Lucent Technologies
Bell Labs Innovations
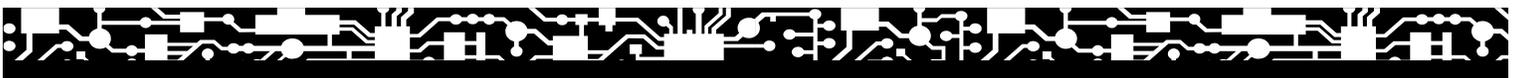
WaveStar® SubNetwork Management System (SNMS) Release 6.0

Applications and Planning Guide

Notice

Every effort was made to ensure that the information in this document was complete and accurate at the time of printing. Information is subject to change; however, Lucent Technologies assumes no responsibility for any errors that may appear in this document.

Mandatory customer information

FCC Warning Statement

This equipment generates, uses, and can radiate radio frequency energy. If not installed, used, and maintained in accordance with the instruction manual, it may cause interference to radio communications. Operation of this equipment in a residential area may cause interference, in which case users will be required to take whatever measures may be required to correct the interference as their own expense.

Trademarks

InfoWare, Metropolis, NetCare, SLC, and WaveStar are registered trademarks of Lucent Technologies.

http://www.lucent.com, Lucent, Lucent Technologies, Lucent Technologies NetCare, Metropolis, and We Make The Things That Make Communications Work are trademarks of Lucent Technologies.

CORBA is a trademark of the Object Management Group.

Hewlett-Packard, HP, HP-UX, GlancePlus, JetDirect, OpenView, PA-RISC, and PerfView are registered U.S. trademarks of the Hewlett-Packard Company.

INFORMIX is a registered trademark of Informix Software, Inc.

Internet Explorer, Microsoft, Windows, and Windows NT are U.S. registered trademarks of the Microsoft Corporation.

Netscape Communicator and Netscape Navigator are U.S trademarks of Netscape Communications Corporation.

Orbix is a registered trademark of IONA Technologies.

Pentium is a trademark of Intel Corporation.

Persistence is a trademark of Persistence Software, Inc.

PostScript is a registered trademark of Adobe Systems Incorporated.

SCSI is a registered trademark of Security Control Systems, Inc.

SPARC is a registered trademark of SPARC, International, Inc. Products bearing the SPARC trademark are based on architecture developed by Sun Microsystems, Inc.

Sun Microsystems and Sun Workstation are registered trademarks of Sun Microsystems, Inc licensed to Sunsoft, Inc; and Java is a trademark of Sun Microsystems, Inc.

UNIX is a registered trademark of the Open Group.

Limited Warranty

Lucent Technologies provides a limited warranty for this product. For more information, consult your local Account Representative.

Ordering information

The ordering number for this document is 190–224–143. When ordering from within the United States, call 1–888–LUCENT8 (1–888–582–3688); from within Canada or North America, call 1–317–322–6615; from other locations around the world, call 1–317–322–6416.

Support

Information product support

You can call the toll-free hotline at 1-800-225-4672 for customer assistance and troubleshooting 24 hours a day. See your Lucent Technologies account representative for further details.

Technical support

For technical assistance in the United States call Lucent's Technical Support Center at 1-866-LUCENT8 (1-866-582-3688). For technical assistance outside of the United States, contact your Local Customer Support (LCS) or the support organization designated by your Lucent customer team representative. If you are unsure of who to call, contact the Global TSS Contact Center at 1-630-224-4672.

Lucent Technologies values your comments!

Lucent Technologies welcomes your comments on this information product. Your opinion is of great value and helps us to improve.

1.   Was the information product:

	Yes	No	Not applicable
In the language of your choice?	☐	☐	☐
In the desired media (paper, CD-ROM, etc.)?	☐	☐	☐
Available when you needed it?	☐	☐	☐

Please provide any additional comments:

_____
_____

2.   Please rate the effectiveness of this information product:

	Excellent	More than satisfactory	Satisfactory	Less than satisfactory	Unsatisfactory	Not applicable
Ease of use	☐	☐	☐	☐	☐	☐
Level of detail	☐	☐	☐	☐	☐	☐
Readability and clarity	☐	☐	☐	☐	☐	☐
Organization	☐	☐	☐	☐	☐	☐
Completeness	☐	☐	☐	☐	☐	☐
Technical accuracy	☐	☐	☐	☐	☐	☐
Quality of translation	☐	☐	☐	☐	☐	☐
Appearance	☐	☐	☐	☐	☐	☐

If your response to any of the above questions is "*Less than satisfactory*" or "*Unsatisfactory,*" please explain your rating.

_____
_____

3.   If you could change one thing about this information product, what would it be?

_____
_____

4.   Please write any other comments about this information product:

_____
_____

Please complete the following if we may contact you for clarification or to address your concerns:

Name: _____   Date: _____

Company/organization: _____   Telephone number: _____

Address: _____

Email address: _____   Job function: _____

If you choose to complete this form online, go to http://www.lucent-info.com/comments
Otherwise fax to 407 767 2760 (U.S.) or +1 407 767 2760 (outside the U.S.) or email comments to ctiphotline@lucent.com

Lucent Technologies values your comments!

Lucent Technologies
Bell Labs Innovations

WaveStar® SubNetwork Management System (SNMS) Release 6.0
Applications and Planning Guide

190-224-143   Issue 1   October 2001

Lucent Technologies welcomes your comments on this information product. Your opinion is of great value and helps us to improve.

1.   Was the information product:

	Yes	No	Not applicable
In the language of your choice?	☐	☐	☐
In the desired media (paper, CD-ROM, etc.)?	☐	☐	☐
Available when you needed it?	☐	☐	☐

Please provide any additional comments:

_____
_____

2.   Please rate the effectiveness of this information product:

	Excellent	More than satisfactory	Satisfactory	Less than satisfactory	Unsatisfactory	Not applicable
Ease of use	☐	☐	☐	☐	☐	☐
Level of detail	☐	☐	☐	☐	☐	☐
Readability and clarity	☐	☐	☐	☐	☐	☐
Organization	☐	☐	☐	☐	☐	☐
Completeness	☐	☐	☐	☐	☐	☐
Technical accuracy	☐	☐	☐	☐	☐	☐
Quality of translation	☐	☐	☐	☐	☐	☐
Appearance	☐	☐	☐	☐	☐	☐

If your response to any of the above questions is "*Less than satisfactory*" or "*Unsatisfactory,*" please explain your rating.

_____
_____

3.   If you could change one thing about this information product, what would it be?

_____
_____

4.   Please write any other comments about this information product:

_____
_____

Please complete the following if we may contact you for clarification or to address your concerns:

Name: _____   Date: _____

Company/organization: _____   Telephone number: _____

Address: _____

Email address: _____   Job function: _____

If you choose to complete this form online, go to http://www.lucent-info.com/comments
Otherwise fax to 407 767 2760 (U.S.) or +1 407 767 2760 (outside the U.S.) or email comments to ctiphotline@lucent.com

Contents

List of Figures

List of Tables

....

6   Product Services and Support

....

About this information product

Purpose The *WaveStar SNMS Applications and Planning Guide* (this guide) provides an overview of the WaveStar® Subnetwork Management System (SNMS) application, explains its capabilities, and describes the planning that is necessary before a system can be installed.

Reason for reissue The *WaveStar SNMS Applications and Planning Guide*, Issue 1.0, is a new document that supports WaveStar SNMS, Release 6.0.

Safety labels Safety labels are not applicable to this document.

Intended audience This guide has been written for network management professionals who need specific information about the features, applications, and operations of WaveStar SNMS.

How to use this information product The frontmatter and backmatter of this document consist of a table of contents and an index to facilitate finding information quickly.

This document is organized into the following chapters:

- Chapter 1, "System Overview" provides a system overview of the WaveStar SNMS application.

- Chapter 2, "Features" describes the features of WaveStar SNMS, which are grouped into Configuration Management, Provisioning, NE Software Management, Fault Management, Performance Management, Application Security Management, and the User Interface. In addition, WaveStar SNMS also offers hardware redundancy.

- Chapter 3, "Software Planning and Engineering" provides planning and engineering information on the software related to the use of WaveStar SNMS.

- Chapter 4, "Hardware Planning and Engineering" explains the supported hardware platform for WaveStar SNMS. The SNMS hardware platform provides a valid operation environment for all SNMS activities and includes host hardware configurations, GUI workstation configuration, and host/workstation-related software configurations.

- Chapter 5, "NE Interworking" provides an overview of the Network Elements (NEs) that WaveStar SNMS supports and details regarding the interworking of each NE and WaveStar SNMS.

- Chapter 6, "Product Services and Support" provides an overview of the services and support offered for WaveStar SNMS.

