other organizations publish widely followed standards for LANs. Many of the standards are similar to the IEEE 802 standards. The American National Standards Institute (ANSI) publishes a set of LAN standards, for example, standards for fiber optic and token-ring networks. Both Ethernet and token ring support both IP and SNA concurrently.

LAN Interfaces for HP NonStop S-Series Servers

To connect NonStop S-series servers to Ethernet 802.3 LANs, HP provides the Ethernet 4 ServerNet adapter (E4SA), Fast Ethernet ServerNet adapter (FESA), Gigabit Ethernet ServerNet adapter (GESA), and Gigabit Ethernet 4-port ServerNet adapter (G4SAs). The Token-Ring ServerNet adapter (TRSA) is used to connect to token-ring 802.5 LANs. The ATM 3 ServerNet adapter (ATM3SA) is used to connect ATM networks. The E4SA, FESA, GESA, G4SA, and TRSA use the ServerNet LAN systems access (SLSA) subsystem to deliver external LAN access. For more

information about the SLSA subsystem, refer to ServerNet LAN Systems Access (SLSA) Subsystem on page 2-11.

Port Access Method (PAM) Programmatic Interfaces

The PAM subsystem is an independent interface that provides programmatic interfaces that can be used by applications programmers to support specialized devices or applications on a LAN. An application can access two different types of port interfaces by making file-system procedure calls. The port interfaces are as follows:

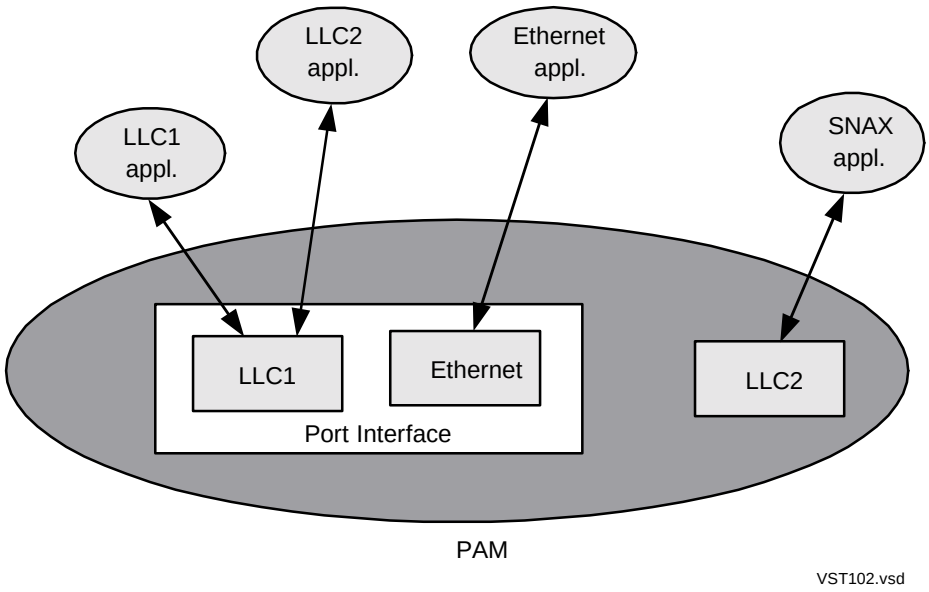
- Link Level Control type 1 (LLC1)
- Ethernet

The LLC1 connectionless service, often described as a datagram service, allows network entities to exchange data without establishing a connection at the Data-Link Layer. No call setup or termination procedures are required; however, the upper-layer software must provide the mechanisms for message routing, sequencing, delivery, error-detection, and flow control if required by the application.

The PAM subsystem also provides services to the OSI/AS, OSI/TS, SNAX/XF, and SNAX/APN subsystems. The OSI/AS and OSI/TS subsystems are PAM clients and use the port interface using file-system calls. The SNAX/XF and SNAX/APN subsystems are also PAM clients; however, they use a message-system interface instead of the port interface.

Figure 9-2 shows the relationship between applications and the programmatic interfaces to the PAM subsystem.

Figure 9-2. PAM Programmatic Interfaces



NetBIOS-Compatible LANs

Once a *de facto* industry-standard LAN interface for PC LAN applications, the network basic input/output system (NetBIOS) application interface is now used for legacy applications.

Three HP products provide connectivity to NetBIOS-compatible LANs:

- HP NonStop IPX/SPX
- HP NBX
- HP NBT

The NonStop IPX/SPX subsystem allows a NonStop system to function as a fault-tolerant database or transaction server on a Novell NetWare local area network (LAN). NonStop IPX/SPX provides connectivity to the NetWare LAN through an implementation of Novell's proprietary protocol suite.

HP NBX provides legacy NetBIOS support over NonStop IPX/SPX; HP NBT provides legacy NetBIOS support over HP NonStop TCP/IP.

Note. For G-series systems, MULTILAN software and hardware is not supported. The MLSRV file server is replaced by the SMB file server.

LAN Subsystem Management

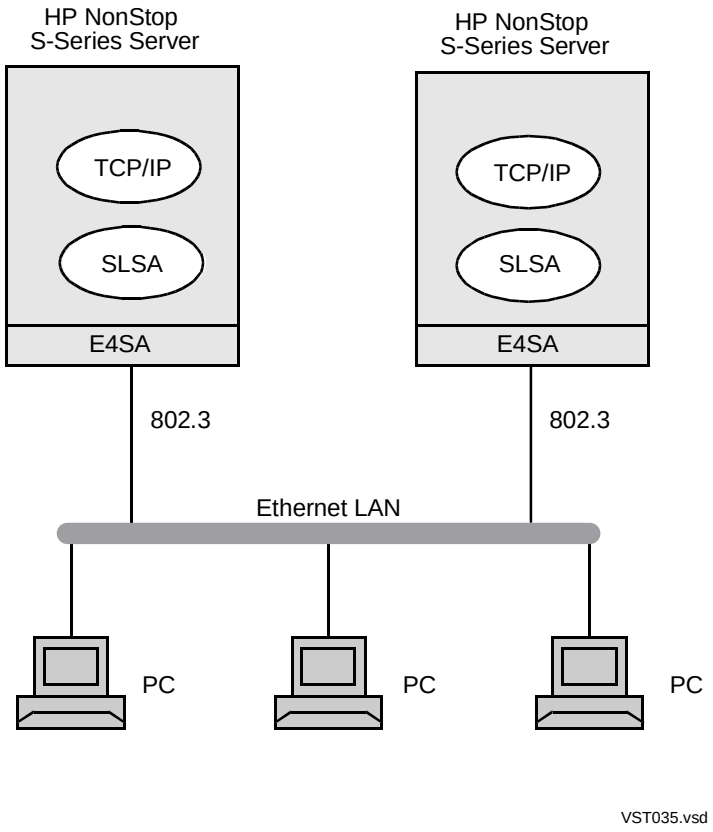
HP NonStop IPX/SPX, the SLSA subsystem, and the PAM subsystem support DSM and the Event Management Service (EMS). You can use the Subsystem Control Facility (SCF) to manage these products interactively. The PAM subsystem also provides the Subsystem Programmatic Interface (SPI) for writing management applications.

LAN Application Example

Figure 9-3 is an application example that shows a large aerospace manufacturer using PCs as cell controllers in a factory environment. The PCs send instructions to programmable controllers and machine tools that assemble printed circuit boards (PCBs).

The HP NonStop S-series servers communicate with the PCs across an Ethernet LAN. They also communicate information collected from the PCs to various host computers in the company.

Figure 9-3. LAN Application Example



10 TCP/IP Network Connections

HP provides a set of products that let you integrate HP NonStop S-series servers with multivendor host networks and workstations using the Transmission Control Protocol (TCP) or related User Datagram Protocol (UDP) and the Internet Protocol (IP). The product set includes:

- A standards-based programming interface (called the sockets library) that reduces programmer learning time and increases application portability
- A network terminal server (TELNET) that makes it possible for an HP application to log onto an application on another system or for another system, terminal, or workstation to log onto HP applications or utilities, including Pathway applications and Guardian utilities
- Terminal emulators for a variety of workstations that allow those workstations access to HP applications
- File transfer utilities implementing the File Transfer Protocol (FTP) over TCP/IP and the Trivial File Transfer Protocol (TFTP) over UDP, both of which enable the exchange of files between NonStop S-series servers and other stations on the network
- A gateway enabling users of an HP TRANSFER mail service (such as M6530 or PSMAIL) to exchange mail with users on other systems and workstations that implement the Simple Mail Transfer Protocol (SMTP)
- A domain name service (DNS) that allows the NonStop S-series server to act as a name server for a part of the network, performing name-to-address and address-to-name translations and collaborating with other name servers to resolve names
- Management interfaces consistent with Distributed Systems Management (DSM)
- Support for local area networks (LANs), X.25, and ATM networks
- Support for IP Multicast

This section discusses the following topics:

A Brief Look at TCP/IP

Transmission Control Protocol/Internet Protocol (TCP/IP) is a set of layered communications protocols for connecting workstations and larger systems. The interface was defined by users at several universities under the auspices of the U.S. Department of Defense Advanced Research Projects Agency (ARPA). While it is not currently part of the Open Systems Interconnection (OSI) standards, TCP/IP has been implemented by most major computer vendors and is therefore a *de facto* standard for multivendor connectivity.

TCP implements functions corresponding to layer 4 of the OSI Reference Model: the Transport Layer. It is connection-oriented and provides for the reliable exchange of data between a sending and a receiving system, no matter how many intermediate nodes the data traverses. TCP regards the data as a stream of bytes; it is not record-oriented. It guarantees that all data sent will be received by the destination system and will arrive in the order in which it was sent.

An alternative to TCP is the User Datagram Protocol (UDP). It is connectionless and record-oriented: it guarantees only that a packet received at the destination node is exactly what the sender sent. UDP does not guarantee that every packet will be delivered nor that packets will arrive in the order in which they were sent. Overhead for UDP is substantially less than for TCP.

IP implements functions corresponding to layer 3 of the OSI Reference Model: the Network Layer. Specifically, it handles the routing of data through a network, which typically consists of many different (heterogeneous) subnetworks. IP is connectionless; it routes data from a source address to a destination address; each message, or datagram, contains the information required to locate the destination node. Routers along the way contain the information required to locate the next stop (or gateway) on the path to the destination.

Associated with TCP/IP are several higher-level services that implement functions at layers 5 through 7 of the OSI Reference Model. The applications HP implements as products are described in HP NonStop TCP/IP, Parallel Library TCP/IP, and NonStop TCP/IPv6 on page 10-3.

HP NonStop TCP/IP, Parallel Library TCP/IP, and NonStop TCP/IPv6

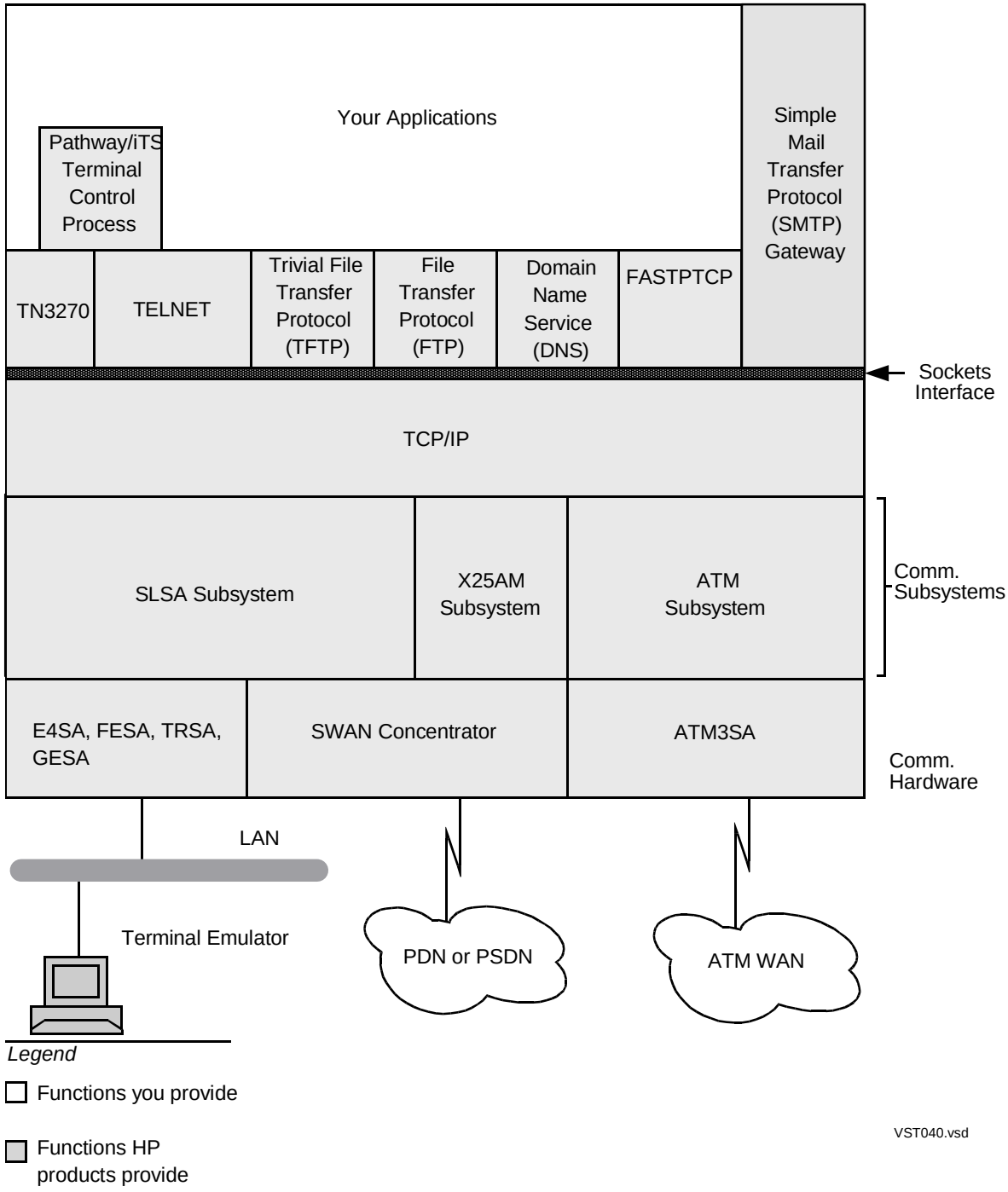
NonStop TCP/IP, Parallel Library TCP/IP, and NonStop TCP/IPv6 provide TCP/IP connections for the NonStop S-series server. The TCP/IP products connect the NonStop S-series server to a variety of UNIX systems, including the Integrity series (the HP fault-tolerant UNIX systems), Sun and HP workstations, Windows-based personal computers (PCs), and various large systems such as those manufactured by HP under the DEC name, Cray, Unisys, and IBM. The TCP/IP products also support the UDP protocol. The Parallel Library TCP/IP and NonStop TCP/IPv6 products support Ethernet connections and X.25 through the WAN subsystem; only NonStop TCP/IP supports token-ring and ATM connections.

Figure 10-1 on page 10-4 shows the relationship of the TCP/IP products to other HP products that you use to achieve a connection. Notice that TCP/IP on the NonStop S-series server relies on the ServerNet LAN systems access (SLSA) subsystem for connection to a local area network (LAN), the X25AM subsystem for connection to a wide area network (WAN) (NonStop TCP/IP only), and the ATM subsystem for connection to an ATM network (NonStop TCP/IP only).

Note. Parallel Library TCP/IP and NonStop TCP/IPv6 do not support subnets of type X25 but X.25 functionality is supported on these products through the X25AM and WAN subsystems. See the *X25AM Configuration and Management Manual* for more information.