Conventions used   In this document, any words that are being defined/and or emphasized are shown in *italic* type.

How to comment   Customer satisfaction is extremely important to Lucent Technologies. Users are encouraged to provide feedback on the WaveStar SNMS documents.

Two customer comment forms appear immediately after the title page of this document. Complete the form and fax it to the number provided.

1   System Overview

Overview

Purpose   This chapter provides a system overview of *Lucent Technologies*™ *WaveStar*® SubNetwork Management System (SNMS) application.

Contents

□

Lucent Technologies - Proprietary
See notice on first page

Lucent's Management Products for NEs

Our Family of Management Products

Lucent's family of management products includes service management products, network management products, and element management products for its *WaveStar*® and *Metropolis*™ network elements (NEs). The following figure illustrates the correlation between these products.

Figure 1-1 The Lucent Family of Optical Networking Management Products

```
                    ┌─────────────────────────────┐
                    │     Service Management       │
                    │         OneVision            │
                    └─────────────────────────────┘
   Service Description         │        ↑      Service Impact
                               ▼        │
                    ┌─────────────────────────────┐
                    │     Network Management       │
                    │       WaveStar NMS           │
                    └─────────────────────────────┘
   Network Circuit Design      │        ↑      Filtered Alarms
                               ▼        │       Configuration Information
                                                Performance Monitoring
                    ┌─────────────────────────────┐
                    │     Element Management       │
                    │      WaveStar SNMS           │
                    └─────────────────────────────┘
   NE Provisioning Commands    │        ↑      Configuration Data
                               ▼        │       Command Responses
                                                Alarms
                    ┌─────────────────────────────┐
                    │             NE               │
                    │  WaveStar NEs or Metropolis NEs │
                    └─────────────────────────────┘
```

□
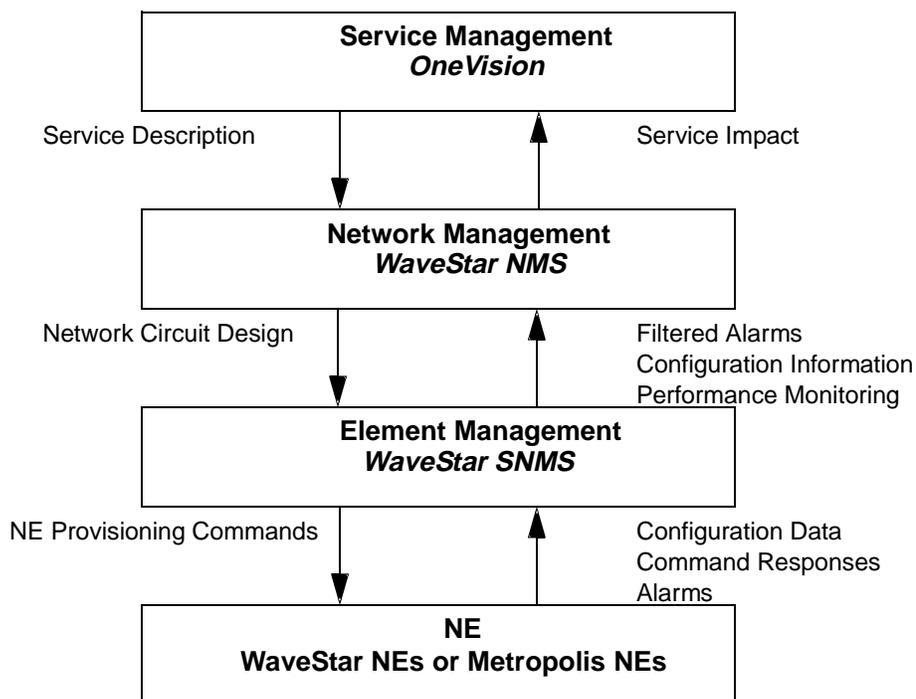
The WaveStar SNMS Product

WaveStar SNMS Defined   The *Lucent*™ *WaveStar*® SubNetwork Management System (SNMS) is an Element Management System (EMS) that supports a new generation of Lucent transmission products: the WaveStar and Metropolis product families. The WaveStar and Metropolis products are intelligent Network Elements (NEs) that can discover and report their configuration (including physical equipage) and connectivity within the network.

WaveStar SNMS operates as an enhanced graphical tool and as a general configuration management aid. It capitalizes on the capabilities of the NEs and optimizes the management functions of the NEs to create an intelligent operations environment.

WaveStar SNMS Features at a Glance   Just as the WaveStar and Metropolis NEs solve network transport needs, WaveStar SNMS answers the NE's network management needs:

- WaveStar SNMS provides centralized, secure, remote administration of Synchronous Optical Networks (SONET) and Dense Wavelength Division Multiplexing (DWDM) subnetworks. From a single work center, a WaveStar SNMS user can remotely manage SONET and DWDM NEs. Lucent Technologies patented Dynamic Network Operations (DNO) process gathers network configuration information from the NEs, providing accurate, hands-off population of the WaveStar SNMS database, and ensures that the WaveStar SNMS management functions operate using the actual network configuration.

- WaveStar SNMS provides fault, performance, configuration, security, and log management functions via its GUI.

- WaveStar SNMS supports 7-layer Open Systems Interconnection (OSI) as well as OSI over Transmission Control Protocol/Internet Protocol (TCP/IP) communication protocols over local area network (LAN) physical interfaces.

- WaveStar SNMS R6.0 and the HP K-Class, L-Class, and the N-Class servers support X.25 connections for those NE that require connections to X.25 PSNs.

- WaveStar SNMS supports Common Management Information Services Element (CMISE) and Translation Language One (TL1) application protocols.

- WaveStar SNMS provides a TL1 cut-through capability, allowing the user to access an NE through a native command set.

- WaveStar SNMS supports communication multiplexing or concentration to provide network security and to record all database changes.

□

Lucent Technologies - Proprietary
See notice on first page

190-224-143
Issue 1, October 2001

The WaveStar and Metropolis Product Families

The Product Family Vision and Goal

The vision of the WaveStar and Metropolis product families is to meet customers' diverse, potentially complex, and rapidly evolving network transport needs.

The goal of the WaveStar and Metropolis product families is to support any service, at any bandwidth, for any sized network efficiently and economically. This goal is realized through an architecture that provides flexibility and scalability:

- To achieve *flexibility*, the product family is based on a layered architecture that includes a DWDM optical wave division layer and an STM time division layer, such as SONET and Synchronous Digital Hierarchy (SDH). This flexible, layered approach enables the WaveStar and Metropolis products to acknowledge networks with multiple network layers that can efficiently provide the desired services at the desired bandwidths.

- *Scalability* is achieved through an architecture that includes several NE types, each with a modular design using common platform components. This scalability enables the products to be used economically in small and large, complex networks.

The flexibility and scalability of the WaveStar and Metropolis architectures enables the product families to meet the needs of service providers, which differ in the end services to be provided, the service bandwidth requirements, and the size and complexity of the overall network.

Supported NEs

WaveStar SNMS is a management system for the WaveStar and Metropolis product families that provides Element Management Layer (EML) functions for both products. WaveStar SNMS management functions include configuration management, fault management, performance management, and security management functions.

As of this writing, WaveStar SNMS currently supports, the following NEs

- Metropolis DMX (MetroDMX) Access Multiplexer
- MetroEON (OLS 40G/80G)
- WaveStar BWM
- WaveStar LambdaRouter-256
- WaveStar NCC

- WaveStar OLS 1.6T (OLS 400G/800G)

- WaveStar TDM 2.5G/10G (SONET)

- WaveStar TDM 10G (STM-64)

Refer to Chapter 5, "NE Interworking" for descriptions of each NE, for the current releases supported, and for a discussion of interworking considerations and constraints.

□

Hardware Architecture

Hardware Components

The WaveStar SNMS hardware platform provides an operational environment for all WaveStar SNMS activities. It consists the following hardware components:

- *Hewlett-Packard*® (HP) 9000 Enterprise servers, which function as host processors

- user desktops, which enable end users to access the WaveStar SNMS GUI and system administrators to administer the system

- system console, which enables installers and/or system administrators to run UNIX commands and install the system

WAN/PSN Connectivity

The WaveStar SNMS hardware platform is connected via an Ethernet LAN, with the option to interface via a Wide Area Network (WAN).

A WAN and/or a Packet Switched Network (PSN) is recommended for large, geographically dispersed configurations to concentrate access from WaveStar SNMS to the managed subnetworks. The same WAN/PSN can also be used to access other network management systems or other hosts. Every WaveStar SNMS installation requires data connections to each managed subnetwork. The southbound WAN from WaveStar SNMS to the NEs must support an OSI/LAN interface and/or an IP/LAN interface. HP servers equipped with the appropriate X.25 card can support NEs that require access to an X.25 PSN.

HP 9000 Enterprise Server Family

WaveStar SNMS relies on three members of the *HP*® *9000 Enterprise Server Family* to process user requests:

- *L-Class server* is a scalable, entry-level computing device that incorporates features found on HP's mid-range and high-end servers.

- *N-Class server* is a scalable, mid-range computing device that provides best-in-class performance, connectivity, and availability.

- *K-Class servers,* which is currently slated to be discontinued as of September 1, 2001, is another of HP's mid-range computing devices.

These servers run on HP's operating system, *HP-UX*® 11.0.

User Desktops WaveStar SNMS supports three different user desktop platforms for running the GUI client:

- *Pentium*® II PC running Windows NT 4.0 with Service Pack 4 or Windows 2000

- HP B2000 Workstation running HP-UX 10.20 or 11.0

- Sun Ultra 5 Workstation running Solaris 2.6/2.7

System Console The system console enables installers and system administrators to run *UNIX*® commands and to install and initialize the system.

The L-Class and N-Class servers can support a typical system console; however, they are shipped with HP's WebConsole.

The WebConsole, which, resides at the back of the L-Class or N-Class server, enables installers and administrators to access the server remotely via a LAN connection and an IP address.

□

Software Architecture

....

Software Components The WaveStar SNMS software architecture is platform based and relies on object-oriented design. The WaveStar SNMS software consist of these components:

- the WaveStar SNMS Application Program from Lucent Technologies

- integrated software from third parties

- operating systems (OSs) and Internet browsers from third parties

The WaveStar SNMS Application Program The WaveStar SNMS software architecture can be divided into the following major subsystems:

- Configuration Management

- Fault Management

- NE Event Handler

- EMS Security Management

- Southbound Management Interface

  - X.25-based protocol layer

  - OSI-based protocol layer

  - OSI over TCP/IP-based protocol layer

  - TL1 Manager

  - Connection Manager

  - Gateway process

  - QA process (CMISE only)

  - SONET Directory Service (SDS)

- Log Management

- Operation, Administration, and Maintenance

  - Log and trace

  - Scheduler

- *JAVA*®-based GUI

....

GUI WaveStar SNMS incorporates a platform independent, Java-based Graphical User Interface (GUI) that is a common interface to all NEs, regardless of type, and provides a powerful, flexible user interface to execute the most frequently used actions. The GUI also supports numerous customization options so users can tailor displays to their preferences.

The GUI provides graphical features such as:

- multilevel displays of the network

- an automatically generated map of the overall managed domain

- hierarchically arranged equipment displays down to the shelf level

- a graphical representation of the cross connection configuration with point and click provisioning

- form and menu-based provisioning for viewing and setting provisional parameters.

- the ability to initiate a cut-through session to directly send TL1 commands to NEs

The recommended platform for the WaveStar SNMS Java GUI client is a personal computer (PC) running *Windows NT*® 4.0 with Service Pack 4 or Windows 2000. The Java GUI software is installed on the PC as a standalone application.

Transaction requests are issued by the GUI software to the EMS host. The host returns responses associated with these transactions back to the PC. The interface to the PC is via an 802.3 LAN link. The GUI application messages and GUI cut-through data traffic are transported using this interface.
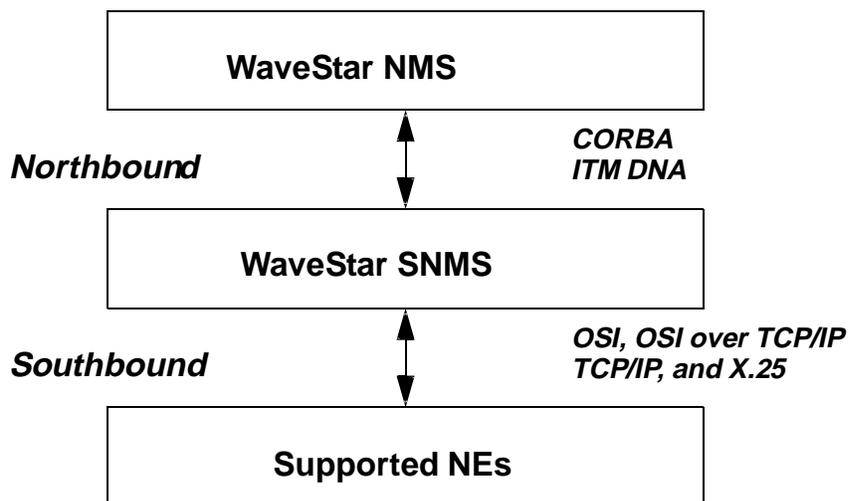
☐

System Interfaces

....

Definition WaveStar SNMS provides two types of interfaces:

- *Southbound interfaces* are required so WaveStar SNMS can communicate with the supported NEs.

- *Northbound interfaces* are required so WaveStar SNMS can communicate with other OSs, such as WaveStar NMS

The following figure illustrates this concept:

Figure 1-2 System Interfaces

Southbound Interfaces The WaveStar SNMS southbound interface contains the required functionality to connect to the NEs, to manage these connections, and to forward and receive the messages between the NEs and WaveStar SNMS, for all supported communication protocols.

The WaveStar SNMS southbound interface supports pure OSI, OSI over TCP/IP, pure TCP/IP, and X.25 communications with the NEs. However, some limitations exist. Refer to Chapter 5, "NE Interworking" for details.

CM Process

The Connection Manager (CM) process centralizes the functions of sending, receiving, routing, and processing the connections needed for responses and autonomous messages going in, and coming from, the

....

Lucent Technologies - Proprietary
See notice on first page

CMISE and TL1 Southbound subsystems. CM handles the following functions:

- At start-up, CM loads external configurative parameters from a configuration file.

- CM creates and terminates associations to all NEs.

- CM staggers association requests to minimize the impact of the connection processes on the network.

- CM implements association recovery mechanisms.

- CM receives connection-related indication messages from TL1 and CMISE southbound subsystems, updates association status in memory, and forwards notifications to WaveStar SNMS.

- CM creates/modifies/deletes NEs, and stores and forwards related information.

- CM notifies WaveStar SNMS of any incorrect NE types.

CMISE Southbound

The Common Management Information Services Element (CMISE) southbound subsystem consists of two processes—the Gateway (GW) and the Q3 Adaptor processors—to support the WaveStar OLS 1.6T NEs. Refer to Chapter 5, "NE Interworking" for details.

TL1 Southbound

TL1 Southbound is supported by the TL1-Manager process, which is responsible for command/response handling.

SONET Directory Services

The SONET Directory Services (SDS) subsystem resides in the southbound system. All system applications access the shared memory contained in SDS to retrieve information. The shared memory contains the status, last update time, and various directory information. WaveStar SNMS relies on two agents to manage this information:

- Directory Services Agent (DSA), which maintains the Directory Information Base

- Directory User Agent (DUA), which retrieves and transfers information to and from the Directory Information Base

The DSA organizes NEs into a structure known as the ***Management Information Tree (MIT)***. The DUA accesses the DSA for any new NEs registered in the MIT and notifies other WaveStar SNMS processes of the existence of the new NE. WaveStar SNMS then logs

into the new NE and, via the Dynamic Network Operations (DNO) process, gathers the internal configuration and external connectivity relationships from the NE, which ensures that the WaveStar SNMS management functions operate using the actual network configuration.

Northbound Interfaces

WaveStar SNMS northbound interfaces include the following:

- Common Object Request Brokered Architecture (CORBA) Northbound Interface
- ITM DNA Northbound Interface

CORBA

WaveStar SNMS is designed as an EMS within the Telecommunications Management Network (TMN) layered management model for network management. In addition, WaveStar SNMS provides element management functions (and some subnetwork management functions) for the WaveStar product line. To provide network level management support, Lucent Technologies offers the WaveStar Network Management System (NMS) which provides end-to-end transport network integration across multiple element management domains. The WaveStar NMS provides state-of-the-art network management capabilities including:

- end-to-end STM (SDH) circuit provisioning (automatic, semi-automatic, and manual routing)
- end-to-end DWDM optical channel provisioning (automatic, semi-automatic, and manual routing)
- STM (SDH) circuit fault and performance management
- optical channel fault and performance management
- protection switch management
- equipment inventory

For the northbound interface to WaveStar NMS, WaveStar SNMS supports a standard northbound interface based on CORBA/IDL. This interface is based on to the TeleManagement Forum (TMF) NML-to-EML Interface G7 Version 2.0. In addition, to the transaction oriented CORBA interface to WS-NMS, a GUI cut-through capability exists between WaveStar NMS and WaveStar SNMS that gives WaveStar NMS users direct access to WaveStar SNMS' EML screens/functions.