For WAN connections, as shown in Figure 10-1, the connection passes to the packet switching data network (PSDN) and for ATM connections, the connection passes to an ATM LAN or WAN network.

Figure 10-1. NonStop TCP/IP and Related Products



LAN and WAN Connections

The TCP/IP products support both LANs and WANs by running over the SLSA subsystem and X25AM, respectively. (If you use X25AM, TCP or UDP uses the routing services of X25AM as well as IP.) The application interface is the same for LANs and WANs.

NonStop TCP/IP supports Ethernet, Fast Ethernet, Gigabit Ethernet, token-ring, and ATM connectivity. Parallel Library TCP/IP and NonStop TCP/IPv6 support Ethernet, Fast Ethernet, and Gigabit Ethernet connectivity. Section 9, Local Area Network (LAN) Connections, describes the Ethernet and token-ring interfaces. To use the token-ring interface, select the Subnetwork Access Point (SNAP) encoding option in your NonStop TCP/IP configuration.

Berkeley Sockets Programmatic Interface

The TCP/IP application program interface (API)—based on the Berkeley Software Distribution (BSD) UNIX 4.3 sockets interface—is one of the few interfaces offered by HP that does not take the form of file-system procedure calls. The TCP/IP API enables you to port existing TCP/IP applications to NonStop S-series servers from other computers. It also allows programmers who are familiar with the Berkeley sockets interface to work in HP online transaction processing (OLTP) environments.

A **socket** is a logical connection between two applications across a network. The same application or system can use multiple sockets. A socket is associated explicitly or implicitly with an address and a logical port number. When you identify the process or device with which you want to communicate, you identify the remote socket by specifying the address and port. (Each server on a host has its own port number.)

The sockets interface consists of a library of C language functions that give you access to TCP or UDP or direct access to IP.

OSS sockets are not BSD and have their own set of functions. For more information about OSS sockets, see the *OSS Porting Guide* and the *OSS Programmer's Guide*.

File Transfer and Access Facilities

NonStop TCP/IP includes two utilities that let you transfer unstructured binary or ASCII files between computer systems. The File Transfer Protocol (FTP) runs over TCP and provides for reliable file transfers. It is suitable for most file transfers between NonStop systems and other systems on the network. The Trivial File Transfer Protocol (TFTP) runs over UDP; it is connectionless and does not include any user-authentication mechanism, so its overhead is low. One good application of TFTP is to provide boot files for diskless workstations or shop-floor controllers.

Terminal and Workstation Interfaces

The TCP/IP products include components that support terminal and workstation access to applications across a TCP/IP network.

One such component implements the TCP/IP network terminal protocol (TELNET). The HP TELNET client allows you to log onto another computer on the TCP/IP network as if your application were a terminal. The HP TELNET server lets users on other systems or workstations log onto your NonStop S-series server to run line-at-a-time applications, such as HP utilities or conversational Pathway applications. (The TELNET server fully supports 6530 page-mode applications.) The remote system or workstation must also support the TELNET protocol. The programmatic interface to TELNET is a file-system interface.

The TCP/IP products also provide terminal-emulation software. The TN3270 server product supports the standard TN3270 protocol used by IBM 3270 emulators over TCP/IP.

Simple Mail Transfer Protocol (SMTP) Gateway

The TCP/IP products include a gateway that allows users of an HP TRANSFER mail service to exchange electronic mail (e-mail) with UNIX workstations and hosts that use the Internet-format mail. The gateway can also relay SMTP messages between hosts; the NonStop S-series server is an intermediate system in such exchanges.

Domain Name Service (DNS)

Because a TCP/IP network is normally heterogeneous, a distributed name service is defined to make resources on different nodes visible to, and addressable from, other nodes. The resources for which name-to-address and address-to-name conversions are supported include the nodes themselves, users, printers, and some others.

The TCP/IP name space consists of a hierarchy of **domains**. A domain is an arbitrary division of a network; it usually has geographic or topological significance, with a node serving as a gateway into the domains and a series of addresses assigned to the domain. Within a domain there can be multiple administrative **zones**, whose main significance is logical. (For instance, you might assign all devices in a building to one domain and all devices on the same floor to one zone. Alternatively, you might define domains and zones along organizational lines.) A domain typically has one or more name servers capable of converting names to addresses or addresses to names and of communicating with the name servers for zones in the domain. The domain name server retains the name and address information for its own zone and communicates with servers in the other zones for resolution of names defined there.

The HP Domain Name Service (DNS) allows the NonStop S-series server to act as a name server in a TCP/IP network. Because the NonStop S-series server is fault-tolerant, name information is protected against, and remains available through, component failures, such as failure of the processor in which a disk process runs. The DNS consists of an interactive utility and a server process, which in turn consists of a domain name resolver (for name-to-address conversions) and a domain name server (for address-to-name conversions).

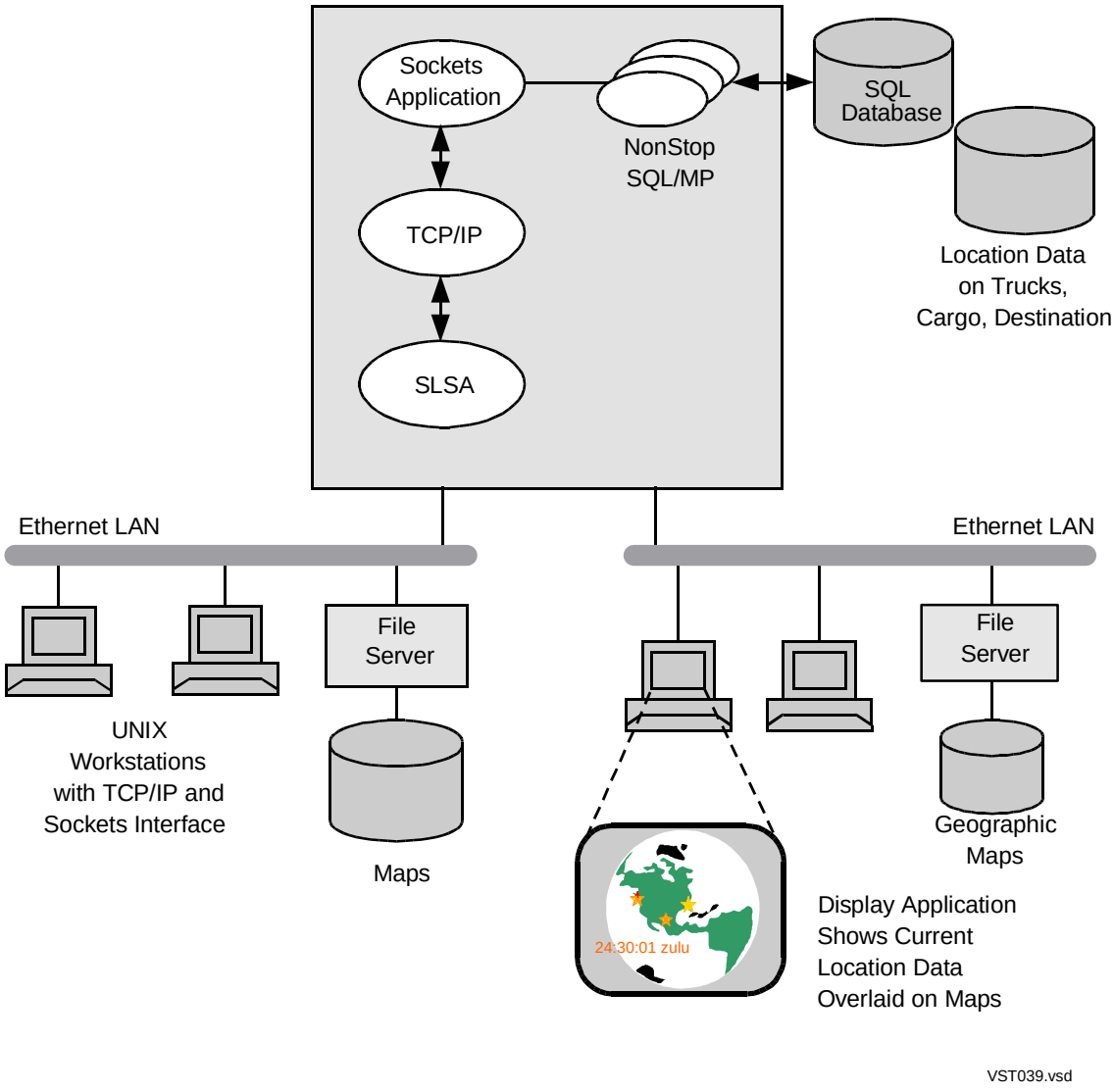
NonStop TCP/IP, Parallel Library TCP/IP, and NonStop TCP/IPv6 Subsystem Management

The TCP/IP products support Distributed Systems Management (DSM). They also support a programmatic interface. The NonStop TCP/IP products report critical errors or other abnormal conditions to the Event Management Service (EMS).

TCP/IP Application Example

Figure 10-2 on page 10-8 is an application example that shows how a trucking company might use TCP/IP products to monitor the locations and status of its trucks. UNIX workstations on LANs display current data overlaid on detailed maps. The maps are stored on file servers in the LAN; the current locations and status of trucks are recorded in an HP NonStop SQL database on the NonStop S-series server. The sockets interface of the TCP/IP products support cooperative processing between the workstations and the NonStop S-series server. Because the database is on the NonStop S-series server, it is available and reflects the current state of the trucking operation at all times.

Figure 10-2. NonStop TCP/IP Application Example



Parallel Library TCP/IP Architecture and Features

Parallel Library TCP/IP is a NonStop TCP/IP product that provides increased performance and scalability. Parallel Library TCP/IP coexists with NonStop TCP/IP on NonStop S-series servers. Parallel Library TCP/IP supports Ethernet 4 ServerNet adapters (E4SAs), Fast Ethernet ServerNet adapters (FESAs), Gigabit Ethernet ServerNet adapters (GESAs), and Gigabit Ethernet 4-port ServerNet adapters (G4SAs).

Parallel Library TCP/IP takes advantage of the NonStop S-Series server architecture, which makes it possible for all processors in a system to access an adapter. Parallel Library TCP/IP uses the communications adapter and the ServerNet cloud to route packets directly to the processor containing the application. By directly routing packets

to the correct processor from the adapter, Parallel Library TCP/IP eliminates the message-system hop that occurred between processes in the NonStop TCP/IP architecture.

By eliminating message system hops, Parallel Library TCP/IP reduces the total path-length from the application to the wire. This path-length reduction reduces individual request latency. In addition, more requests per second can be serviced with the same processor cost, resulting in higher throughput.

Single IP Host

In NonStop TCP/IP, if you were to run multiple process instances of a listening application in multiple processors (to increase computing power), you needed a different TCP/IP process, (one per listening application process instance), in each processor. Each of those TCP/IP processes required a unique physical port (PIF) and presented a unique IP host to the outside world.

By contrast, in Parallel Library TCP/IP, you can run multiple process instances of a listening application in multiple processors, all sharing the same PIF. ServerNet allows all processors in a clustered system to access the same PIF; Parallel Library TCP/IP allows applications in different processors to access the same PIF and share a common listening TCP port number. Hence, in Parallel Library TCP/IP, multiple application process instances running in different processors can be presented to the outside world as a single IP host.

Ethernet Failover

Ethernet failover, available as of the G06.10 RVU of Parallel Library TCP/IP, provides fault tolerance at the adapter level. With Ethernet failover, you can configure your network to continue running if an adapter fails or during maintenance and replacement of an adapter.

Ethernet failover allows TCP and UDP sessions to continue operating if there are cabling or adapter failures. With Ethernet failover, network traffic automatically migrates from the faulty logical interface (LIF) to the working LIF.

Ethernet failover requires two logical interfaces or LIFs. To implement Ethernet failover, you can configure one Ethernet 4 ServerNet adapter (E4SA) or one Gigabit Ethernet 4-port ServerNet adapter (G4SAs), which contain four Ethernet ports—each of which is configured through a LIF—or two Fast Ethernet ServerNet adapters (FESAs) or two Gigabit Ethernet ServerNet adapters (GESAs). (Two FESAs or GESAs are needed because these adapters only have one Ethernet port and one LIF.)

NonStop TCP/IPv6 Architecture and Features

NonStop TCP/IPv6 shares the same architecture and features of Parallel Library TCP/IP and adds IP version 6 (IPv6) functionality. NonStop TCP/IPv6 is available as of G06.20. Since Parallel Library TCP/IP is now a mature product, any new features that are added in the future will be added to NonStop TCP/IPv6 rather than to Parallel Library TCP/IP.

Internet Protocol Version 6 (IPv6), as defined in RFC 2460, is the replacement network layer protocol for the Internet, designed to replace the current Internet Protocol Version 4 (IPv4). The following list highlights some of the features of IPv6:

- IPv6 Address

  The IPv6 address is 128 bits in length (compared to the 32-bit IPv4 address) and uses a new text-representation format as follows:

  `x:x:x:x:x:x:x:x`

  The x is a hexadecimal value of a 16-bit piece of the address. For example, the following addresses are IPv6 addresses:

  `FEDC:BA98:7654:3210:FEDC:BA98:7654:3210`

  `1070:0:0:0:0:800:200C:417B`

- Neighbor Discovery Protocol

  IPv6 nodes on the same link employ the neighbor discovery protocol to discover each other's presence, determine each other's link-local addresses, find routers, and maintain reachability information about paths to active neighbors and remote destinations.

- Stateless address autoconfiguration

  Each IPv6-enabled subnet can be configured to auto configure its addresses based on the information contained in neighbor discovery router advertisement packets.

NonStop TCP/IPv6 can be run in INET mode; in this mode it is a direct replacement for Parallel Library TCP/IP and supports only IPv4 communications. The three operating modes of NonStop TCP/IPv6 are:

Mode	Description
INET	In INET mode, NonStop TCP/IPv6 supports only IPv4 communications and is a direct replacement for Parallel Library TCP/IP.
INET6	In INET6 mode, NonStop TCP/IPv6 supports only IPv6 communications. Changes must be made to Guardian and OSS sockets applications to support IPv6 communications.
DUAL	IN DUAL mode, NonStop TCP/IPv6 supports both IPv4 and IPv6 communications. Changes must be made to Guardian and OSS sockets applications to support IPv6 communications.

Refer to the following manuals for information about NonStop TCP/IPv6:

TCP/IPv6 Configuration and Management Manual
TCP/IPv6 Migration Guide
TCP/IPv6 Configuration and Management Manual

11 Internet Applications

The growth of the Internet and the World Wide Web is transforming the corporate environment. In order to meet the challenges of this new environment, HP offers an integrated family of Internet transaction processing servers and solutions for running critical enterprise applications on the Web. HP WebServer solutions comprise a comprehensive suite of products and services. This section provides a brief overview of some of the HP WebServer products available on the NonStop system.

A Brief Look at the World Wide Web

The World Wide Web was defined by the CERN project in Switzerland and extended by a number of groups, most notably the National Center for Supercomputing Applications (NCSA) at the University of Illinois. The Web was developed to improve communication over the Internet by allowing users to access and display platform-independent documents containing ASCII text, graphics, sound, and video elements. In addition to document access, the Web provides document-searching facilities and interaction with user-written and vendor-provided scripts and servers.

The remainder of this subsection describes the following topics:

- How Web servers and Web clients function in the Web technology client-server architecture.
- How HyperText Transfer Protocol (HTTP) is used to transfer data on the Web.
- How HyperText Markup Language (HTML) is used to display formatted text and create hyperlinks.
- How the Common Gateway Interface (CGI) is used to provide an interface between Web server applications.
- How HP provides products to support the new number of emerging standards for Web services, such as JavaScript, Extensible Markup Language (XML), and J2EE.