ITM DNA Northbound Interface

WaveStar SNMS provides a northbound interface to Lucent Technologies Integrated Transport Management Dynamic Network Analyzer (ITM DN). ITM DNA is a report generation system that allows users to access, query, and analyze managed network data.

With regard to WaveStar SNMS, ITM DNA's primary use is to collect performance monitoring data for report generation. ITM DNA uses TCP/IP connections between WaveStar SNMS and ITM DNA and the Open Data Base Connectivity (ODBC) protocol for ITM DNA to remotely query and retrieve information from the WaveStar SNMS database.

□

WaveStar SNMS Release 6.0

Highlights of WaveStar SNMS Release 6.0

The highlights of Release 6.0 of WaveStar SNMS include:

- The *HP L-Class servers* are now offered in new hardware configurations that include *disk mirroring for standalone configurations*.

- The *software installation and upgrade* process continues to be more simplified with the use of Ignite-UX!.

- The *BLSR Ring Map* for the WaveStar BWM NEs is a GUI feature that allows the user to view a list of NEs and protection groups in a 2-Fiber or 4-Fiber BLSR ring. The user can also create a new ring map, which is built on the TID and protection group AID of a local NE, and define a list of NEs (by TID) that are connected to the local NE on the ring. A new view of each ring map can be obtained by providing the TID of a different NE in the ring.

- *NPPA/NUT Provisioning* is a GUI feature that allows the user to override, on BLSR service/protection tributaries, the automatic switching of traffic to protection tributaries and the selection of service/protection switching setup (for example protected/preemptible and unprotected/not preemptible).

- *Performance Management Enhancements* to the existing Performance Management feature affect the collection of 15-minute and/or 1-day PM data on a per-AID or per-facility basis:

  - PM data that is zero can now be differentiated from PM data that is missing.

  - Per-AID and per-facility-type PM data collection can be set independently for 15-minute and one day PM data.

- ***FTP/FTAM gateway panel for Add/Modify an NE window*** for the WaveStar BWM NEs and WaveStar NCCs is an enhancement that has been made to the existing Add/Modify an NE window. It is used to:

  - identify TCP/IP-connected WaveStar BWM NEs and WaveStar NCCs as an FTP/FTAM gateway for NE software backup/restore and software download operations

  - select a WaveStar BWM or WaveStar NCC as the FTP/FTAM gateway for NE software backup/restore and software download operations

- An ***On Cable Pairs Associations Report*** is now available via the Provisioning window.

- ***IP Tunneling Report*** is an enhancement to IP Tunneling feature in the GUI that allows the user to specify fields and print a tabular report of IP tunneling data.

- For alarms only, ***the characteristics of the screen display*** (column width, order, sort per user) can now be saved.

- The ***Print screen capability*** is now available for the Provisioning window.

- ***Alert/acknowledge*** has been restricted to no-alarmed standing conditions.

□

2   Features

Overview

Purpose   This chapter describes the features of WaveStar SubNetwork Management System (SNMS). WaveStar SNMS is an element management system (EMS) that provides a set of standard and value-added features that are needed to administer the supported WaveStar Network Elements (NEs). These software features are grouped into Configuration Management, Provisioning, NE Software Management, Fault Management, Performance Management, Application Security Management, and the User Interface. In addition, WaveStar SNMS also offers hardware redundancy.

Contents

□

Configuration Management

....

The Basis of All Configuration Management Features

WaveStar SNMS automatically creates and dynamically maintains an accurate network model with minimal user input, using Lucent Technologies' patented *Dynamic Network Operations* (DNO) process. This model includes the configurations of:

- the entire network, which includes the set of managed NEs and their interconnectivity

- each NE within the network and the internal configuration of each NE

This data is the basis of all configuration management features.

Users can make configuration changes via the WaveStar SNMS GUI, which are translated into the appropriate southbound messages and sent to the NEs. Upon receiving confirmation of the change, WaveStar SNMS updates its database to reflect the new configuration.

Configuration changes made to the network other than through WaveStar SNMS, such as through the NE craft interface terminals (CITs), are autonomously reported to WaveStar SNMS by the NEs and WaveStar SNMS again automatically updates its database.

Subnetwork Initialization

With the DNO process, the NEs are the source of the WaveStar SNMS database information. The DNO process consists of two parts:

- discovering the NEs and their connectivity with one another

- discovering the internal configuration and status of each NE

WaveStar SNMS performs the DNO process through communication with the intelligent WaveStar and Metropolis NEs. DNO ensures that all WaveStar SNMS functions operate using accurate information.

WaveStar SNMS can discover NEs through communication with either of the following:

- central directory

- neighboring NEs

The WaveStar SNMS architecture includes a directory with automatic registration of NEs in the directory.

Note: The directory can also be manually provisioned. Therefore, it is an option to use the directory even for NEs that cannot automatically register themselves in the directory. The LambdaRouter, MetroDMX,

....

Lucent Technologies - Proprietary
See notice on first page

and MetroEON (40G/80G) cannot automatically register in the directory.

This directory includes the NEs by name and address so data connections can be initiated. The directory function can be provided by either of the following:

- WaveStar SNMS

- WaveStar Network Communications Controller (NCC)

The system administrator must enter sufficient information for WaveStar SNMS to begin communicating with the directory (such as identifying WaveStar SNMS as the directory or entering a WaveStar NCC into WaveStar SNMS and identifying it as the directory), and WaveStar SNMS automatically initiates DNO and begins the network discovery process. For NEs that do not support a directory or when a directory does not exist in the network, the system administrator must enter sufficient information for WaveStar SNMS to begin communication with at least one NE.

Note: NEs can report their OSI neighbors. Thus, all NEs in an OSI-connected set can be discovered through adding any NE within the set. WaveStar SNMS can manage multiple independent sets of OSI-connected NEs; and for these instances, the system administrator must enter sufficient information for WaveStar SNMS to begin communication with at least one NE in each OSI-connected set.

Both the WaveStar and Metropolis NEs can report the names and addresses of their neighboring NEs. Thus even without a directory, WaveStar SNMS can sequentially discover the NEs in the network.

The automatic discovery process discovers the following:

- the network configuration (the nodes in the network and their interconnection)

- the internal configuration of each NE

Once an NE is discovered, WaveStar SNMS communicates with each NE to learn its internal configuration—such as its equipage, NE and port parameters, cross-connection configuration—and its connectivity to neighboring NEs. Having initially captured the configuration data upon discovery of each NE, WaveStar SNMS uses autonomous messages from the NEs reporting configuration changes to keep its database current, which ensures the database accuracy regardless of the source of NE configuration changes. Furthermore, WaveStar SNMS incorporates features—such as automatically querying the NEs

notification message logs upon a temporary loss of communication with an NE and periodically auditing its own database against the NEs' internal configurations—as additional safeguards to ensure that its own database is current and accurate.

NE Configuration Change Logging

WaveStar SNMS stores all configuration change autonomous messages (database change messages and protection switching notifications) from the NEs in a Notification Log. This Notification Log provides users with a historical record of all configuration changes on the NEs, which supplements the current configuration data maintained in the WaveStar SNMS database.

The Notification Log includes all configuration changes, including those made from the craft interface terminal (CIT) and other operation systems. This information is stored on-line for a user definable number of days. (The maximum value is 45 days.) Users can query, filter, and sort the Notification Log for a display based on the NE, the time period, and the notification type. Users can configure the display to accommodate personal preferences and direct the output to a printer or a file.

Graphical Network and NE Displays

Graphical network and NE displays consist of the following:

- network topology display
- NE equipment displays
- NE graphical display of cross-connects

Network Topology Display

WaveStar SNMS graphically displays its managed WaveStar subnetworks, which includes the following:

- the NEs
- the facilities (trails) interconnecting the NEs

A WaveStar subnetwork is a set of NEs connected with transmission interfaces for which a Data Communication Channel (DCC) is active. From the WaveStar SNMS perspective, a subnetwork is a set of NEs that can be accessed from the same access NE; that is, the NE can be accessed with a physical OSI LAN, TCP/IP, or X.25 connection to WaveStar SNMS. Via this single access point, WaveStar SNMS can establish connections to all NEs in the subnetwork and initiate the DNO process on the entire subnetwork.

The Map Window

The WaveStar SNMS network display enables users to view the layout and status of the entire network via the Map Window. Users can customize the Map Window to match the physical topology of their network and they can tailor the look-and-feel of the display to their preferences. The following table explains the preference categories.

Table 2-1   Map Window Customization

Preference Category	Allows users to ...
Nodes and Lines	choose the size of the NE and the thickness of the trail lines between the NEs
Labels	choose the size, content, and alignment of the Map item labels
Colors	choose the colors associated with alarms and cross connects
Shapes	choose the shapes used for Map items
Fault	set the preferences associated with how alarms are displayed in the Map and Alarm Notification windows
Other	set the display of various system entities, such as tooltips, to on or off

For a complete representation of any network, WaveStar SNMS allows users to add the following to the Map Window:

- unmanaged NEs, which are any NEs that communicates with WaveStar SNMS but are not managed by WaveStar SNMS

- the physical connections between unmanaged NEs, and unmanaged NEs and managed NEs

WaveStar SNMS can automatically discover NEs that it cannot manage through the T1.245 directory or a neighboring managed NE.

*Note:*NEs can be manually entered into the T1.245 directory or put in the directory by the Target Identifier (TID) Address Resolution Protocol (TARP) to T1.245 directory gateway function provided by the WaveStar NCC.

The graphical depictions distinguish managed and unmanaged NEs. Users who want to restrict the Map Window to managed NEs can suppress the display of unmanaged NEs.

NE Equipment Display

WaveStar SNMS graphically displays the physical NE equipment, which consists of bays and shelves with slots (either equipped with circuit packs or unequipped). The equipment displays are hierarchically arranged so users can navigate from the complete system view, to bay views, to views of individual shelves. Based on NE-provided information, this data is updated (via DNO), as equipment is installed or removed in the field.

By selecting a specific entity, such as a pack in the shelf display, users can do the following:

*   display the current detailed inventory information such as the software version number, Common Language Equipment Identifier ($CLEI^{TM}$) code, and serial number

*   generate inventory reports enumerating the equipment within an NE along with the detailed inventory information
    Example: Users can generate a report of all circuit packs (CPs) in a shelf or all shelves and CPs in a bay. This type of report is useful to check installation jobs remotely because it provides accurate, real-time equipment inventory data.

NE Graphical Display of Cross-Connects

WaveStar SNMS graphically displays a logical view of the NE cross-connection configuration, with dynamically updated information about cross-connections and the ports/time slots that are currently used in cross-connections. The display shows the following:

*   ***Ring interfaces*** are depicted on the left and right sides of the window, with the East and West sides of the ring interface on opposites sides of the window.

*   ***Non-ring interfaces*** are depicted along the top and/or bottom. Users select the interfaces for display.

*   ***Time-slots*** (tributaries) are represented as subdivisions within the ring and non-ring interfaces.

*   ***Cross-connects*** are represented as lines between the time-slots (tributaries) of the selected interfaces.

Example: a selected OC-48 interface is subdivided into four STS-12 subdivisions, which in turn are subdivided into four STS-3 subdivisions, which in turn are subdivided into three STS-1 subdivisions. A cross-connect is represented by a line connecting two subdivisions of the same rate. Using this logical view, users can

visualize the current cross-connection status—meaning, they can readily identify which ports/time slots already have cross-connects and which are still available. Using this view, users can set up additional cross-connections or modify or remove existing ones.

☐

Provisioning

Overview Provisioning WaveStar SNMS consists of the following:

- date/time synchronization
- scheduling
- NE provisioning

Date/Time Synchroniza-tion WaveStar SNMS uses Network Time Protocol (NTP) to ensure the accuracy of its internal clock. WaveStar SNMS in turn provides centralized, remote date/time synchronization between its internal clock and those of the managed NEs. Synchronization can be performed on-demand or set up on a periodic schedule using the WaveStar SNMS Scheduler for the following:

- a single NE
- an aggregate of NEs
- all of NEs in a user Target Group

The time can be set to the WaveStar SNMS local time or any other time zone. The transition from standard time to daylight savings time is also supported as a user selected option.

Scheduler The WaveStar SNMS Scheduler enables users to schedule functions to be performed at the following intervals:

- *Periodic scheduling* is used for functions that are typically performed on a regular basis. DNO, NE memory backup, and date and time synchronization can be periodically scheduled.

- *Specific future date and time scheduling* is generally used for performing time-consuming functions during off-peak hours. Software download and software activation can be scheduled to be performed at specific future dates and times.

WaveStar SNMS monitors the execution of scheduled jobs and attempts to complete failed jobs using re-try algorithms incorporated in the corresponding applications. The Scheduler provides a method to have routine tasks done automatically, and it improves performance by moving resource intensive tasks to off-peak hours and staggering them in time.

NE Provisioning   Users can display the current values for NE parameters as set at the NE and modify those parameters that can be administered remotely. The parameters displayed on the NE provisioning window vary depending on the NE type and release number. As with most WaveStar SNMS provisioning features, users set/choose parameter values by selecting a set of allowable values.

Equipment Provisioning   The WaveStar NEs have modular architectures so they can be economically configured to meet service demands. Through equipment provisioning, additional bays, shelves, and circuit packs can be added to the system to provide additional capacity; or the parameters of existing equipment can be modified.

The WaveStar NEs and WaveStar SNMS support equipment pre-provisioning so equipment can be defined and provisioned in the software prior to its physical installation, which minimizes service turn-up times. WaveStar SNMS maintains the equipment status; and in the graphical displays of the equipment, it distinguishes between equipment that is physically installed from that which is software defined—equipment that is defined in software is provisionable along with the physically installed equipment.

Equipment provisioning is supported with windows that display the current provisioned values, typically with lists of allowable values for making configuration changes. Using these features, users can create new equipment for pre-provisioning and provision existing equipment.

Refer to Chapter 5, "NE Interworking" for special considerations regarding the optical allocation provisioning for the WaveStar OLS 1.6T NEs.

Protection Group Provisioning   Protection groups include the following groups:

- equipment protection groups
- transmission interface (port) protection groups
- cross-connects that provide path protection, such as dual ring interworking cross-connects

Protection group provisioning for equipment and cross-connect protection groups is generally limited to modifying parameters. (The protection group members are fixed.) However, to support protected transport services, the WaveStar NEs allow for the flexible organization of their ports into protection groups.

Most WaveStar NEs allow users to create port protection groups flexibly and to assign ports to roles in those protection groups, including both ring and linear port protection groups.

Example: a user can create a 4-fiber, bi-directional line-switched ring (BLSR) protection group and flexibly assign any four ports on a shelf to the four roles in that protection group, which are the East Service member, the East Protection member, the West Service member, and the West Protection member. Thus, while equipment and cross-connect protection groups are typically limited to modifying parameters, port protection groups can also be created, deleted, and the members of the group can be modified.

NE Protection Group Provisioning

The flexible and configurable protection groups supported by the WaveStar NEs coupled with the WaveStar SNMS protection group provisioning capabilities, enable users to perform many network re-arrangements remotely with only software changes.

The WaveStar SNMS protection group provisioning features enable users to display, create, delete, and modify the WaveStar NEs' protection groups.

Important! The exact capabilities of a protection group are a function of the protection group type. Equipment and cross-connection protection groups are generally limited to modifying parameters. Port protection groups include the capability to create, delete, and modify the members of the group.

WaveStar SNMS features limit the user to valid choices based on the current NE configuration and apply constraints based on the NE and protection group type.

Example: To create a new 4-fiber BLSR protection group on the WaveStar BWM, WaveStar SNMS provides selection choices based on constraints such as: a port can only be in a single protection group, all ports in a protection group must be at the same line rate (e.g., OC-48), or all ports in a protection group must reside on the same shelf. These features assist users to manage the WaveStar NEs' protection groups efficiently and accurately.

NE Protection Switch Status Management

WaveStar SNMS maintains the current protection switch status of all protection groups. Besides letting users retrieve and display the current protection switch status of a protection group at any time,

WaveStar SNMS notifies users of each automatic protection switch event. From the WaveStar SNMS GUI, users can also request a manual protection switch or request to release a protection switch.

Port/Tributary Provisioning

WaveStar SNMS features support port (SONET OC-48 ports, SDH STM-16o ports, DWDM optical lines, and DWDM OTU ports) and tributary (SONET STS-1 tributaries, SDH VC-4 tributaries, and DWDM optical channels) provisioning. Users can display the current values for port and tributary parameters as set at the NE, and modify any parameters that can be administered remotely.

Examples: port parameters are port mode and signal degrade threshold; tributary parameters are tributary monitoring mode and path trace.

WaveStar SNMS also supports port and tributary aliases, which allow users to identify ports and tributaries using their own naming schemes instead of using the native identifiers that the NEs support. Once provisioned, an alias is accessible in the Network Element Explorer (the hierarchically organized list of all provisional objects in an NE) and the Alarm List.