Web Servers and Clients

Web servers are server programs in the World Wide Web technology client-server architecture. Web server functions can be divided into two parts:

- A file server performs functions such as file transfer and buffering.
- A message-switch facility allows messages from Web clients to be forwarded to application programs.

Web clients (often called browsers) are the client programs in the Web technology client-server architecture. They typically provide a number of facilities that vary from one client to another. Web clients can communicate with a number of server types, not just Web servers. This communication is typically initiated by following a hypertext link in the form of a Universal Resource Locator (URL).

HyperText Transfer Protocol (HTTP)

The Web uses HTTP to transfer data between clients and servers. HTTP allows exchanges of documents, human input, and application output between clients and servers that support it. When an HTTP server receives input from a client, it satisfies the request by returning a requested document or by forwarding the request to a program that provides document-search facilities or to an application program whose results are returned to the client.

HyperText Transfer Protocol Secure (HTTPS)

HyperText Transfer Protocol Secure (HTTPS) is a a type of server software that provides secure transactions on the World Wide Web. HTTPS enables online transactions to occur through a secured socket layer (SSL).

Secure Sockets Layer (SSL) is a data communication protocol that implements three cryptographic assurances: authentication, confidentiality, and message integrity. SSL also provides secure key exchange between an client (an Internet browser) and a server.

HyperText Markup Language (HTML)

To display formatted text and allow hypertext links, the Web uses HTML. In HTML documents, certain pieces of text or graphics can be formatted to link to other text or graphics within the same document or in another document. When such a link is highlighted via a computer keyboard, mouse, or other pointing device, the linked text or graphic is displayed.

Another important feature of HTML is its ability to produce online forms, which include text and numeric input fields, drop-down and scrolling lists, radio buttons, and other features useful for data entry. The online forms facility is very important when HTML is used with user-written applications and document-search facilities.

Common Gateway Interface (CGI)

CGI is the interface between the Web server and applications. The interface is context-free and provides for a single, possibly very long, request followed by a single, possibly very long, response. The CGI application uses environment variables and a data stream to exchange HTTP requests and responses with a client, by way of the Web server.

Java 2 Enterprise Edition (J2EE)

The Java 2 Enterprise Edition (J2EE), developed by Sun Microsystems, enables the use of dynamic applications to communicate over HTTP with client browsers, specifically web containers, servlets, JavaServer Pages (JSP), Java classes, and deployment descriptors. The iTP Secure WebServer implementation of servlets and JSP is a key component for J2EE compliance. It allows support for Java-based

NonStop products. For an overview of all these other components of a complete J2EE environment, consult the Sun Microsystems J2EE website.

Extensible Markup Language (XML)

The Extensible Markup Language (XML) is the universal format for structured documents and data on the web. XML is extensible, platform-independent and is similar to HTML in that XML uses tags and attributes.

Simple Object Access Protocol (SOAP)

Simple Object Access Protocol (SOAP) is a lightweight protocol for exchange of information in a decentralized, distributed environment. SOAP is an XML-based protocol that consists of three parts: an envelope that defines a framework for describing what is in a message and how to process it, a set of encoding rules for expressing instances of application-defined datatypes, and a convention for representing remote procedure calls and responses.

HP Internet Products

HP offers an integrated family of Internet products to enable you to integrate your applications with the Web. These products are described on the following pages:

- BEA WebLogic Server for the NonStop Server on page 11-3
- iTP Secure WebServer on this page
- iTP Active Transaction Pages (ATP) on page 11-5
- NonStop Servlets for JavaServer Pages (NSJSP) on page 11-6
- NonStop SOAP on page 11-6
- NonStop SOAP for Java on page 11-7

BEA WebLogic Server for the NonStop Server

The BEA WebLogic Server (WebLogic Server) is a standards-based J2EE application server that provides a foundation for building applications, and includes:

- Load balancing
- Fault tolerance
- Web services
- Network transparency
- Legacy integration
- Transaction management
- Security

- Multi-threading
- Persistence
- Database connectivity
- Resource pooling
- Development, testing, and packaging facilities

The WebLogic Server uses the Java platform for portability to a large number of operating platforms supporting the Java platform.

On properly configured HP NonStop servers, the WebLogic Server runs unchanged just like on other platforms. In addition, HP provides an XA resource manager for the HP NonStop™ Transaction Management Facility (TMF) facility so that NonStop server resources can participate in global transactions coordinated by the WebLogic Server transaction managers.

iTP Secure WebServer

The iTP Secure WebServer provides a full range of services for running online commercial or informational enterprises on the Web. In addition to basic Web-related services, the iTP Secure WebServer provides other important services including access control, enhanced logging, customized error messaging, and automatic directory indexing.

The ITP Secure WebServer software, which is inherently scalable and reliable, enables the creation of Java Servlets that can take advantage of the database and transaction services infrastructure of the HP NonStop server. Java Servlets run in a container that is implemented as NonStop TS/MP server processes that can be replicated and automatically load-balanced across multiple processor nodes for scalability throughput. Consequently, large volumes of servlet-based web transactions can be executed concurrently to maintain consistent response times.

Features built into the iTP Secure WebServer include:

- Support for ATP, NSJSP, SOAP and other Internet products and services by providing a centralized environment consisting of server classes and other types of objects
- Web clients that provide a graphical user interface (GUI) to the web servers
- The NonStop TCP/IP subsystem, including Parallel Library TCP/IP
- iTP Secure WebServer httpd that enables multiple httpd processes to execute in parallel
- Common Gateway Interface (CGI) servers
- The ability to write CGI applications as Java servlets
- The implementation of replicated web servers that can be used interchangeably and transparently for access to the same content and services

- Encryption and authentication methodologies
- Standards compliance
- Virtual host support for multiple domains

iTP Active Transaction Pages (ATP)

iTP ATP is a server-side JavaScript environment for NonStop systems. iTP ATP enriches the iTP Secure WebServer application-development process by letting you use the popular JavaScript scripting language and readily available Web-authoring tools. ATP gives you a convenient way to provide browser-based access to existing applications.

ATP comes with a set of tools that make it easier to develop server-side scripts. Because these tools are scripts in themselves, you can print or display the source of each to see examples of how to use various ATP objects and functions.

Features of ATP include:

- The JavaScript language interpreter
- An HTML parser to identify and use embedded server-side scripts
- JavaScript language objects to support interfaces with NonStop SQL, NonStop TS/MP, NonStop TUXEDO, and the NonStop TCP/IP sockets interface
- XML for ATP
- IEEE floating-point support

NonStop Servlets for JavaServer Pages (NSJSP)

NonStop Servlets for JavaServer Pages (NSJSP) are platform-independent server-side programs that programmatically extend the functionality of web-based applications by providing dynamic content from a webserver to a client browser over the HTTP protocol. NSJSP is an extension of that servlet functionality, primarily supplying a template of static content to be modified with dynamic content from a servlet or another programmable resource.

The NSJSP implementation is a multi-threaded out-of-process servlet container: a Java web container (with web applications) that runs in a Java Virtual Machine (JVM) outside of the iTP Secure WebServer HTTPD process.

In essence, NSJSP provides the same JVM functionality as any other J2EE implementation, but is unique in its ability to scale across multiple CPUs to provide a NonStop computing environment.

Each web container can contain a number of applications, each with their own servlets, JSP, and other resources. These containers are accessible by any HTTPD process running on any CPU. The containers and the HTTPD processes are part of the NonStop TS/MP 2.0 environment.

NonStop SOAP

Many standards are emerging in support of Web Services. Primary among them is SOAP, the Simple Object Access Protocol. SOAP is an XML standard that defines the XML formats of a service request and response. SOAP is independent of underlying protocols such as HTTP and SMTP and enables access to servers behind a firewall.

NonStop SOAP software running on a NonStop server provides access to the context-sensitive and context-free services of NonStop Transaction Services/MP (NonStop TS/MP) software using SOAP and XML. Transactions can be controlled by the client to commit or roll back an operation that spans multiple SOAP interactions to complete the service. In addition, using the SOAP C++ API, a SOAP client can be set up to access services either on the NonStop platform or on another platform.

Features of NonStop SOAP include:

- A prebuilt SOAP server, which allows an XML or SOAP client to use NonStop TS/MP services. The server provides access to context-free and/or context-sensitive NonStop TS/MP server classes.
- Web Services Description Language (WSDL), an XML-based language that captures the mechanical information a client needs to access a web service: definitions of message formats, SOAP details, and a destination URL. WSDL provides a simple way for service providers to describe the basic format of requests to their systems regardless of the underlying protocol (such as SOAP or XML).
- A Service Definition Repository (SDR). The SDR is a persistent store of data specified in the SDL and is implemented as a Guardian Enscribe database. At run

time, the SOAP server references the SDR, instead of the SDL document. The Soap Admin tool then manages the SDR.

- A tool called Soap Admin, which you use if your XML or SOAP client will communicate with NonStop TS/MP services. The Soap Admin tool parses an XML input file conforming to the SDL DTD and can generate a variety of files that you can use to customize your configuration.
- Compliance with XML, SOAP, JavaScript, HTTP, and HTML standards.

NonStop SOAP for Java

NonStop SOAP for Java runs on a NonStop server and allows a Simple Object Access Protocol (SOAP) client to communicate with NonStop Java classes and NonStop Enterprise Java Beans (EJB). NonStop SOAP for Java allows Java-based services to be made available in a Web services environment.

NonStop SOAP for Java implements Apache SOAP version 2.2. Apache SOAP is an open-source implementation of SOAP version 1.1 and the SOAP Messages with Attachments specifications in Java. Apache SOAP is developed by the Apache SOAP community. Apache SOAP also provides a client library to invoke SOAP services available remotely or as a server-side tool to implement SOAP accessible services.

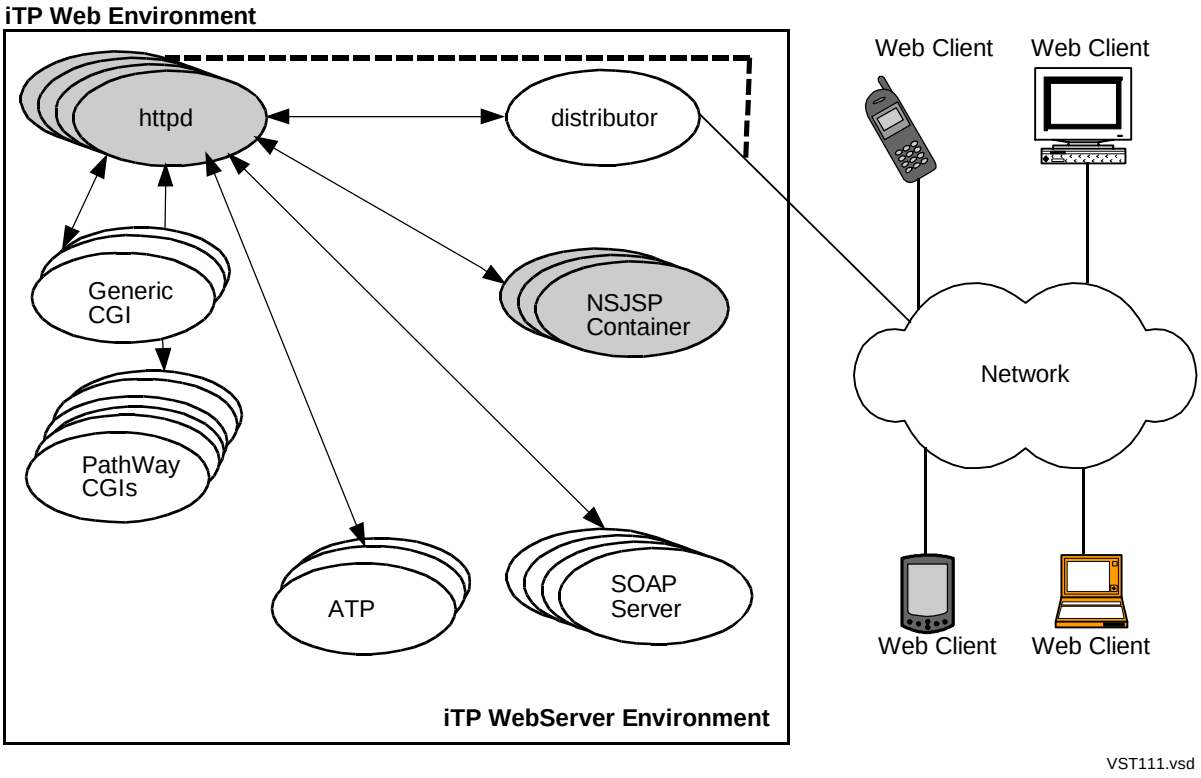
Features of NonStop SOAP for Java include:

- A configuration file and setup script to install NonStop SOAP for Java under the iTP WebServer and NSJSP environments.
- A deployment descriptor file that exposes a service implemented using a standard Java class (including a normal Java bean) or an Enterprise Java Bean (EJB).
- Administration tools to generate a SOAP deployment descriptor file for a Java class or Enterprise Java Bean (EJB). The Administration tools can also be used to generate WSDL and deploy a Java class or an EJB as a Web service.
- SOAP client APIs help you build a SOAP client that can invoke a Web service.
- Support for SOAP attachments on the client and server.
- Samples which utilize the SOAP for Java features.
- A tool for tracing SOAP messages.

Internet Application Example

Figure 11-1 is an application example that shows how the components within the iTP Web Environment interact.

Figure 11-1. Internet Application Example



A

HP NonStop Communications Products

This alphabetical appendix lists and briefly describes HP NonStop communications software and hardware products. Also included are some other HP products used with communications subsystems; for example, some Distributed Systems Management (DSM) tools and utilities.

ActionView.400 — A client-server application for HP NonStop S-series servers and PC workstations using the Microsoft Windows operating system. The ActionView.400 modules provide system and performance monitoring, configuration management for OSI/MHS objects, administrative functions such as chargeback for system usage, and operator alerts when user-defined thresholds are exceeded.

AM3270 — An access method that allows application programs to use individual 3270-compatible devices connected to a nonswitched, bisynchronous, point-to-point or multipoint, communications line.

Asynchronous Terminal Process 6100 (ATP6100) — A software product that provides the means for an application program to use asynchronous point-to-point terminals, printers, and other devices. See also Asynchronous wide area network (AWAN) access servers, GAP, and SWAN Concentrator.

Asynchronous Transfer Mode (ATM) subsystem — An HP communications subsystem that provides access to ATM networks from a NonStop S-series server. ATM is a networking technology that relays fixed-sized cells as opposed to frames or packets. This cell-relay model reduces processing time in the switching hardware, making ATM a high-bandwidth networking option.

Asynchronous wide area network (AWAN) access servers — A series of servers that provides local and remote asynchronous access to NonStop S-series servers and other local area network (LAN)-based resources. AWAN access servers combine the features of both terminal and remote access servers. See also GAP.

ATM 3 ServerNet adapter (ATM3SA) — A ServerNet adapter that provides access to asynchronous transfer mode (ATM) networks from a NonStop S-series server. The ATM3SA supports the ATM User-Network Interface (UNI) specification over a 155 Mbps OC-3 Synchronous Optical Network (Sonet) connection. See also Asynchronous Transfer Mode (ATM) subsystem.

ATP — See iTP Active Transaction Pages (ATP).

ATP6100 — See Asynchronous Terminal Process 6100 (ATP6100).

Cluster Switch — A hardware product that controls the routing of ServerNet messages across the external fabrics of a ServerNet See HP NonStop Cluster Switch (model 6770) and HP NonStop ServerNet Switch (model 6780).

Common Communication ServerNet Adapter (CCSA)	A ServerNet adapter that provides connectivity between NonStop S-series servers and Signaling System Number 7 (SS7) protocol LANs. It features a four-port adapter supporting automatic configuration for V.35, EIA-449, EIA-232, or X.21 operation.
Communication Network Management (CNM)	A SNAX Advanced Program Communication Support (SNAX/APC) interface that gives an application access to IBM System Network Architecture (SNA) network-management messages.
CP6100	A communications process that, when combined with a user-written communications application, passes application data to a protocol module running in the communications line interface processor (CLIP) on a ServerNet wide area network (SWAN) concentrator, enabling the application to not only transfer data but also initiate protocol sequences and control error recovery. CP6100 is commonly used for custom device support.
Distributed Name Service (DNS)	An optional Distributed Name Service (DNS) product, DNS manages a distributed database that can serve as a single-source, automated record of the names of all system and network components and their relationships. DNS supports aliases and various ways of grouping names. You determine which nodes can resolve a name and which can change its definition.
Distributed Systems Management (DSM)	An architecture and a compliant set of tools, including both standard and optional products, enabling the user to manage, monitor, and control every element of a large system or an Expand network. DSM tools include ViewPoint, Subsystem Control Facility (SCF), and Event Management Service (EMS) interfaces to the management processes for various HP subsystems. Among the resources you can manage with DSM are processors, software subsystems, peripheral devices, applications, terminals, and communications lines.
E4SA	See Ethernet 4 ServerNet adapter (E4SA).
EM3270	A process on the NonStop S-series server that enables HP printers, workstations, and terminals to emulate IBM 3270 printers and terminals and to use applications residing on IBM host systems. With EM3270, an HP terminal or workstation becomes the functional equivalent of an IBM 3270 terminal. EM3270 enables HP terminal and workstation users to switch between HP and IBM applications.
EMS	See Event Management Service (EMS).
Envoy	A communications subsystem that, when combined with a communications-oriented user application, supports connection with specialized asynchronous and byte-synchronous devices not supported by higher-level HP communications products.
EnvoyACP/XF	A communications subsystem that, when combined with a communications-oriented user application, supports connection with specialized bit-synchronous devices not supported by higher-level HP communications products.

ES Connect	A product that enables NonStop S-Series processors to communicate with IBM mainframes through IBM's Enterprise Systems Connection (ESCON) channel. Use of the channel means that bulk data transfer to and from IBM machines will be significantly faster.
Ethernet 4 ServerNet adapter (E4SA)	A ServerNet adapter that provides flexible and efficient connectivity between NonStop S-series servers and Ethernet local area networks (LANs). It features 4 ports per board, with each port supporting communications speeds of 10 megabits per second.
Event Management Service (EMS)	Part of Distributed Systems Management (DSM), EMS collects, logs, and distributes event information generated by software subsystems and routes this information through the network. One example of EMS use is that an operator using the OSM Event Viewer or TSM EMS Event Viewer can display all incoming event messages or use filters built with the EMS filter language to select specific sets of event messages according to the operational priorities of the system or network.
Exchange Remote Batch Emulation System	Two products that permit NonStop S-series servers to emulate different types of remote job entry (RJE) devices to an IBM host. Exchange includes a command interpreter and a line server process. It supports interactive, command-file, and programmatic operation. Exchange/RJE emulates an IBM 2780/3780 data transmission terminal for binary synchronous communication. Exchange/SNA emulates an IBM Systems Network Architecture (SNA) workstation, providing simultaneous transmission of multiple, fully synchronized data streams within an SNA environment.
Expand	A network subsystem that extends NonStop Kernel operation to networks of geographically distributed NonStop S-series servers and other NonStop systems. With the Expand subsystem, authorized users can use processes, files, or devices on any system in the network, regardless of their physical location or the occurrence of a line or component failure. Expand networks can include as many as 255 NonStop servers of up to 16 processors each.
Extended General Device Support (GDSX)	A software product that is used to develop a front-end process to interface between an HP application program and an input/output process (IOP). A fully functional GDSX module is a combination of HP code and user-written routines. Typically, GDSX is used for data-stream conversion to support nonstandard devices; it is often used in connection with the Pathway environment.
Fast Ethernet ServerNet adapter (FESA)	A ServerNet adapter that provides connectivity between NonStop S-series servers and Fast Ethernet 802.3u LANs. It features a single-port adapter supporting communication speeds of 100 megabits per second (Mbps) and 10 Mbps.

FASTPTCP	FASTPTCP is a Spooler Print Process that supports a wide-range of network printers as well as printers connected to print servers and terminal servers. Protocols supported include HPJetDirect, Lexmark, Microplex, LPD1179, TELNET, and “raw” TCP. AWAN 3883/4/5 and 3886 models include enhanced support for Fastptcp TELNET protocol. Special support is provided for HP TTAP and Hewlett-Packard PCL printers.
FESA	See Fast Ethernet ServerNet adapter (FESA).
GAP	GAP provides ATP6100 support for AWAN 3883/4/5 and 3886 terminal servers. GAP is required for non-standard asynchronous devices and protocols that do not work with standard AWAN using Telserv or FASTPTCP. GAP is provided by Gemini Communications, Inc., an HP Alliance Partner (http://www.geminic.com).
GDSX	See Extended General Device Support (GDSX).
GESA	See Gigabit Ethernet ServerNet Adapter.
Generalized Full-Duplex Protocol Module	A protocol module that allows the NonStop S-series server to act as supervisor on a full-duplex asynchronous or synchronous line. This product requires CP6100.
Gigabit Ethernet 4-port ServerNet Adapter	A multiport adapter that provides Gigabit connectivity between NonStop S-series servers and 1000 Base-T standard (802.3ab) and 1000 Base-SX standard (802.z) LANs.
Gigabit Ethernet ServerNet Adapter	A ServerNet adapter that provides Gigabit connectivity between NonStop S-series servers and 1000 Base-T standard (802.3ab) and 1000 Base-SX standard (802.z) LANs.
HP Failure Data System (TFDS)	A diagnostic tool that is a component of the HP NonStop Kernel operating system. TFDS isolates software problems and provides automatic processor failure data collection, diagnosis, and recovery services. TFDS monitors processors and automatically initiates a processor dump if a processor fails. The failed processor is reloaded automatically, and the processor is analyzed along with the incident.
HP NBT	A software product that provides legacy Network Basic Input/Output (NetBIOS) support.
HP NBX	A software product that provides legacy Network Basic Input/Output System (NetBIOS) support over NonStop IPX/SPX.
HP NonStop Cluster Switch (model 6770)	A cluster switch assembly consisting of a ServerNet II Switch, an uninterruptible power supply (UPS), and an AC transfer switch. A cluster switch controls the routing of ServerNet messages across the external fabrics of a ServerNet cluster. The 6770 switch supports ServerNet clusters using the star topologies.

HP NonStop ODBC Server	Database connectivity software that allows programs written for use with the Microsoft Open Database Connectivity (ODBC) product, the Microsoft Structured Query Language (SQL) Server, or the Sybase SQL server to access ODBC databases. The NonStop ODBC Server replaces the HP SQL Server Gateway product.
HP NonStop ServerNet Switch (model 6780)	A modular cluster switch that includes a logic board, plug-in cards, power supplies, and fans. A cluster switch controls the routing of ServerNet messages across the external fabrics of a ServerNet cluster. The 6780 switch supports ServerNet clusters using the layered topology.
HP NonStop Remote Server Call/MP (RSC/MP)	RSC/MP allows workstations to access Pathway servers and other Guardian processes on a NonStop S-series server. RSC/MP lets you implement powerful client-server applications—the workstation is the client; the NonStop S-series server with its NonStop Transaction Services/MP (NonStop TS/MP) and Pathway/iTS online transaction processing (OLTP) software is the server—by taking advantage of the power of the workstation with its extensive capabilities and easy-to-use graphical user interfaces (GUIs).
HP NonStop ServerNet Clusters	A communications product consisting of both hardware and software components that permits the clustering of NonStop S-series servers. ServerNet clusters allow multiple multiprocessor systems to work together and appear to client applications as one large processing entity.
HP NonStop TCP/IP	A communications subsystem that provides access to a network, allowing you to use the file transfer protocol (FTP) to transfer files to your HP system and run Web-based servers through facilities such as Simple Mail Transfer Protocol (SMTP). NonStop TCP/IP also provides multicast support, which enables NonStop S-series servers to initiate and receive messages intended for multiple Internet Protocol (IP) addresses associated with Internet subscriptions.
HP NonStop TCP/IPv6	NonStop TCP/IPv6 adds IP version 6 (IPv6) functionality to the Parallel Library TCP/IP product. Internet Protocol Version 6 (IPv6), as defined in RFC 2460, is the replacement network layer protocol for the Internet, designed to replace the current Internet Protocol Version 4 (IPv4).
HP OSI/AS	A communications subsystem that provides the services of the Open Systems Interconnection (OSI) Session and Presentation Layers and the ACSE component of the OSI Application Layer, allowing HP applications to communicate with other applications in a multivendor environment.

HP OSI/FTAM	A communications subsystem that provides file transfer, access, and management (FTAM) functions across a heterogeneous network, in conformance with the International Standardization Organization (ISO) FTAM standard. HP OSI/FTAM supports the transfer of files between NonStop S-series servers and other kinds of computers. It also lets users on the NonStop S-series server manage and operate on remote files and lets users on other kinds of systems manage and operate on files on the NonStop S-series server.
HP OSI/MHS	A communications subsystem that is a message handling system in conformance with the International Telecommunications Union-Telecommunications (ITU-T) X.400 Recommendation. It supports the exchange of messages among diverse applications, such as electronic mail (e-mail) and electronic data interchange (EDI), across Open Systems Interconnection (OSI) networks.
HP OSI/MHS Gateway Programmatic Interface (GPI)	The HP implementation of the X.400 Gateway application program interface (API). It provides a programmatic interface to HP OSI/MHS at the Message Transfer Agent (MTA) boundary.
HP OSI/TS	A communications subsystem that provides Open Systems Interconnection (OSI) layer 4 (Transport) services to HP OSI/AS applications or to user applications needing direct access to OSI Transport Layer services. HP OSI/TS implements the Connectionless Network Layer Protocol (CLNP) for use over local area networks (LANs) or (optionally) X.25 packet-switched data networks (PSDNs). It provides a uniform interface to applications in wide area network (WAN) and LAN environments, using network and data-link services provided by the X.25 Access Method (X25AM) or the Port Access Method (PAM).
HP SQL Server Gateway	See HP NonStop ODBC Server.
HP Tandem Terminal Emulator (TTE)	An HP software product that includes several types of terminal emulators that run on a personal computer (PC) with the Microsoft Windows or MS-DOS operating system. The terminal emulator in TTE provides a 65xx connection and Information Xchange Facility (IXF) file transfer to an HP system.
Information Xchange Facility (IXF)	An HP software product that provides file transfer support between an HP system and IBM-compatible PCs.
IPX/SPX	See NonStop IPX/SPX.
iTP Active Transaction Pages (ATP)	A server-side JavaScript environment for NonStop systems. iTP ATP enriches the iTP Secure WebServer application-development process by letting you use the popular JavaScript scripting language and readily available Web-authoring tools.

iTP Secure WebServer	A software product that provides a full range of services for running online commercial or informational enterprises on the World Wide Web. In addition to basic Web-related services, the iTP Secure WebServer provides other important services including access control, enhanced logging, customized error messaging, and automatic directory indexing.
IXF	See Information Xchange Facility (IXF).
Measure	A utility that gives operators immediate online access to performance statistics for key system and network components, including complex, high-volume business applications. Using this information, operators can optimize online transaction processing (OLTP) applications on NonStop S-series servers. Features include predetermined counters that can be supplemented with your own; continuous system and network monitoring; various methods of examining performance data, including customized printed reports; and a programmatic interface for management applications.
multifunction input/output board (MFIOB)	A board that is part of the processor multifunction customer-replaceable unit (PMF CRU) on a NonStop S-series server. The MFIOB contains one ServerNet router, one service processor, one Ethernet controller, and three SCSI ports.
NBT	See HP NBT.
NBX	See HP NBX.
NET/MASTER	See NonStop NET/MASTER Management Services (NonStop NET/MASTER MS).
NonStop IPX/SPX	A software product that enables a NonStop system to function as a fault-tolerant database or transaction server on a Novell NetWare Ethernet or token-ring local area network (LAN). NonStop IPX/SPX provides high-performance connectivity between NonStop S-series servers and NetWare LANs.
NonStop NET/MASTER Management Services (NonStop NET/MASTER MS)	A network-management product that allows you to monitor and manage a single HP system or an entire network composed of both HP and IBM systems. It includes a wide variety of management services and is fully integrated with other Distributed Systems Management (DSM) products.
NonStop ODBC	See HP NonStop ODBC Server.
NonStop SQL/MP	A relational, distributed database-management system based on the ANSI-standard Structured Query Language (SQL), which is used both to describe and to manipulate data. NonStop SQL/MP offers conversational and programmatic interfaces, including a data dictionary, and permits logical views of the data. It also includes a report writer.

NonStop Transaction Manager/MP (NonStop TM/MP)	One of the core HP transaction processing (TP) services. NonStop TM/MP provides services that ensure that all logical transactions complete entirely or not at all. NonStop TM/MP gives full protection to transactions that access distributed NonStop SQL/MP and Enscribe databases in addition to recovery capabilities for transactions, online disk volumes, and entire databases.
NonStop Transaction Services/MP (NonStop TS/MP)	One of the core HP transaction processing (TP) services. NonStop TS/MP provides services such as process management and link management for TP applications. Link management enables communication between clients and servers.
NonStop TUXEDO	A transaction processing (TP) environment that provides a client-server model for open applications along with the benefits of the HP fundamentals. The NonStop TUXEDO environment provides a standard, easy-to-use application program interface (API) and robust features for both the administrative and development environments.
ODBC	See HP NonStop ODBC Server.
OSI/AS	See HP OSI/AS.
OSI/FTAM	See HP OSI/FTAM.
OSI/MHS	See HP OSI/MHS.
OSI/TS	See HP OSI/TS.
PAM	See Port Access Method (PAM).
Parallel Library TCP/IP	Parallel Library TCP/IP is a NonStop TCP/IP product that provides increased performance and scalability. Parallel Library TCP/IP coexists with NonStop TCP/IP on NonStop S-series servers. Parallel Library TCP/IP supports both Ethernet 4 ServerNet adapters (E4SAs) and Fast Ethernet ServerNet adapters (FESAs).
Pathway Open Environment Toolkit (POET)	A set of programs and utilities that assists in the creation and running of client/transaction server applications for HP systems. POET can be used to build clients that run on a PC platform.
Pathway/iTS	A transaction processing (TP) product that supports requester programs that run in the Guardian environment and communicate with terminals and intelligent devices. It requires the services of NonStop Transaction Services/MP (NonStop TS/MP).
Pathway/XM	A transaction processing (TP) product that provides centralized management functions for the NonStop Transaction Services/MP (NonStop TS/MP) and Pathway/iTS products. Pathway/XM provides enhanced and simplified system management, increased system capacity, automatic load balancing, and other features for managing Pathway applications.
PC6530 Terminal Emulator (PCT)	A program that lets an IBM PC or a compatible workstation (such as an HP PSX) emulate an HP 6530 terminal.