Port and tributary provisioning features use a form-based display of the current values, typically with selections that can be made from lists of allowed values.

Point and Click Cross-Connect Provisioning

From the graphical cross-connect display, users can add, modify, and delete cross-connects. WaveStar SNMS also provides functions for the following:

- to convert cross-connections to and from path-protected cross-connections

- to mark a cross-connection as red-lined, which prevents its removal unless the red-line indication is first removed

- to roll a cross-connection from one source address to another to support bridge and roll operations

*Note:*Bridging and rolling moves a circuit to different facilities within the network without disrupting service (for example: to change the route a circuit uses across a network, while the endpoints remain the same). The circuit is first bridged at the source, and additional connections are then added through the network so the signal is simultaneously carried on both the old route and the new route through the network. (At this point, the receiver is still taking the

signal from the original source.) The circuit is then rolled at the sink (at the receiver) from the original source to the new source. With the roll, the circuit is now using the new route, and the connections associated with the original route can be removed. Not all NE types support rolling cross-connects.

Users are limited to choices based on the WaveStar SNMS' cross-connection algorithms and knowledge of the current configuration of the NE. These algorithms apply NE specific constraints regarding cross-connects, such as allowable cross-connection rates and types, and restrictions based on the NE's cross-connection capabilities (not all NE types support all cross-connect operations), equipage, and current cross-connection status. The cross-connect action is displayed as a ***pending*** state until NE confirmation is received.

WaveStar SNMS also allows users to have an additional descriptive field with each cross-connection. This field is maintained on WaveStar SNMS and can be used to keep additional information with each cross-connect.

Example: Additional descriptive information that could be kept on hand would be an alternate cross-connect name or a note to associate a circuit ID with the cross connect.

DCN Provisioning   WaveStar SNMS provides GUI based functions for Data Communications Network (DCN) provisioning for supported NEs.

WaveStar NEs support external LAN interfaces and provide embedded data communications channels (DCCs) within their transmission interfaces. DCN provisioning includes provisioning for LAN and DCC interfaces. For these interfaces, DCN provisioning includes multiple aspects of data communications and data communications protocol provisioning, including the following:

- provisioning OSI and IP addresses
- provisioning IP and OSI stack parameters (for example: OSI transport and network layer parameters)
- provisioning TARP parameters
- enabling and disabling DCC interfaces
- resetting LAN interfaces

The DCN provisioning features use a form-based display of the current values, typically with selections that can be made from lists of allowed values.

Synchronization Management

WaveStar SNMS provides Synchronization Management functions to facilitate user operations for configuring, managing, and controlling the timing sources and distribution of outgoing timing for the WaveStar Bandwidth Manager.

Refer to the description of the WaveStar SNMS BWM in Chapter 5, "NE Interworking" in this document for more information.

NE Software Management

NE Memory Backup and Restoration

WaveStar SNMS provides remote NE memory backup and restoration using the file transfer of a binary image of the NEs' complete memory.

WaveStar SNMS supports the following file transfer protocols:

- the file transfer protocol (FTP) for TCP/IP-connected NEs

- file transfer, access, and management (FTAM) for OSI-connected and OSI over TCP/IP-connected NEs

If a catastrophic failure occurs, NE Memory Backup and Restoration replaces manual record keeping and manual data entry to reconstruct the NE database. For NEs, such as the WaveStar NCC, which also have a secondary storage device for local backup and restoration of its primary memory, WaveStar SNMS also supports memory backup and restoration to and from the NE's secondary storage.

The backup procedure can be executed:

- on-demand

- scheduled via the WaveStar SNMS Scheduler

Up to seven backup files can be saved per NE, with the oldest file overwritten once the limit is reached.

Major Capabilities of NE Memory Backup and Restoration

NE Memory Backup and Restoration provides the following major capabilities:

- Compatibility with TCP/IP and OSI networks.

- A user-selectable *Intelligent Backup* mode option for on-demand and scheduled backup operations. With the *Intelligent Backup* mode, memory backups are performed only if the NE configuration has changed since the most recent backup. (WaveStar SNMS tracks configuration changes that have occurred since the last backup and only proceeds with the memory backup if changes have occurred.)

- If a command that could change any parameter setting that is backed-up is executed while the NE memory backup is in progress, WaveStar SNMS displays a warning message upon completion of the backup.

- A warning is provided if a mismatch occurs between the NE type or NE release of the backup file and the NE to be restored upon a memory restoration request.

NE Generic Software Management

NE Generic Software Management provides for the following:

- the management of NE software releases on WaveStar SNMS

- the high speed download of generic NE software from WaveStar to the NE via the intra-office LAN (IOA LAN), which can be an OSI LAN, a TCP/IP LAN, or a combination a TCP/IP and an OSI LAN)

- remote software activation

The following major functions are provided:

- copy NE software from source media to the WaveStar SNMS file system

- perform high speed download of a selected NE software version from WaveStar SNMS to the NE

- copy software from NE to NE

- activate (install) software in the NE

- delete NE software from WaveStar SNMS file system

These functions can be initiated manually via the GUI. In addition, downloading software to an NE, copying software from NE to NE, and activating NE software can be scheduled. WaveStar SNMS maintains the NE's current software version in its database and verifies the compatibility of the software version for the download, copy, or activate with the NE type and current software version.

Important! Not all NEs support remote software downloads or copying software between NEs. Refer to Chapter 5, "NE Interworking" for details of what a particular NE supports.

☐

Fault Management

....

Alarm Collection WaveStar SNMS provides for autonomous and on demand collection of alarms (and non-alarmed standing conditions).

WaveStar SNMS collects the following:

- all facility and equipment alarm messages (including environmental alarms), alarm clearing messages, and event messages that are autonomously generated by NEs

- WaveStar SNMS detected internal WaveStar SNMS alarms

- NE to WaveStar SNMS communication alarms

WaveStar SNMS keeps its alarm database current to reflect the real-time alarm state of the network.

Alarm Display Alarms (and non-alarmed standing conditions) are displayed in graphical and textual formats. (Non-alarmed standing conditions are included in the display beginning in WaveStar SNMS R3.1.)

The alarm status in all graphical and textual formats is dynamically maintained as new alarms are received and existing alarms clear.

Graphical Format

The Graphical User Interface (GUI) provides a color-coded control panel, with counts of alarms per severity type, that changes as alarms are received and cleared. These alarms include those originated by NEs as well as alarms detected by WaveStar SNMS (self-detected WaveStar SNMS failures and WaveStar SNMS detected data communication failures between WaveStar SNMS and the managed NEs).

The following table shows the default colors used for each alarm severity level.

Table 2-2   Default Colors Used for Alarm Severity Levels

Default Alarm Color	Alarm Severity Level for SONET Transport	Alarm Severity Level for SDH Transport
Red	Critical	Prompt
Yellow	Major	Deferred
Cyan	Minor	N/A
Gray	Throttled	*N/A*

....

Lucent Technologies - Proprietary   190-224-143
See notice on first page   Issue 1, October 2001

Table 2-2   Default Colors Used for Alarm Severity Levels (continued)

Default Alarm Color	Alarm Severity Level for SONET Transport	Alarm Severity Level for SDH Transport
Green	No Active Alarms	No Active Alarms
Magenta	Loss of Communication	N/A
White	Not Alarmed State	Not Alarmed State

The GUI also displays a color-coded logical Map Window with icons representing each managed NE and the WaveStar SNMS host. In the Map Window, NEs can be grouped into user-definable groups called *aggregates,* and WaveStar SNMS displays the color code representative of the highest severity currently active alarm for each entity displayed on the map (aggregate, NE, WaveStar SNMS, and optical trail/facility).

Important! Aggregates are used to simplify the complexity of the Map Window. NEs can be grouped to form an aggregate so an icon for the aggregate can be displayed in place of the NEs on the Map Window. Aggregates on the Map Window can be *exploded* to illustrate their entities. *Example:* the NEs of a ring can be grouped to form an aggregate that represents the ring. The aggregate can be represented as an icon on the map, or the aggregate may be expanded on the Map Window so each NE within it is represented by an icon. Aggregates can be placed in other aggregates in a hierarchical fashion, which results in a Map Window that has multiple levels.

In addition to the Map Window, WaveStar SNMS also provides color-coded NE equipment displays to represent the highest severity currently active alarm on each piece of equipment.

Example: the shelf level displays indicate the highest severity alarm for each circuit pack. This nested set of displays allows users to *drill down* from aggregates to individual NEs to bays and shelves of the NEs to view the source of the alarm. Users can also navigate directly from the Alarm List to the equipment view with the alarmed item (the shelf view with the alarmed circuit pack).

Textual Format

WaveStar SNMS provides textual alarm summaries and listings, which include tabular equivalents to the graphical alarm displays, that are dynamically updated as alarms are received and cleared.