Port Access Method (PAM)	An HP communications subsystem that provides an independent interface to allow applications access to token-ring or Ethernet local area networks (LANs) on NonStop S-series servers. The PAM subsystem provides a port interface that applications can use by making file-system procedure calls.
PTrace	PTrace displays the results of a trace obtained with the SNAX product family. Fields are labeled so operators need not be familiar with trace record formats.
QIO	An HP product that provides buffers and control blocks for protocol processes, including the ServerNet LAN systems access (SLSA) subsystem and another HP data communications subsystem running on the same processor. The QIO subsystem consists of the QIO Monitor (QIOMON) process, the LAN driver and interrupt handler (DIH), and the QIO library. SNAX over Ethernet uses QIO to communicate directly with SLSA and eliminate the need for the Port Access Method (PAM) subsystem.
Remote Duplicate Database Facility products (RDF and NonStop RDF/MP)	The RDF subsystem maintains a backup database on one or more remote systems by constantly reading the audit records generated by the NonStop Transaction Services/MP (NonStop TS/MP) product's main functional component, the Transaction Monitoring Facility (TMF), on the primary system, and then applying all changes to the backup database within seconds or minutes. Besides providing disaster recovery for your critical online applications, the backup database can serve as a read-only resource when transaction workload needs to be reallocated to provide greater system efficiency.
Safeguard System Protection	Safeguard provides authentication, authorization, and auditing services for protecting system or network components from unauthorized use.
SCF	See Subsystem Control Facility (SCF).
SCP	See Subsystem Control Point (SCP).
ServerNet adapter	A customer-replaceable unit (CRU) or field-replaceable unit (FRU) that connects peripheral devices to the rest of the system though a ServerNet bus interface (SBI). A ServerNet adapter is similar in function to an I/O controller logic board (LB) and backplane interconnect card (BIC) in other NonStop systems.
ServerNet Clusters	See HP NonStop ServerNet Clusters.
ServerNet LAN systems access (SLSA) subsystem	A communications subsystem that provides an architecture that supports parallel local area network (LAN) input/output (I/O). This architecture allows NonStop S-series servers to communicate across a ServerNet system area network (ServerNet SAN) and access Ethernet and token-ring devices through various LAN protocols.

ServerNet wide area network (SWAN) concentrator	A communications device that connects to a NonStop S-series server through dual Ethernet ports and provides WAN connections. The SWAN concentrator supports both synchronous and asynchronous data using EIA-232, EIA-449, V.35, and X.21 electrical and physical interfaces. Each SWAN concentrator can also have at least one synchronous line running at a speed of up to 256 kilobits per second (Kbps).
ServerNet wide area network (SWAN 2) concentrator	The SWAN 2 concentrator is a next-generation SWAN concentrator. The SWAN 2 concentrator is a communications device that connects bit-synchronous, byte-synchronous, and asynchronous devices to HP NonStop S-Series servers. The SWAN 2 concentrator enables customers migrating from NonStop K-series servers to NonStop S-Series servers to preserve their investment in legacy devices.
ServerNet/FX adapter	A ServerNet adapter that provides the physical connection between a NonStop S-series server and an existing FOX ring. See also ServerNet/FX adapter subsystem.
ServerNet/FX adapter subsystem	A communications subsystem that allows you to add a NonStop S-series server to an existing FOX ring. See also ServerNet/FX adapter.
SLSA	See ServerNet LAN systems access (SLSA) subsystem.
SNAView	A product that translates Event Management Service (EMS) event messages into IBM Systems Network Architecture (SNA) message formats for display on an IBM NetView console.
SNAX Advanced Peer Networking (SNAX/APN)	A software product that enables a NonStop S-series server to function as a type 2.1 LEN node. The extended version of the product, SNAX/APN-EN, enables a NonStop S-series server to act as an end node. Both products enable IBM Systems Network Architecture (SNA) hosts and devices to communicate with and share applications with NonStop S-series servers. Application programs using SNAX/APN can participate in an SNA environment while taking advantage of HP product features such as high data integrity, continuous availability, and modular expandability. SNAX/APN allows devices connected to a NonStop S-series server to communicate with applications on either a NonStop server or an IBM host. SNAX/APN can run over X.25 packet-switched data networks (PSDNs), token-ring and Ethernet local area networks (LANs), and other types of networks.
SNAX Advanced Program Communication Support (SNAX/APC)	A software product that provides a high-level interface that allows HP applications to communicate with LU 6.2 applications running in an IBM Systems Network Architecture (SNA) network.
SNAX Common Programming Interface for Communications (SNAX/CPI-C)	A software product that works with SNAX Advanced Program Communication Support (SNAX/APC) and uses the LU 6.2 protocol. SNAX/CPI-C provides an easy-to-use, platform-independent programming interface for transaction programs (TPs) that require program-to-program communication.

SNAX Creator-2	A software product that starts CRT or ITI applications automatically when a logon request or an INIT-SELF request is received. SNAX Creator-2 replaces the original Creator process.
SNAX Extended Facility (SNAX/XF)	A software product that enables IBM Systems Network Architecture (SNA) hosts and devices to communicate with and share applications with NonStop S-series servers. Application programs using SNAX/XF can participate in an SNA environment while taking advantage of HP product features such as high data integrity, continuous availability, and modular expandability. SNAX/XF allows devices connected to a NonStop S-series server to communicate with applications on either a NonStop server or an IBM host. SNAX/XF can run over X.25 packet-switched data networks (PSDNs), token-ring and Ethernet local area networks (LANs), and other types of networks.
SNAX High-Level Support (SNAX/HLS)	A software product that provides a general-purpose, high-level interface by which HP application programs can communicate with intelligent IBM Systems Network Architecture (SNA) devices and software products, regardless of communications protocols. SNAX/HLS supports LU types 0, 1, 2, 3, 4, and 7.
SNAX product family	The Systems Network Architecture Communications Services (SNAX) product family consists of those HP software products that provide access to IBM SNA networks.
SPI	See Subsystem Programmatic Interface (SPI).
SQL/MP	See NonStop SQL/MP.
Subsystem Control Facility (SCF)	A Distributed Systems Management (DSM) interface that allows the operator to manage communications lines, devices, and subsystems. The SCF command interpreter works with the Subsystem Control Point (SCP) to configure and control data communications subsystems. SCP conveys messages from SCF to the subsystems and returns completion messages to SCF.
Subsystem Control Point (SCP)	In Distributed Systems Management (DSM), the management process for all HP data communications subsystems. There can be several instances of the SCP process. Commands for data communications subsystems are sent to an instance of SCP, which in turn sends the commands on to the manager processes of the target subsystems. SCP also processes a few commands itself. It provides security features, version compatibility, and support for tracing and for applications implemented as NonStop process pairs.
Subsystem Programmatic Interface (SPI)	A set of procedures, definitions, and conventions for building and retrieving information from command, response, and event-message buffers. SPI formats and protocols are published and supported by HP; therefore you can develop applications that manage HP subsystems, and you can make your own applications manageable by Distributed Systems Management (DSM) tools.
SWAN Concentrator	See ServerNet wide area network (SWAN) concentrator. See also ServerNet wide area network (SWAN 2) concentrator.

SWAN 2 Concentrator	See ServerNet wide area network (SWAN 2) concentrator. See also ServerNet wide area network (SWAN) concentrator.
TCP/IP	See HP NonStop TCP/IP, HP NonStop TCP/IPv6, and Parallel Library TCP/IP.
Telserv	An HP product that provides the TELNET protocol for remote terminal connection services.
TFDS	See HP Failure Data System (TFDS).
TMF	See Transaction Monitoring Facility (TMF).
TN6530	A program that allows a Sun or other UNIX workstation to emulate an HP 6530 terminal.
Token-Ring ServerNet adapter (TRSA)	A ServerNet adapter that provides connectivity between NonStop S-series servers and token-ring local area networks (LANs).
TR3271 Access Method	An access method that allows a NonStop S-series server to connect to IBM hosts by emulating one or more IBM 3270 cluster controllers in a remote 3270 bisynchronous environment. When used with the AM3270 passthrough protocol, TR3271 allows 3270 devices to connect to a NonStop S-series server and use application programs running on an IBM system connected to that NonStop S-series server.
Transaction Monitoring Facility (TMF)	The major component of the NonStop Transaction Manager/MP (NonStop TM/MP) product, which protects your distributed database from incomplete transactions and system failures in online transaction processing (OLTP) environments. To furnish this service, TMF manages database transactions, keeps track of database activity through audit trails, and provides database recovery methods. In the event of a total system failure, TMF enables you to restore the database to a state that was known to be stable before the failure.
TRANSFER	The TRANSFER delivery system is a high-level software product that supports communications among end users, input/output (I/O) devices, and running programs (referred to as processes). TRANSFER provides a set of processes that build, maintain, and route packages of data to requesting applications. Senders and receivers of packages can be located anywhere in an HP Expand network and can be associated with different applications.
TRSA	See Token-Ring ServerNet adapter (TRSA).
TTE	See HP Tandem Terminal Emulator (TTE).
ViewPoint	An extensible, interactive console application for operators, provided as part of Distributed Systems Management (DSM). ViewPoint allows a system or a network to be controlled from a single terminal. It includes several block-mode display screens for event messages, a block-mode display for system or network status, a conversational HP Tandem Advanced Command Language (TACL) screen, and a facility called Define Process to maintain sessions with multiple subsystems at the same time.

Wide area network (WAN) subsystem	The communications subsystem used to configure and manage both WAN and local area network (LAN) connectivity for the following communications subsystems: Asynchronous Terminal Process 6100 (ATP6100), CP6100, Envoy, EnvoyACP/XF, Expand, SNAX Advanced Peer Networking (SNAX/APN), SNAX Creator-2, and X.25 Access Method (X25AM). The WAN subsystem is also used to control access to the ServerNet wide area network (SWAN) concentrator and ServerNet wide area network (SWAN 2) concentrator.
X.25 Access Method (X25AM)	A communications subsystem that enables a NonStop S-series server to connect to packet-switched data networks (PSDNs) conforming to the ITU-T X.25 Recommendation. X25AM is used by applications and terminals on a NonStop S-series server to communicate with host computers or terminals in an X.25 network.
X3PAD	A software product that emulates an X.3 packet assembler/disassembler (PAD), allowing a terminal connected to a NonStop S-series server to use the X.25 Access Method (X25AM), which in turn allows the terminal to communicate with another system on an X.25 network. The terminal can operate only in conversational mode. You can also use X3PAD to support exchange of data between a Guardian file and a system other than a NonStop S-series server on the packet-switched data network (PSDN).
x6530	A 6530 terminal emulator for the X-Windows System, a popular network presentation service that allows a user to run several applications at once in different windows on the same display. x6530 allows a UNIX workstation or local area network (LAN) server to support up to thirty 6530 windows, used by X-Windows servers or X-terminals on a LAN. (That is, the device on which x6530 runs can provide the emulation services to other stations on the LAN, as long as those stations run the X-Windows server software.) x6530 can run on the HP Integrity system and the SUN/4, Apollo 4500, and Mips workstations.

B

Communications Products by Type of Connection

This appendix lists HP NonStop communications products that can be used for connecting to various types of devices and networks. In many cases, there are several products you could use; the best choice depends on specific characteristics of the device you are connecting, the topology of your network and the communications lines or facilities you want to use, your performance requirements, and other factors. Your HP representative will help you make your selection.

The list is in alphabetical order by device or connection type. Within each type, the order of products is also alphabetical.

Asynchronous Point-to-Point Terminals

Asynchronous wide area network (AWAN) access servers
AWAN 3886 family of servers
ATP6100
CP6100
Envoy
Pathway/TS
RSC/MP

IBM Batch Terminals (2780, 3780, or 3770)

Exchange/RJE over CP6100
Exchange/RJE over Envoy
Exchange/SNA over SNAX

IBM 3270 Terminals or Equivalent

AM3270 (byte-synchronous)
Pathway/TS
SNAX/APN
SNAX/XF

IBM Mainframe or Intelligent Devices

AM3270
CP6100
EM3270
Envoy (byte-synchronous)
EnvoyACP/XF
ES Connect
Exchange
HP NonStop TCP/IP
SNAX/APC (LU 6.2)
SNAX/APN
SNAX/CPI-C
SNAX/HLS
SNAX/XF
TR3271

Internet Connections

iTP Active Transaction Pages (ATP)
iTP Secure WebServer
Local Area Networks (LANs)
Asynchronous Transfer Mode (ATM) subsystem
NonStop IPX/SPX
Port Access Method (PAM) subsystem
ServerNet LAN systems access (SLSA) subsystem
SNAX/APN
SNAX/XF
HP NBT
HP NBX
HP NonStop TCP/IP
Parallel Library TCP/IP
HP OSI/AS
HP OSI/TS

OSI Networks

HP OSI/AS
HP OSI/FTAM
HP OSI/MHS
HP OSI/TS

Other Computers or Devices

CP6100
Envoy
EnvoyACP/XF
GDSX
HP NonStop TCP/IP
HP OSI/AS
HP OSI/TS
X25AM

PC Workstations

Asynchronous wide area network (AWAN) access servers
ES Connect
NonStop IPX/SPX
PC6530
RSC/MP
HP NBT
HP NBX
HP NonStop TCP/IP
HP NonStop ODBC Server (replaces SQL Server Gateway)
Titanium
TN3270

Printers, Serial

Asynchronous wide area network (AWAN) access servers
AWAN 3886-08, 3886-16, AWAN-32
ATP6100
CP6100
Envoy
SWAN
SWAN 2

Printers Network

FASTPTCP for TCP/IP LANs
FASTSMB for SMB LANs
FASTPNOV for Netware LANs
FASTPX25 for X.25 WANs
FASTPXNS for XNS LANs

SNA Terminals

SNAX/APN
SNAX/XF

Sun Workstations

RSC/MP
HP NonStop TCP/IP
HP OSI/AS
HP OSI/TS
TN3270
TN6530
x6530

HP NonStop Servers

ES Connect
Expand subsystem
ServerNet/FX adapter subsystem

TCP/IP Networks

NonStop TCP/IP
NonStop TCP/IPv6
Parallel Library TCP/IP

UNIX Workstations

HP NonStop RSC/MP
HP NonStop TCP/IP
HP OSI/AS
HP OSI/TS
TN3270
TN6530
x6530

X.25 Packet-Switched Data Networks (PSDNs)

HP NonStop RSC/MP
SNAX/XF
HP OSI/AS
HP OSI/TS
X25AM
X3PAD

X-Terminals

x6530

C Guide to the Manuals

This appendix can help you select the manuals you will need in the course of learning about—and using—HP communications products.

Because so many different combinations of products are possible, and because most product-specific manuals introduce the manual sets to which they belong, this appendix does not attempt to present every possible combination of manuals. Rather, it describes how information is likely to be distributed among manuals that describe a communications product, and it mentions other types of manuals you will probably need.

Manual Titles and Manual Types

If you are still unsure about the manuals you need in order to work with a given product or set of products, select one manual related to the product and read the introductory material. Most manuals include information at the beginning that guides you to companion books. Most HP NonStop S-Series manuals begin with a section called About This Manual that includes a Related Manuals subsection.

Application Programming Manuals

In general, if you are writing an application program, you need the programming manual for the product whose interface you are using directly; several Guardian manuals (unless you are using only Pathway/TS (SCREEN COBOL) requesters); and the manuals for the programming language and other program-development tools you plan to use.

Operations and System Management Manuals

Operators and system managers often need more manuals than do programmers. You need the management and operations manual (or configuration and management manual, or configuration and control manual) for every product in the stack your applications employ. You also need the configuration and management manuals for all the products you use. You are likely to need the manuals for numerous other management utilities, such as Measure and PTrace. You will also need the *Operator Messages Manual*.

Management Programming Manuals

If you are writing an application that manages one or more communications subsystems, you need a combination of programming and management manuals. You need several Guardian manuals and the manuals for the programming language and development tools you will use. You also need several Distributed Systems Management (DSM) manuals and the management programming manual for every product your application must manage. You probably also need the management and operations (or configuration and management, or configuration and control) manual for each of the products.

Glossary

This glossary includes a selection of terms used in this manual. Definitions of data communications terms are brief; they are intended only to make this manual more meaningful than it would otherwise be to readers unfamiliar with communications and networking. Many textbooks and technical dictionaries define these terms in more detail.

Note. Names of HP products are generally defined in Appendix A, HP NonStop Communications Products, rather than in this glossary.