These tabular listings:

- provide summaries and/or exhaustive listings of active alarms in the network (or selected aggregate or NE)

- provide access to the complete message of each alarm

- support sorting so users can group and order lists to best meet their needs

- supports filtering so users can choose a subset of alarms to display (only the set of service affecting or unacknowledged alarms)

Transient Event Display

The Transient Event Display provides WaveStar SNMS users with a notification of transient events along with a dynamically maintained display of incoming transient events. The notification triggers the user to open the display of transient events.

The display includes all events that were received since the display was last closed:

- While open, the display is automatically updated with each new incoming transient event.

- After closing, the display automatically clears. (The Alarm Log continues to provide a persistent record of all incoming transient events.) An indicator in the GUI notifies users of new transient events while the transient event display is closed. Displaying the transient event list turns off the indicator. This capability is coupled with the existing WaveStar SNMS event-per-time (EPT) filter so only transient events that exceed the EPT filter are forwarded to the GUI for notification and display.

Alarm Processing and Volume Reduction

Alarm processing applies to both the GUI and, when applicable, forwarding alarms, conditions, and events to northbound OSs. Alarm processing reduces the volume of alarms that the WaveStar SNMS users and other systems must handle.

User-Settable Alarm Monitoring

WaveStar SNMS allows users to predefine a ***throttle level*** for alarm monitoring. When the rate of alarms from an NE reaches the predefined throttle level, WaveStar SNMS automatically adjusts its mode of alarm processing and monitoring for that NE—it logs all alarms, but passes only critical alarms to be processed and displayed.

This feature provides overload protection for WaveStar SNMS and is useful during events such as initial turn-up, where an NE generates a large numbers of messages, which are typically not service-affecting. This feature can also be manually invoked.

Aging

WaveStar SNMS receives alarms and holds them for a user-defined period of time, and logs them before displaying them on the GUI. If a clear message is received within this period of time, the alarm is not shown. Alarm aging suppresses transient alarms. The duration of holding time, which includes an option for no aging, is administrator tunable.

Symptomatic Alarm Filtering (SAF)

To conform with SONET, SDH, and other standards, NEs generate directly detected and symptomatic alarms.

Symptomatic alarms are typically generated to make users aware of problems that can affect their services, but that have occurred in another management domain.

Example: NEs generate Alarm Indication Signals (AIS) and Remote Failure Indications (RFI) upon detection of certain incoming failure conditions. Therefore AIS and RFI alarms are symptomatic of other failure conditions within the network, such as a loss of signal (LOS) alarm that results from a fiber cut. WaveStar SNMS provides SAF to suppress symptomatic alarms and only displays to users the directly detected root cause alarms. With the SAF feature, WaveStar SNMS allows users to display the filtered or unfiltered view of the network's current alarm status.

Event Per Time (EPT) Thresholds

WaveStar SNMS receives transient event messages, such as Threshold Crossing Alerts (TCAs), and counts them over a pre-set time period. Different threshold levels can be set for each event type. If the incoming rate of transient events exceeds a user-specified frequency, WaveStar SNMS forwards the event to subscribed northbound systems and to the GUI for display. EPT thresholding identifies chronic performance problems or *bad actors*.

Audible Alarm Alerting   WaveStar SNMS provides an audible signal for new alarm conditions that apply to a particular user Target Group. The audible signal persists for a configurable interval, and periodically repeats until:

- the user acknowledges the audible signal
- the alarm condition(s) clears

The severity of the highest displayed alarm on a GUI dictates the sound that is generated. The new alarm conditions include alarms generated by the NEs for network failures, environmental alarms, and alarms generated by the WaveStar SNMS host. This feature can be enabled/disabled per host and per user GUI.

Non-alarmed events do not generate audible signals. The audible signal's parameters (sound, duration, and interval between repetitions) can be administered globally for each WaveStar SNMS host.

Visible Alarm Alerting and Acknowledgment   The Visible Alarm Altering and Acknowledgement feature indicates the receipt of a new alarm by flashing the impacted icon on the GUI. These new alarms stop flashing when users acknowledge the alarm or the alarm is cleared.

WaveStar SNMS supports options for the following types of alarm acknowledgement:

- *Single acknowledgement* provides for one acknowledgement of an alarm.
- *Double acknowledgement* provides for an acknowledgement of both the setting and clearing of alarms.
- *No acknowledgement* of alarms does not acknowledge any alarms and disables visible alarm alerting.

If the receipt of the alarm is acknowledged when double acknowledgement is enabled, the clear must also be acknowledged to remove the alarm from the active alarm list. With single and double acknowledgement, the ID of the person who acknowledges the alarm is logged in the WaveStar SNMS database and is displayed as a field in the WaveStar SNMS alarm list display.

WaveStar SNMS also provides an option for *alarm latching*, which requires an alarm to be acknowledged before it is removed from the active alarm list. Thus, an alarm that sets and clears without any user intervention cannot quietly disappear from the active alarm list without a user having noticed it. Along with single or double alarm

acknowledgement, alarm latching ensures that every alarmed condition is brought to the operator's attention.

The WaveStar SNMS suite of alarm alerting and acknowledgement features provides a powerful and flexible system for bringing alarms to the user's attention and tracking and managing the alarm handling process.

Automatic Alarm Resynchronization

WaveStar SNMS automatically uploads the NE's current alarm (and non-alarmed standing condition) status when a connection is first established with an NE, and when a connection is re-established with a NE following any data communications failure. (In addition, the user can initiate an on-demand alarm resynchronization with a specified NE.)

This automatic alarm resynchronization ensures that WaveStar SNMS has an accurate view of the current alarm status if autonomous messages are not received because of a communications failure. The alarm resynchronization feature updates the WaveStar SNMS database and the GUI alarm displays as a part of the resynchronization process.

Alarm Logging and Storage

WaveStar SNMS receives and stores every NE-generated *alarm*, *condition*, *alarm/condition clear*, and *event* message in an alarm/event log. The set and clear messages for alarms and standing conditions are linked as a single record, along with user acknowledgement information. Thus, the alarm/event log provides a complete record of all alarm related activity and allows users to see the current status of the alarms and a history of their disposition. Threshold Cross Alerts (TCAs) and other transient events are also maintained in the log.

This information is stored on-line for a user definable number of days, the maximum of which is 45 days. The number of days for which information is stored is also subject to WaveStar SNMS storage capacity and the received alarm/event traffic. If insufficient storage capacity exists for the volume of received alarms/events, the oldest alarm/event messages are overwritten regardless of their age.

Users can query, filter, and sort the Alarm/Event Log for display based on the NE, the time period, the message type (alarm, event, or both) and several other parameters that are associated with alarm and events. Users can configure the display to accommodate personal preferences and direct the output to a printer or a file.

Alarm Logging and Storage

WaveStar SNMS receives and stores every ***alarm***, ***condition***, ***alarm/condition clear***, and ***event*** message generated by an NE. This information is stored on-line in the Alarm Log for a user definable number of days (45 days, which is the maximum value).

Note: The number of days for which information is stored is subject to WaveStar SNMS storage capacity and the received alarm/event traffic. If insufficient storage capacity exists for the volume of received alarms/events, the oldest alarm/event messages are overwritten regardless of their age.

Users can query, filter, and sort the Alarm Log based on NE, time period, and any of several parameters associated with each alarm, such as the alarm severity.

TCAs are accessible as part of the Alarm Log. The information from the set and clear messages in the Alarm Log is grouped so users can readily determine the current status of the alarms/conditions in the historical log.

Environmental Alarms

WaveStar SNMS receives environmental alarms, which are alarms that typically are used to indicate central office related failures as opposed to NE specific abnormal conditions. These alarms are forwarded by the NEs and displayed graphically with the other NE generated alarms. They are color-coded to match their severity.

The description of the environmental alarms (also called ***scan points*** or ***miscellaneous discrete inputs***) is provisionable on each NE.

In addition, the provisioning of control points (also called ***miscellaneous discrete outputs***) is supported using a menu and forms based interface. Most NE types provide control points to control miscellaneous equipment in the central office remotely. Similar to scan points, the description to identify the function of control points is provisionable.

Alarm Severity Provisioning

Rather than setting alarm severities individually for every object within the NE that can emit an alarm, the WaveStar NEs use the concept of ***alarm profiles*** to set alarm severities.

Example: An OC-n port has an alarm profile, which specifies the alarm severities for various port failure conditions, such as a service-affecting loss-of-signal (SA-LOS). Individual OC-n ports are assigned to an OC-n port alarm profile to set their alarm severities, which enables the alarm severities to be changed for a large number

of ports, simply by changing the alarm profile to which they are assigned.