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access method. An input/output process (IOP) that allows applications running on a NonStop server to communicate with other systems or devices. More generally, a protocol that provides for orderly access, by systems and devices, to a communications medium.

activity attribute. A dynamic attribute of a file, specific to an individual File Transfer, Access, and Management (FTAM) association. See also file attribute.

AC transfer switch. A component that provides access to dual AC power sources and the ability to switch between them if one source fails. The ServerNet II Switch and the uninterruptible power supply (UPS) have only a single power input. To reduce the likelihood that a single failure in an AC line source will bring down a ServerNet II Switch, an AC transfer switch with two line cords is incorporated into the switch power subsystem. The AC transfer switch draws power from its primary current source as long as it is available. If the primary source fails, then the load is switched to the secondary current source.

adapter. See ServerNet adapter.

ANSI. An acronym for American National Standards Institute.

API. See application program interface (API).

Application Layer. Layer 7 of the Open Systems Interconnection (OSI) Reference Model. This layer provides the interface between user programs (application processes) and the OSI network. Layer 7 provides for peer-to-peer communication between applications and includes standards for services such as file transfer and electronic mail (e-mail).

application program interface (API). A set of functions or procedures that are called by an application program to communicate with other software components.

ARPA. An acronym for Advanced Research Projects Agency.

asynchronous data transmission. A method of data transmission in which data is sent and received one character at a time, each character being preceded by a start bit and followed by one or more stop bits. Contrast with synchronous data transmission.

Asynchronous Transfer Mode (ATM) protocol. A cell-switching and multiplexing technology that combines the benefits of circuit switching (constant transmission delay and guaranteed capacity) with those of packet switching (flexibility and efficiency for intermittent traffic). ATM is a connection-oriented environment. The ATM subsystem is the HP implementation of the ATM protocol.

asynchronous wide area network (AWAN) servers. A local area network (LAN)-based communications device that provides (1) asynchronous connections to terminals, printers, and terminal emulators for HP NonStop S-series and K-series servers; (2) remote access disk operating system (DOS), Windows, and Macintosh computers; (3) VT-to-6530 protocol conversion; and (4) dial-out connections for LAN-attached DOS, Windows, and Macintosh computers.

Availability Statistics and Performance (ASAP). A monitoring tool that provides graphical and tabular displays of system and network object performance, object state, and entity threshold information. The Availability Statistics and Performance Extension (ASAPX) product integrates and extends ASAP monitoring capabilities to single and multinode application environments. For more information about ASAP, refer to the following manuals: *ASAP Client Manual*, *ASAP Server Manual, ASAP Extension Manual*, and *ASAP Migration Guide for NSX and OMF Users*. ASAP replaces NSX.

AWAN. See asynchronous wide area network (AWAN) servers.

bandwidth. The range of frequencies at which data can be transmitted on a circuit. Bandwidth generally correlates with data rate: higher-bandwidth lines carry more data in less time than do lower-bandwidth lines.

baseband. A signaling technique in which the signal is transmitted in digital form instead of being altered by modulation. (Modems are not needed for baseband transmission.) Twisted-pair wiring is the usual medium for baseband networks. Contrast with broadband and carrierband.

Binary Synchronous Communication (BSC). A byte-synchronous communications protocol defined by IBM.

bisynchronous data transmission. Same as byte-synchronous data transmission.

bit-synchronous data transmission. A method of data transmission that allows synchronous, full-duplex data transmission, with bit insertion to permit data transparency.

block mode. A type of operation in which a device saves up characters, attempting to transmit them only when a function key or the Enter key is pressed. The block mode of a terminal supports page mode applications.

bridge. A device that connects different local area networks (LANs) at the Data-Link Layer. Layers above the Data-Link Layer are presumed to be alike on the networks. Contrast with gateway.

broadband. A signaling technique in which the signal is modulated by a modem. Broadband is characterized by the use of multiple frequency channels for transmission. Contrast with baseband and carrierband.

BSC. See Binary Synchronous Communication (BSC).

bus. A system or subsystem data path that provides serial or parallel interconnection for multiple modules or components. Examples of buses are serial maintenance buses (SMBs) and SCSI buses.

byte-synchronous data transmission. A method of data transmission in which embedded control characters govern data transmission on a link. For example, control characters delimit blocks and headers and label transparent data.

carrierband. A signaling technique similar to broadband and associated with token bus local area networks (LANs). Carrierband differs from broadband in that only one frequency channel is used for transmission. Contrast also with baseband.

Carrier Sense Multiple Access with Collision Detection (CSMA/CD). A local area network (LAN) access method defined by Ethernet and IEEE 802.3.

CCITT. See International Telecommunications Union–Telecommunications (ITU–T).

character mode. A type of operation in which an asynchronous device transmits and receives characters one at a time, with each character preceded by a start bit and followed by one or more stop bits.

client. A software process, hardware device, or combination of the two that requests services from a server. Often, the client is a process residing on a programmable workstation and is the part of the application that provides the user interface. The workstation client might also perform other portions of the application logic.

CLIP. See communications line interface processor (CLIP).

CLNP. See connectionless network protocol (CLNP).

cluster. A group of related devices or systems under common control.

cluster controller. A device that controls access to a group of terminals or printers.

cluster switch. See Cluster Switch on page A-1.

CNM. See communications network management (CNM) interface.

coaxial cable. A transmission cable consisting of two conductors concentrically arranged and separated by an insulating layer, and characterized by high data rates, low error rates, and low electrical interference.

collector. A process, defined by the Event Management Service (EMS), to which subsystems report events.

command interpreter. A program that accepts commands for control of a subsystem or utility and that either executes those commands or sends them to the program that will execute them. Command interpreters are most commonly used interactively, by human users, but most can also accept input in other ways—for example, from command files.

communications line interface processor (CLIP). The major programmable device within the ServerNet wide area network (SWAN) concentrator, providing link-level protocol and a software interface to the host. The CLIP stores and implements specific communications protocols.

communications network management (CNM) interface. A programmatic interface for the SNAX/XF subsystem. Programmers can use CNM to request configuration and statistical information maintained by the subsystem and the Systems Network Architecture (SNA) host.

communications subsystem. The combination of data communications hardware and software processes that work together to provide services and access to wide area networks (WANs) and local area networks (LANs).

Compaq TSM. A product name modifier that identifies a client or server software component used to manage or service NonStop S-series servers.

Compaq TSM package. A software product for NonStop S-series servers that provides the information needed to perform functions such as querying resources and testing, provides notification of problems on the system, and allows local or remote access to the system for service and maintenance. TSM performs the same role as that of TMDS, Syshealth, and Remote Maintenance Interface (RMI) on earlier NonStop systems.

configuration. (1) The arrangement of enclosures, system components, and peripheral devices into a working unit. (2) The definition or alteration of characteristics of an object.

configuration management. The task of defining and maintaining records of system and object configurations.

connection. The path between two protocol modules that provides reliable stream delivery service.

connectionless. Characterized by the absence of logical connections between communicating entities. Connectionless operation requires that the data itself contain all the context information—such as addresses—required to get it to its destination and identify it to the recipient. Higher levels of protocol, or the application itself, are responsible for message sequencing and error handling. Contrast with connection-oriented.

connectionless network protocol (CLNP). A protocol for communication across subnetworks of a larger network. CLNP is defined as the Open Systems Interconnection (OSI) Internet Protocol (IP) and is implemented as part of HP OSI/TS.

connection-oriented. Characterized by logical connections between communicating entities. Connection-oriented protocols ensure that data arrives at its destination in sequence and error-free. Contrast with connectionless.

connectivity. The ability of a system to communicate meaningfully with other systems and devices by way of communications protocols.

controller. See ServerNet addressable controller (SAC).

cooperative processing. Process-to-process data communications between systems or between a system and an intelligent device.

CSMA/CD. See Carrier Sense Multiple Access with Collision Detection (CSMA/CD).

data communications. The transmission of data among computing devices. Often used to refer only to low levels of protocol.

datagram. A packet of data that includes all addressing information required to move it from source to destination. Associated with protocols that do not establish and maintain logical connections between communicating entities.

data-link control. A set of functions associated with Layer 2 of the Open Systems Interconnection (OSI) Reference Model. Responsible for reliable communication between nodes. (When applications communicate with devices or other applications, the data can travel through many intermediate nodes; data-link protocols accomplish reliable communication between two physically connected nodes.) Also used by non-OSI architectures such as IBM Systems Network Architecture (SNA).

Data-Link Layer. Layer 2 of the Open Systems Interconnection (OSI) Reference Model. The functions of this layer include packaging data for transmission across the network and ensuring that the data arrives at the next layer without any errors.

data stream. The sequence of bits produced or interpreted by a device, in conformance with the protocol of that device.

device emulation. Software that allows a device such as a workstation, terminal, or system to affect the behavior of another kind of device or system, usually to permit access to applications running in other vendors' systems.

distributor. A process, defined by the Event Management Service (EMS), responsible for sending event messages to applications, files, printers, or remote nodes.

domain. (1) In HP NonStop S-series servers, a set of objects over which control or ownership is maintained. Types of domains include power domains and service processor (SP) domains. (2) In IBM Systems Network Architecture (SNA), a division of a network for control or administrative purposes. A domain consists of a system services control point and the resources it controls. (3) In Transmission Control Protocol/Internet Protocol (TCP/IP), a domain is a division of a network for naming and

addressing purposes. (4) In Domain Name Service (DNS), a domain is the set of nodes where a given name and its attributes are defined.

dual-ported. The capability of a ServerNet adapter or peripheral device to receive data and commands from two sources although only one source might have access at any particular moment.

electronic data interchange (EDI). An application of messaging in which the messages consist of business data in a prescribed format. The International Telecommunications Union–Telecommunications (ITU–T) X.400 Recommendation and related standards support exchange of messages among EDI applications; there are also numerous protocols defined specifically for EDI.

Ethernet. A local area network (LAN) that uses the Carrier Sense Multiple Access with Collision Detection (CSMA/CD) access method on a bus topology and is the basis for the IEEE 802.3 standard.

Expand network. The HP NonStop Kernel operating system network that extends the concept of fault-tolerant operation to networks of geographically distributed systems. If the network is properly designed, communication paths are constantly available even if there is a single line failure or component failure.

event. A significant change in some condition in the system or network. Events can be operational errors, notifications of limits exceeded, requests for action needed, and so on.

Expand line-handler process. A process pair that handles incoming and outgoing Expand messages and packets. An Expand line-handler process handles direct links and also binds to other processes via the network access method (NAM) interface to support Expand-over-X.25, Expand-over-ServerNet, Expand-over-FOX, and Expand-over-SNA links. The Expand-over-IP line-handler process communicates with a NonStop TCP/IP process through the shared memory of the QIO subsystem. The Expand-over-ATM line-handler process communicates with the Asynchronous Transfer Mode (ATM) subsystem through the shared memory of the QIO subsystem. See also network access method (NAM) and NETNAM protocol.

Expand multi-CPU feature. A feature of the Expand subsystem that enables you to spread the communications load over multiple processors by connecting multiple Expand line-handler processes, each in a separate processor, between two adjacent nodes. The Expand multi-CPU feature significantly increases the maximum throughput of an Expand path, especially for Expand-over-IP connections. See also multi-CPU path.

Expand-over-ATM line-handler process. An Expand line-handler process that uses the Asynchronous Transfer Mode (ATM) subsystem to provide connectivity to an ATM network.

Expand-over-FOX line-handler process. An Expand line-handler process that uses the NETNAM protocol to access the network access method (NAM) interface provided by the FOX monitor process, $ZZFOX. The Expand-over-FOX process handles incoming

and outgoing Expand messages and packets going outside a FOX ring and handles security-related messages within the ring.

Expand-over-IP line-handler process. An Expand line-handler process that uses the NonStop TCP/IP subsystem to provide connectivity to an Internet Protocol (IP) network.

Expand-over-NAM line-handler process. An Expand line-handler process that uses the NETNAM protocol to access the network access method (NAM) interface provided by an X25AM line-handler process or a SNAX/APN line-handler process.

Expand-over-ServerNet line-handler process. An Expand line-handler process that uses the NETNAM protocol to access the network access method (NAM) interface provided by the ServerNet monitor process, $ZZSCL. The Expand-over-ServerNet process handles incoming and outgoing Expand messages and packets going outside a ServerNet cluster and handles security-related messages within the cluster.

Expand-over-SNA line-handler process. An Expand line-handler process that uses the NETNAM protocol to access the network access method (NAM) interface provided by a SNAX/APN line-handler process.

Expand-over-X.25 line-handler process. An Expand line-handler process that uses the NETNAM protocol to access the network access method (NAM) interface provided by an X25AM line-handler process.

expert system. A software product that uses artificial intelligence in performing its tasks.

fabric. A complex set of interconnections through which there can be multiple and (to the user) unknown paths from point to point. The term fabric is used to refer to the X or Y portion of the ServerNet system area network (ServerNet SAN); for example, the X fabric.

Fast Ethernet ServerNet Adapter (FESA). The FESA is a single-port adapter that provides connectivity between NonStop S-Series servers and Fast Ethernet 802.3u LANs. It supports 100 Mbps and 10 Mbps Ethernet data transfer rates on NonStop S-Series servers.

FASTPTCP. FASTPTCP is a Spooler print process that supports a wide-range of network printers as well as printers connected to print servers and terminal servers. Protocols supported include HPJetDirect, Lexmark, Microplex, LPD1179, Telnet, and “raw” TCP. AWAN 3883/4/5 and 3886 models include enhanced support for FASTPTCP Telnet protocol. Special support is provided for HP Tandem Transparent Protocol (TTAP) and HP Printer Control Language (PCL) printers.

fault-tolerance. The ability of an HP NonStop server to continue processing despite the failure of any single software or hardware component within the system.

Fiber Optic eXtension (FOX). A term used to describe various fiber-optic extension products. The FOXII subsystem is provided for Cyclone systems, the TorusNet vertical

subsystem is provided for NonStop K-series servers, and the ServerNet/FX adapter subsystem is provided for NonStop S-Series servers. See also Expand-over-FOX line-handler process and FOX ring.

file. A logical construct subject to operations such as reading and writing. The term file is most commonly used to refer to data stored on a disk, but on the NonStop server, processes, devices, and various other entities are also defined as files.

file attribute. Information about a file such as filename, storage account, and date and time of file creation. File attributes are present from one file access to another, although the actual values of a file attribute can change. See also activity attribute.

file system. A set of system procedures that run as part of a user's process and send messages to other processes, such as an input/output process (IOP).

flag. A bit pattern that signifies the beginning or end of a block of data in a bit-synchronous protocol.

FOX ring. A FOX-connected network. A FOX ring consists of two separate bidirectional fiber-optic rings and can connect as many as 14 servers in a limited geographical area. See also Fiber Optic eXtension (FOX).

frame. A block of data in a bit-synchronous protocol.

front-end. A piece of hardware or software that handles communications functions on behalf of another piece of hardware or software. For example, communications functions can be performed in a front-end processor, as opposed to a host system; this delegation of function is common in IBM Systems Network Architecture (SNA) networks. One common application of HP communications products is a front-end process that resides logically between application software (such as a Pathway application) and an HP product controlling one or more communications lines; the front-end process satisfies the protocol requirements of a specialized device or supports a communications interface that the application software does not directly support.

full-duplex transmission. A method of operating a communications circuit so that each end can simultaneously transmit and receive. Required for two-way simultaneous (TWS) protocol operation.

functional unit. In Open Systems Interconnection (OSI) terms, a collection of service primitives needed to provide one of the major operational styles of working. Functional units determine which set of File Transfer, Access, and Management (FTAM) services are available for an association, depending on which service class is negotiated.

G4SA. See Gigabit Ethernet 4-port ServerNet adapter (G4SA).

GAP. GAP provides ATP6100 support for AWAN 3883/4/5 and 3886 terminal servers. GAP is required for non-standard asynchronous devices and protocols that do not work with

standard AWAN using Telserv or FASTPTCP. GAP is provided by Gemini Communications, Inc., an HP Alliance Partner (http://www.geminic.com).

gateway. A device that connects different local area networks (LANs) at a level above the Network Layer; that is, it accommodates differences at some higher layer and all layers below it. Contrast with bridge.

GESA. See Gigabit Ethernet ServerNet adapter (GESA).

Gigabit Ethernet 4-port ServerNet adapter (G4SA). A multiport ServerNet adapter that provides 1000 megabits/second (Mbps) data transfer rates between HP NonStop S-series systems and Ethernet LANs. The G4SA is the only LAN adapter supported for the I/O Adapter Module (IOAM) enclosure, and it is installed in slots 1, 2, 3, 4, and 5 of an IOAM. Although the G4SA supersedes the Ethernet 4 ServerNet adapter (E4SA), Fast Ethernet ServerNet adapter (FESA), and the Gigabit Ethernet ServerNet adapter (GESA), it cannot be installed in an HP NonStop™ S-series enclosure.

Gigabit Ethernet ServerNet adapter (GESA). A single-port ServerNet adapter that provides 1000 megabits/second (Mbps) data transfer rates between HP NonStop™ S-series systems and Ethernet LANs. A GESA can be installed in slots 51 through 54 of an I/O enclosure and slots 53 and 54 of a processor enclosure.

Two versions of the GESA are available:

- 3865 GESA-C (T523572): a single-port copper version compliant with the 1000 Base-T standard (802.3ab)
- 3865 GESA-F (T523572): a single-port fiber version compliant with the 1000 Base-SX standard (802..z)

Government Open Systems Interconnection Profile (GOSIP). A specification of the set of requirements an Open Systems Interconnection (OSI) implementation must meet in order to be used for government applications.

graphical user interface (GUI). A user interface that offers point-and-click access to program functions.

GUI. See graphical user interface (GUI).

half-duplex transmission. A method of operating a communications circuit so that transmission must occur in one direction at a time. Supports only two-way alternate protocol operation.

HDLC Extended Mode protocol. See High-Level Data Link Control (HDLC) Extended Mode protocol.

HDLC Normal protocol. See High-Level Data Link Control (HDLC) Normal protocol.

heterogeneous. Consisting of components following different protocols and often manufactured by different vendors.

High-Level Data Link Control (HDLC) Extended Mode protocol. The protocol used by the satellite-connect line-handler process. Unlike the HDLC Normal protocol implemented by direct-connect Expand line-handler processes, the HDLC Extended Mode protocol uses the maximum window size of 61 frames (the maximum number of outstanding frames before an acknowledgment is required) and implements the selective reject feature. Selective reject causes only frames that arrive in error to be retransmitted. See also High-Level Data Link Control (HDLC) Normal protocol.

High-Level Data Link Control (HDLC) Normal protocol. The protocol used by the direct-connect line-handler process. The direct-connect line-handler process is provided for use with conventional voice-grade leased-line and switched-line facilities, private facilities, and fractional Transmission Group 1 (T1) facilities. See also High-Level Data Link Control (HDLC) Extended Mode protocol.

host system. A computer system that supports very large databases and that does batch processing, usually for an entire network of smaller systems.

HP NonStop Kernel. The operating system for HP NonStop servers.

HP NonStop ServerNet Cluster. The product name for the collection of hardware and software components that constitute a ServerNet cluster.

HP NonStop Open System Management (OSM) Interface. See OSM.

IEEE. An acronym for Institute of Electrical and Electronics Engineers.

IEEE 802.3 protocol. Institute of Electrical and Electronics Engineers (IEEE) standard defining the hardware layer and transport layer of (a variant of) Ethernet. The maximum segment length is 500 meters and the maximum total length is 2.5 kilometers. The maximum number of hosts is 1024. The maximum packet size is 1518 bytes.

initiator. The File Transfer, Access, and Management (FTAM) process responsible for establishing an association and initiating activities over the association. The initiator accepts requests for operations on remote files. See also responder.

input/output (I/O). (1) Data entered into a computer or transmitted out of a computer. (2) The process of entering data into or transmitting data out of a computer.

input/output process (IOP). A running program (part of the operating system) that manages the input/output (I/O) functions for one or more ServerNet addressable controllers (SACs) of the same type. See also file system.

interactive interface. The means by which an operator gains access to a set of computing services.

International Standards Organization (ISO). A worldwide federation of national standards bodies established to promote the development of standards, such as network communications standards, to facilitate the international exchange of goods and services, and to develop mutual cooperation in areas of intellectual, scientific, technological, and economic activity.

International Telecommunications Union–Telecommunications (ITU–T). The standards-writing organization for international telephone carriers. Formerly referred to as the International Telegraph and Telephony Consultative Committee (CCITT).

Internet Protocol (IP). The Internet standard protocol that defines the Internet datagram as the unit of information passed across the Internet and that provides the basis for the Internet connectionless, best-effort packet-delivery service.

Internet Protocol (IP) address. A 4-octet (32-bit) numeric value identifying a particular network (network address portion) and a local host on that network (local address portion).

interpersonal message (IPM). A type of message, equivalent to an office memorandum, subject to exchange through a message handling system (MHS). The International Telecommunications Union–Telecommunications (ITU–T) X.400 Recommendation and related standards prescribe a format and protocol for exchange of interpersonal messages.

I/O adapter module (IOAM). A collection of modular components that provides I/O connectivity and can include ServerNet switch boards, Fibre Channel ServerNet adapters (FCSAs), Gigabit Ethernet 4-port ServerNet adapters (G4SAs), fans, and power supplies. In the IOAM, each module is a logical entity that represents a single service domain.

I/O adapter module enclosure (IOAM enclosure). The sheet-metal carrier that is installed in a standard 19-inch rack and contains the IOAM components.

IOAM. See I/O adapter module (IOAM).

IOAM enclosure. See I/O adapter module enclosure (IOAM enclosure).

ISO. See International Standards Organization (ISO).

ITU–T. See International Telecommunications Union–Telecommunications (ITU–T).

LAN. See local area network (LAN).

leased line. A nonswitched line; a telecommunications line on which connections do not have to be established by dialing.

line. The specific hardware path over which data is transmitted or received. A line can also have a process name associated with it that identifies an input/output process (IOP) or logical device associated with that specific hardware path.

line interface module (LIM). The part of a line interface unit (LIU) that provides the electrical interface. See line interface unit (LIU).

line interface unit (LIU). A dual-ported unit consisting of two parts: a communications line interface processor (CLIP) and a line interface module (LIM). An LIU can communicate with either the primary or the backup processor, providing fault-tolerance. When it is a component of the communications subsystem, an LIU communicates with either processor through either of a pair of communications interface units (CIUs).

local area network (LAN). A network that is located in a small geographical area and whose communication technology provides a high-bandwidth, low-cost medium to which low-cost nodes can be connected. One or more LANs can be connected to the system such that the LAN users can access the system as if their workstations were connected directly to it.

local bridge. A device that connects different kinds of local area networks (LANs) in the same geographical location. See also bridge, and contrast with remote bridge.

Logical Link Control (LLC). A subset of Layer 2 of the Open Systems Interconnection (OSI) Reference Model, responsible for reliable transfer of information between nodes, usually on a local area network (LAN). The IEEE 802.2 standard defines two types of LLC, one connectionless and the other connection-oriented.

logical unit (LU). A port through which a user or an application gains access to the services of an IBM Systems Network Architecture (SNA) network.

LU. See logical unit (LU).

MAC. See Measure.

management. Monitoring and control of system resources, including configuration, availability, and quality of service (including security and performance).

management application. An application process that manages the operation of one or more systems or subsystems. See also management.

management interface. A means by which a person or program manages the operation of one or more systems or subsystems. See also management.

management model. The approach taken and the mechanisms used to support such tasks as resource control, resource inquiry, and fault management. See also management.

management process. An HP process through which an application issues commands to a subsystem. It can be part of one subsystem or can be associated with more than one subsystem. The Subsystem Control Point (SCP) is the management process for all communications subsystems that support Distributed Systems Management (DSM).

manager process. An HP subsystem process that performs management services; a process with which the Subsystem Control Point (SCP) management process

communicates to control a particular subsystem. (For example, an application controls SNAX/XF by issuing requests to the SCP, but the SSCP process actually services the requests. The SCP is the management process, and the SSCP is the manager process.)

Measure. A tool used for monitoring the performance of HP NonStop systems. Measure can be used in an Expand network to determine if the network is contributing to performance problems.

media access control (MAC). A subset of Layer 2 of the Open Systems Interconnection (OSI) Reference Model, responsible for orderly sharing of a communications medium by multiple nodes on a local area network (LAN).

message handling (or messaging). The computing function that allows exchange of electronic messages among users in a network. Electronic mail and electronic data interchange (EDI) are examples of message-handling applications.

Message Store (MS). Within a message handling system (MHS), a structure and a related processing entity equivalent to a mailbox for a specific user, through which the user can submit and retrieve messages. A process or set of processes called a User Agent (UA) interacts with the MS on the user's behalf.

Message Transfer Agent (MTA). Within a message handling system (MHS), a processing entity that relays messages across the network.

MFIOB. See multifunction I/O board (MFIOB).

modem. Modulator-demodulator. A device that translates digital signals to analog form, and vice versa, permitting computer communications to occur over telephone lines.

Multicast. An Internet Protocol (IP) address type of UDP port that sends and receives messages to and from multiple recipients (as in Internet subscription services).

multifunction I/O board (MFIOB). A ServerNet adapter that contains ServerNet addressable controllers (SACs) for SCSI and Ethernet; a service processor; ServerNet links to the processor, to the two ServerNet adapter slots, and to one of the ServerNet expansion board (SEB) slots; and connections to the serial maintenance bus (SMB), which connects components within an enclosure to the service processor (SP).

multi-CPU path. The fundamental component of the Expand multi-CPU feature. A multi-CPU path can consist of up to 16 individual Expand paths, including multiline paths. Each Expand line-handler process (or multiline path) that is a member of a multi-CPU path is configured in a different processor. See also Expand multi-CPU feature.

multiline path. A path between two neighbor systems that consists of more than one physical line. You can configure as many as eight parallel lines between the same two systems. The Expand subsystem will simultaneously transmit data over all of the lines in the path, increasing overall bandwidth. The Expand subsystem also automatically

reroutes data over remaining lines if one or more lines fail. See also line, path, and route.

multipoint. A communications line connecting more than two data stations for data transmission. See also point-to-point.

NAU. See network addressable unit (NAU).

NetBIOS. See network basic input/output system (NetBIOS).

NETNAM protocol. The protocol used by an Expand line-handler process to communicate with a network access method (NAM). See also network access method (NAM).

network. A group of interconnected computer systems and devices and the hardware and software used to connect them.

network access method (NAM). The interface through which an Expand-over-NAM line-handler process communicates with an X25AM line-handler process or a SNAX/APN line-handler process, and through which an Expand-over-ServerNet line-handler process communicates with the ServerNet monitor process ($ZZSCL) and an Expand-over-FOX line-handler process communicates with the FOX monitor process ($ZZFOX).

network addressable unit (NAU). Logical entities subject to individual reference and allowing control and manipulation of node resources in an IBM Systems Network Architecture (SNA) network.

network basic input/output system (NetBIOS). A *legacy* standard protocol for communication among IBM personal computers (PCs) and equivalent devices.

network interface unit (NIU). A device used to connect terminals or other devices to a local area network (LAN). An NIU can be either a separately packaged server or a card that fits into a slot in the terminal or other device.

Network Layer. Layer 3 of the Open Systems Interconnection (OSI) Reference Model, responsible for routing data through a network.

node. A system or device that follows the protocols of a specific network and that other systems or devices in that network can address.

node type (NT). A classification of IBM Systems Network Architecture (SNA) network nodes on the basis of the physical unit (PU) type associated with the node. For example, a node containing a PU of type 4 is called a node type 4.

NonStop. Characterized by continued operation even when a component fails, or when equipment is being repaired or replaced, or while new processors or peripheral devices are being added to the system.

NonStop Kernel. The HP operating system, which consists of the core and system services. The operating system does not include any application program interfaces (APIs).

NonStop TCP/IP. The HP implementation of Transmission Control Protocol/Internet Protocol (TCP/IP) for the HP NonStop servers. See also Parallel Library TCP/IP and NonStop TCP/IPv6.

NonStop TCP/IP process. An HP product that supports the Transmission Control Protocol/Internet Protocol (TCP/IP) layers. TCP/IP processes are used together with the communications line interface processor (CLIP) pNA+ to provide the transport layer between wide area network (WAN) I/O processes and data link control (DLC) tasks, between ConMgr and the Simple Network Management Protocol (SNMP) task, between the WANBoot process and BOOTP tasks, and between a TSM process and a DIAG task.

NonStop TCP/IP subsystem. A subsystem that allows the use of HP NonStop TCP/IP to access an HP NonStop S-series host from Macintosh computers, personal computers, and UNIX workstations. Applications running on a NonStop S-series system or in an Expand network can transparently exchange data with NonStop TCP/IP devices.

NonStop TCP/IPv6. An HP product that adds IP version 6 (IPv6) functionality to the Parallel Library TCP/IP product. IPv6 is a TCP/IP protocol that extends the IP version 4 (IPv4) Internet address of 32 bits to 128 bits. NonStop TCP/IPv6 can be run in three modes: INET (supports only IPv4 communications and is a direct replacement for Parallel Library TCP/IP), INET 6 (only IPv6), and DUAL (both IPv4 and IPv6 communications).

nowait input/output (I/O). In the Guardian file system, a mode of operation in which the called procedure initiates an input/output (I/O) operation but does not wait for it to be completed before returning control to the caller.

object. (1) One or more of the devices, lines, processes, and files in an HP subsystem; any entity subject to independent reference or control by one or more subsystems; (2) In the Subsystem Control Facility (SCF), a resource controlled by an SCF subsystem. SCF objects include processes, disks, disk files, and data communications lines. Each object has an object type and an object name.

Open Systems Interconnection (OSI). A data communications model developed by the International Standards Organization (ISO) in 1977.

Originator/Recipient (O/R) name. A unique means of identifying an originator or a recipient of messages to a message handling system (MHS). An O/R name can be either a name or an address.

OSI. See Open Systems Interconnection (OSI).

OSM. OSM stands for HP NonStop Open System Management (OSM) Interface. This product replaces TSM as the system management tool of choice for NonStop S-series servers. It provides the same functionality as TSM while overcoming the limitations of TSM. OSM is required for support of the new functionality released in G06.21 and later RVUs.

packet assembler/disassembler (PAD). A device that allows asynchronous terminals (or other entities emulating asynchronous terminals) to use an X.25 network.

packet-switching. A technique in which messages are broken into smaller units, called packets, which can be individually addressed and routed through the network. The receiving node ascertains that all packets are received and in the proper sequence before forwarding the complete message to the addressee.

packet-switched data network (PSDN). An X.25 packet-switching network. A PSDN can be either a public data network (PDN) or a private PSDN.

page mode. A page-mode terminal or application displays a whole screenful of data as a unit, allowing the user to make changes at various row and column positions before pressing a function key to initiate host processing. Most page-mode terminals, including all HP terminals, use block mode transmission; some do not, relying on the host to manipulate the terminal screen and handle keystrokes individually.

Parallel Library TCP/IP. An HP product that provides increased performance and scalability over conventional Transmission Control Protocol/Internet Protocol (TCP/IP). Parallel Library TCP/IP coexists with conventional TCP/IP on HP NonStop™ S-series systems and supports Ethernet 4 ServerNet adapters (E4SAs), Fast Ethernet ServerNet adapters (FESAs), Gigabit Ethernet ServerNet adapters (GESAs), Gigabit Ethernet 4-port ServerNet adapters (G4SAs), and ServerNet wide area network (SWAN) concentrators. See also NonStop TCP/IP and NonStop TCP/IPv6.

passthrough. The transparent passage of data through a system on the route between sending and receiving systems or devices. The Expand subsystem supports pass-through routing between any two nodes in an Expand network. SNAX/XF supports a pass-through configuration that allows IBM hosts and 3270 devices to communicate through a NonStop server.

path. The route that data takes from one location to another within a system or between systems; normally used when there is more than one possibility. The Expand subsystem defines a path as the connection between two adjacent nodes; an Expand path can consist of multiple physical links.

PDN. See public data network (PDN).

PSDN. See packet-switched data network (PSDN).

peer. A device or software entity that communicates as an equal (rather than as a supervisor, for example) with another device or software entity at the same protocol level.

Physical Layer. Layer 1 of the Open Systems Interconnection (OSI) Reference Model. This layer establishes the physical connection between the network and the computer equipment. Protocols at the Physical Layer include rules for transmission of bits across the physical medium and rules for connectors and wiring.

physical unit (PU). An entity in an IBM Systems Network Architecture (SNA) network, responsible for the physical configuration of a node. Often identified with the node itself; for instance, a host is a PU type 5.

point-to-point. Transmission of data directly between two points, without the use of any intermediate terminal or computer. See also multipoint.

port. (1) A data channel that connects to other devices or computers. (2) A connector to which a cable can be attached. The system transmits and receives data or requests through ports on ServerNet adapters and processor multifunction (PMF) customer-replaceable units (CRUs). A port is also called a connector. (3) The entrance or physical access point (such as a connector) to a computer, multiplexer, device, or network where signals are supplied, extracted, or observed.

Presentation Layer. Layer 6 of the Open Systems Interconnection (OSI) Reference Model, responsible for accommodating differences in data representation between communicating systems.

primitive. The smallest unit of action that can be requested of a protocol layer, or the smallest unit of response.

procedure. A functionally separate block of machine instructions; part of a program. A procedure is usually invoked by a statement called a procedure call.

process. A unique execution of a program. The NonStop Kernel operating system is a collection of processes cooperating by using a common message system.

process pair. Two processes running the same program: a primary process that is active, and a secondary, backup process (in another processor) that is ready to take over if the primary process fails. See also NonStop.

profile. A disk file containing modifiers and default values. On NonStop S-Series servers, a profile is required when configuring a device. HP provides profiles for the different types of Expand line-handler processes. You can create your own customized profile using the SCF interface to the WAN subsystem (ADD PROFILE command). You can also alter profile modifier values for a particular device using the SCF interface to the WAN subsystem (ADD DEVICE and ALTER DEVICE commands). Profiles are provided on NonStop S-Series servers only.

programmatic. Used by programs, rather than by human operators.

protocol. The set of rules governing the operation of communicating entities.

protocol module. A program that runs in a communications line interface processor (CLIP) and implements a communications protocol, normally a link-level protocol.

PU. See physical unit (PU).

public data network (PDN). An X.25 packet-switched data network (PSDN), operated by a public institution, and available, by subscription, to a broad range of users.

remote bridge. A device that connects local area networks (LANs) in different geographic locations. See also bridge; contrast with remote bridge.

requester process. A process that requests the services of another process, often on behalf of users or other processes. A requester process uses interprocess messages to communicate with a server. Similar to the term client used by some other vendors. See also service class.

requester-server model. The rules for communication between processes. One process, the requester, makes a request of the other process, the server. The server takes the requested action and then replies to the requester.

responder. The File Transfer, Access, and Management (FTAM) process that receives requests for associations and file operations from other systems in an Open Systems Interconnection (OSI) network. See also initiator.

route. The whole distance data must traverse from a sending node to a receiving node, potentially consisting of many physical connections and traversing any number of intermediate nodes.

RS-232C. One of the most commonly implemented electrical interface standards, defined by the Electronic Industries Association (EIA). RS is an acronym for Recommended Standard; there are others, distinguished by number: for example, RS-422.

satellite-connect line-handler process. An Expand line-handler process that implements the satellite-efficient version of the High-Level Data Link Control (HDLC) protocol, HDLC Extended Mode. This type of Expand line-handler process is provided for use with satellite connections but can also be used to manage terrestrial lines.

SCF. See Subsystem Control Facility (SCF)..

SCP. See Subsystem Control Facility (SCF)..

SDLC. An acronym for Synchronous Data-Link Control.

Secure Socket Layer (SSL) or Transport Layer Security (TLS) . is a data communication protocol that implements three cryptographic assurances:authentication, confidentiality, and message integrity. SSL also provides secure key exchange between an client (an Internet browser) and a server. SSL/TLS does not offer nonrepudiation.

sensitive command. A command that can be issued only by a restricted set of users. For HP communications subsystems, the sensitive commands are those that can change the state or configuration of objects, start or stop tracing, or change the values of statistics counters.

server. (1) An implementation of a system used as a stand-alone system or as a node in an Expand network. (2) A combination of hardware and software designed to provide services in response to requests from clients across the network. For example, the NonStop range of servers provides transaction processing (TP), database access, and other services. (3) A process or program that provides services to a client or a requester.

server class. Servers are designed to receive request messages from clients or requesters; perform the desired operations, such as database inquiries or updates, security verifications, numerical calculations, or data routing to other computer systems; and return reply messages to the clients or requesters. A server process is a running instance of a server program.

ServerNet II Switch. A 12-port network switch that provides the physical junction point to enable a NonStop S-series server to connect to a ServerNet cluster.

ServerNet adapter. A customer-replaceable unit (CRU) or field-replaceable unit (FRU) that connects peripheral devices to the rest of a NonStop S-series server through a ServerNet bus interface (SBI). A ServerNet adapter is similar in function to an input/output (I/O) controller logical board (LB) and backplane interconnect card (BIC) on a NonStop K-series server.

ServerNet cluster. A network of servers connected together using the ServerNet protocol, and sharing a common transport for interprocessor communication across and within a cluster. Offers fast end-to-end communication without intermediate protocol stacks, achieving comparable speeds for internal and external ServerNet communication. ServerNet clusters enable multiple NonStop S-Series servers to work together and appear to client applications as one large processing entity. ServerNet clusters extend the ServerNet X and Y fabrics outside the system boundary and allow the ServerNet protocol to be used for intersystem messaging. See also cluster.

ServerNet Cluster. The abbreviated product name for the collection of hardware and software components that constitute a ServerNet cluster. The full product name is HP NonStop ServerNet Cluster. See also ServerNet cluster.

ServerNet addressable controller (SAC). A controller that is uniquely addressable within one or more ServerNet address domains (SADs) through the node ID and address fields in a request packet. A SAC is typically implemented on some portion of a processor multifunction (PMF) customer-replaceable unit (CRU), an input/output (I/O) multifunction (IOMF) CRU, or a ServerNet adapter.

ServerNet/FX adapter subsystem. The HP subsystem that enables a NonStop S-Series server to communicate with Cyclone and NonStop K-series servers in a FOX ring. See also Expand-over-FOX line-handler process and FOX ring.

ServerNet LAN systems access (SLSA) subsystem. A subsystem of the NonStop Kernel operating system. The SLSA subsystem enables the protocol input-output (I/O) processes (IOPs) and drivers to access the ServerNet adapters.

ServerNet SAN. See ServerNet system area network (ServerNet SAN).

ServerNet system area network (ServerNet SAN). A wormhole-routed, full-duplex, packet-switched, point-to-point network designed with special attention to reducing latency and ensuring reliability. The ServerNet SAN provides the communications path used for interprocessor messages and for communication between processors and I/O devices.

ServerNet wide area network (SWAN) concentrator. (1) An HP data communications peripheral that provides connectivity to an HP NonStop S-series server. The SWAN concentrator supports both synchronous and asynchronous data over RS-232, RS-449, X.21, and V.35 electrical and physical interfaces. (2) A collective term for both SWAN concentrators and SWAN 2 concentrators when a distinction between the two is not required.

ServerNet wide area network (SWAN) 2 concentrator. An HP data communications peripheral that provides connectivity to an HP NonStop S-series server. The SWAN 2 concentrator supports both synchronous and asynchronous data over RS-232, RS-449, X.21, and V.35 electrical and physical interfaces. The SWAN 2 concentrator is the next-generation SWAN concentrator and has 12 WAN ports.

service class. A set of functional units negotiated at association establishment, determining what kinds of operations can occur over the association. International Standards Organization (ISO) File Transfer, Access, and Management (FTAM) specifies five levels of service classes, four of which are supported by the HP FTAM implementation. See also functional unit.

session. In IBM Systems Network Architecture (SNA), a logical connection between two logical units (LUs), possibly of different types. More generally, a temporary logical connection between systems and devices.

Session Layer. Layer 5 of the Open Systems Interconnection (OSI) Reference Model, responsible for coordination and synchronization of transmissions between communicating entities.

Simple Network Management Protocol (SNMP). An asynchronous request-response protocol used for network management. SNMP originated as a means for managing Transmission Control Protocol/Internet Protocol (TCP/IP) and Ethernet networks. The TSM package can include an SNMP-compliant interface for communication between the TSM workstation and HP NonStop S-series server.

SNA. See Systems Network Architecture (SNA).

SNMP. See Simple Network Management Protocol (SNMP).

socket. A logical connection between two applications across a Transmission Control Protocol/Internet Protocol (TCP/IP) network.

stack. A layered organization of protocol functions, in which entities at a given level use services at the next lower level. Application-oriented functions are near the top of the stack, and communications-oriented functions are near the bottom of the stack.

subarea. A division of an IBM Systems Network Architecture (SNA) network for addressing purposes. A subarea consists of a subarea node, which must be of type 4 or 5, and the resources it controls. The subarea has an address unique in the network, and addresses are unique within the subarea.

subdevice. A recipient of requests within a subsystem. A subdevice often corresponds to a real external entity, such as a station on a multipoint line.

subsystem. A process or collection of processes that give users access to a set of related resources or services. A subsystem typically controls a cohesive set of objects.

Subsystem Control Facility (SCF). A part of DSM, it is used to provide a common, interactive management interface for configuring, controlling, and collecting information from HP data communications products.

Subsystem Control Point (SCP). A network management process for receiving and redistributing the messages that SCF sends to certain data communications subsystems.

switch enclosure. An enclosure provided by HP for housing the subcomponents of a NonStop Cluster Switch. These subcomponents include the ServerNet II Switch, the AC transfer switch, and the uninterruptible power supply (UPS). A switch enclosure resembles, but is half the height of, a standard NonStop S-series system enclosure.

switched line. Refers to circuit-switched networks, such as a public telephone network. A communications line in which the connection between the computer and a remote station is established by various circuit switches. Sometimes called a dial-up line.

synchronous data transmission. A method of data transmission whereby data is sent and received in blocks (or frames) instead of one character at a time. Synchronous data transmission requires synchronization characters or flags in the transmission. Contrast with asynchronous data transmission.

system process. (1) A privileged process that comes into existence at system-load time and exists continuously for a given configuration for as long as the processor remains operable. (2) A configuration operating system process, such as the memory manager, the monitor, and the input/output (I/O) control processes. Contrast with user process.

system services control point (SSCP). An IBM Systems Network Architecture (SNA) network entity residing in a host node and providing services for control of network resources.

Systems Network Architecture (SNA). The IBM communications model that describes the logical structure, formats, protocols, and operational sequences for transmitting information units through, and controlling the configuration and operation of, networks.

TCP/IP. See Transmission Control Protocol/Internet Protocol (TCP/IP).

terminal control process (TCP). A process used for terminal management and transaction control, provided by HP as part of the Pathway/TS product.

token-bus network. A network in which computers are connected on a bus (as opposed to a ring or star shape) and in which the right to transmit data is defined by possession of a special kind of data unit, called a token. Stations pass the token from one to the next in logical order: for example, in order by station address.

token-ring network. A network in which computers are connected in a ring-shaped layout (topology) and in which the right to transmit data is defined by possession of special kind of data unit, called a token. A station that is finished transmitting or that does not wish to transmit passes the token along to the adjacent station on the ring.

topology. The geometric layout of a network. Examples of network topologies are ring (nodes arranged in a circle), star (one node in the middle with connections to each of the other nodes), bus (nodes arranged in a line), and mesh (nodes arranged in a complex way, with multiple cross-connections between nodes).

Transmission Control Protocol (TCP). The Internet standard transport-level protocol that provides the reliable, full-duplex stream service on which many application protocols depend. TCP allows a process on one machine to send a stream of data to a process on another. It is connection-oriented, in the sense that before transmitting data participants must establish a connection. Software implementing TCP usually uses the Internet Protocol (IP) to transmit information across the Internet. The IP suite is often referred to as TCP/IP because TCP is one of the two most fundamental protocols.

Transmission Control Protocol/Internet Protocol (TCP/IP). A set of layered communications protocols for connecting workstations and larger systems. See also Transmission Control Protocol (TCP).

transport class. A definition of the capabilities and responsibilities of an Open Systems Interconnection (OSI) Transport Layer implementation, tailoring the functions of the transport layer to the characteristics of an underlying network environment. For example, different transport classes imply different levels of responsibility for error-handling.

Transport Layer. Layer 4 of the Open Systems Interconnection (OSI) Reference Model, responsible for reliable transfer of data between sending and receiving systems. Transport classes determine the level of service; for example, if the underlying network

service has a high level of reliability, less work might be required of the Transport Layer.

TSM. See Compaq TSM.

two-step read. A method of receiving incoming data by obtaining first the length of the incoming message and then the data itself, in two separate calls.

uninterruptible power supply (UPS). A source of power, external to a device, capable of supplying continuous power to the device in the event of a power failure.

User Agent (UA). Within a message handling system (MHS), a processing entity that acts on behalf of a person or an application to send and receive messages.

user process. A process subject to creation, execution, and termination. Contrast with system process.

virtual circuit. A logical connection between nodes in a packet-switching network. The nodes communicate as if over a real physical circuit, although in actuality different parts of a message can travel over different lines; the network provides addressing and dynamic routing services.

virtual route. A logical connection between two subarea nodes in an IBM Systems Network Architecture (SNA) network. A virtual route corresponds to a physical route, with provision for transmission priorities, flow control (pacing of transmissions), and data integrity (implemented with sequence numbers). Between its end points, a virtual route can traverse other nodes, called intermediate nodes, which simply move the message forward.

wide area network (WAN). A network in which the nodes are geographically remote from one another and operates over a larger geographical area than a local area network (LAN)—typically, an area with a radius greater than one kilometer. The elements of a WAN may be separated by distance great enough to require telephone communications. Contrast with local area network (LAN) and ServerNet system area network (ServerNet SAN).

window. A session between a workstation and an application, usually on a local area network (LAN). With appropriate software, a workstation can support multiple windows, each potentially for a different application; the interactions that make up each session are displayed in a separate area of the screen. Each display area is also called a window.

X.25. An interface recommendation developed by the International Telecommunications Union–Telecommunications (ITU–T) for packet-switched data network (PSDN) procedures. See also packet-switching and virtual circuit.

X and Y fabrics. X and Y fabrics are a collection of connected routers and ServerNet links that, together, provide an interconnection for NonStop S-Series servers. Each processor connects to both fabrics. The X fabric and the Y fabric are not connected to

each other; therefore, a ServerNet packet cannot cross from one fabric to the other and a failure in one fabric does not affect the other fabric.

zone. An arbitrary administrative division of a Transmission Control Protocol/Internet Protocol (TCP/IP) domain.

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