WaveStar SNMS supports remote provisioning to view, create, delete, and modify the alarm profiles. Using this feature, users can display the set of alarm profiles on one or more selected NEs, and select an alarm profile to view, modify, or delete. Alternatively, users can also choose to create a new alarm profile for the NE or NEs. As with other WaveStar SNMS features, provisioning is done through user-friendly screens that provide the set of provisionable parameters and offer selection from sets of allowable values. The assignment of alarm profiles to objects, such as ports or protection groups, is done as a part of the corresponding provisioning function—that is, as a part of port provisioning or protection group provisioning.

Test Access Management

Test access management consists of test access configuration management and loopbacks. Test access configuration management, along with loopback management capabilities, enable remote network testing and fault isolation.

Both test access connection management and loopback status are maintained in the WaveStar SNMS database and are integrated into the WaveStar SNMS cross-connection features so circuit provisioning users know which tributaries and/or time-slots are currently involved in the test access connection or the loopback.

Test Access Connection Management

Test access connections provide access for external test systems to both monitor and test signal paths. The WaveStar SNMS test access connection management feature enables users to do the following:

- display the current set of test access connections

- create new test access connections

- change test access modes

- release existing test access connections

The WaveStar SNMS test access connection management feature graphically illustrates the types of test access connections, which are:

- Monitor E-Tributary (MONE)

- Split E-tributary (SPLTE)

Loopbacks

NEs support various types of loopback capabilities. Along with test sets and test access capabilities, these loopback capabilities enable users to inject and monitor test signals to verify system performance and isolate faults.

Fundamentally two types of loopbacks exist:

- loopbacks on an entire facility called ***facility loopbacks***
- loopbacks on individual tributaries (***time slots***) called ***cross-connect loopbacks***. The cross-connect loopback status is maintained in the WaveStar SNMS database and is integrated into the WaveStar SNMS cross-connection features, so circuit provisioning users are aware of tributaries/time-slots that are currently involved in a cross-connect loopback.

WaveStar SNMS manages loopbacks by type. The WaveStar SNMS loopback management features enable users to display the current set of loopbacks on an NE, create additional loopbacks, and release loopbacks.

As with other WaveStar SNMS features, these capabilities are supported with forms and menu-based selection.

Example: to remove a loopback, the user is presented with the current set of active loopbacks and selects the loopback to be released.

□

Performance Management

Remote Administration of PM Parameters and Thresholds	WaveStar SNMS supports the remote administration of performance monitoring (PM) parameters for WaveStar NEs.

WaveStar SNMS supports remote provisioning to view, create, delete, and modify the Threshold Crossing Alerts (TCA) threshold profiles. Using this feature, a user can display the set of TCA threshold profiles on one or more selected NEs (that use the concept of TCA profiles for each type of object); and then select a TCA threshold profile to view, modify, or delete.

As with other WaveStar SNMS features, provisioning is done through user-friendly screens that provide the set of thresholds and offer selection from sets of allowable threshold levels. For digital performance monitoring (PM) parameters, WaveStar SNMS supports viewing and setting the threshold values as either of the following:

- raw counts (the number of errored seconds)

- a percentage of the maximum value (the percentage of errored seconds)

The assignment of TCA threshold profiles to objects, such as ports, is done as a part of the corresponding provisioning function (such as a part of port provisioning).

Exception Reporting

WaveStar SNMS provides performance exceptions by logging Threshold Crossing Alerts (TCAs) received from the NEs. TCAs, which are in the form of reported events, are generated whenever an administered performance threshold is exceeded in the NE. TCAs are an example of a transient event and are handled as a part of transient event reporting.

In addition, transient events are available as a subset of the Alarm Log. Refer to the previous section in this chapter titled "Alarm Logging and Storage" (2-21).

PM Data Collection and Reporting

WaveStar SNMS enables users to collect and store Performance Monitoring (PM) data from the NEs' 15 minute and daily registers.

The primary role of WaveStar SNMS in collecting PM data is to be an intermediary storage point and to provide centralized access to PM data for performance data report generation systems at the network

management layer, such as Lucent Technologies ITM DNA. However, WaveStar SNMS also provides basic queries and reports of the stored PM data.

Users have two options to use to collect PM data:

- With ***PM data collection by a termination point type***, users can specify the NE and the port and tributary types (OC-3, STM-1o, STS-1) for which PM data is to be collected. PM data is then collected for all termination points of that type on the NE. This option best suits operators who want universal or near universal PM data collection across their network.

- With ***PM data collection by an individual termination point***, users can specify the NE and the exact ports and tributaries of that NE for which PM data is to be collected. PM data is then collected only for those specific points. This option suits the needs of operators who want to collect PM data for specific services or in response to specific complaints or problems.

With either option, WaveStar SNMS periodically collects the requested PM data. The collected PM data is stored in the WaveStar SNMS database and is accessible by WaveStar SNMS users. WaveStar SNMS can provide storage for up to 30 days of PM data.

In addition, WaveStar SNMS provides two types of queries and reports to view all PM data. WaveStar SNMS provides the following:

- reports to view all PM data of a ***given type*** (all OC-3 ports of an NE) for a single collection interval.
  Example: WaveStar SNMS users can query the PM database by NE, PM interface type, PM data type (24 hour or 15-minute), and date and time (time only applies to 15-minute data) to display the PM data for this interval in a tabular format.

- reports to view all PM data for up to ***two collection points*** (a single OC-3 port) across multiple collection intervals.
  Example: WaveStar SNMS users can query the PM database by NE, specific collection point, PM data type (24 hour or 15-minute), start date and time, and end date and time to produce a PM report.

Users can display PM reports with either of the following:

- the raw PM counts (the number of errored seconds)

- the raw counts and the percentages of the counts relative to the maximum values (percentage of errored seconds)

Security Management

Overview	WaveStar SNMS maintains a set of NE connections that all users share. In this environment, administration of individual user logins and passwords is centralized on WaveStar SNMS rather than distributed across the managed NEs. WaveStar SNMS provides two levels of login security:

- one for access to the desktop (for example, the Windows NT PC)
- one for access to the WaveStar SNMS application

Network access through WaveStar SNMS affords users more robust and flexible security management than is afforded to them when they access the NE though its craft interface terminal (CIT).

Global Password Administration

WaveStar SNMS provides enhanced security over its southbound interfaces to the NEs, which is achieved by supporting global password administration for the NE login IDs used by WaveStar SNMS.

Global password administration enables WaveStar SNMS system administrators to change passwords easily for numerous NEs in a single operation.

Example: In a single operation, system administrators can change all NEs, all NEs of a selected NE type, or all NEs in an aggregate of NEs.

Global password administration coordinates changing the information in the NE's local security system and in the WaveStar SNMS database as a single user operation.

Target and Command Group Partitioning

WaveStar SNMS provides a powerful and flexible permission scheme using the following configurable groups to which users can be assigned:

- *NE Target Groups*, which define the NEs that users can access
- *Command Groups*, which define the WaveStar SNMS functions and TL1 commands that users can execute

With this flexible partitioning, users can be assigned to a combination of technologies (SONET/STM NEs only), geography, and job function (provisioning versus maintenance).

Only the WaveStar SNMS system administrator can create user logins, and administer NE Target Groups and Command Groups. WaveStar SNMS supports a maximum of 32 Command Groups and 32 Target Groups.

WaveStar SNMS User Login Management

Besides standard desktop-based security, WaveStar SNMS provides these additional user security management features:

* With *login aging*, user logins are deleted after a period of un-use. The time period for login aging is administrator tunable.

* With *password aging*, users are required to change passwords after a specified time period. The time period for password aging is administrator tunable.

* With *inactivity sensing*, WaveStar SNMS automatically logs off users from the application after a period of inactivity. The time period for inactivity sensing is administrator tunable.

* With *administrator control*, the WaveStar SNMS administrator can enable/disable user logins, display all active user sessions, and terminate active user sessions.

NE Login Management

WaveStar SNMS supports remote provisioning to view, create, delete, and modify (change the user's privileges) the user logins maintained on the NEs. With this feature, a user can display the set of user logins on a selected NE. Alternatively the user can choose to create a new user login on the NE.

NE Command Response Log

WaveStar SNMS maintains a log of all commands and their associated responses between WaveStar SNMS and the NEs, which is known as the *Command Response Log*. This log records all WaveStar SNMS originated management operations on the NEs. The log includes the NE name, date and time stamps, the originating user ID, the command name, the affected entity within the NE (the AID), and the final disposition of the request. Users can query, filter, and sort the Command/Response Log for a display based on the NE name, time period, or user name (originating user). Users can configure the display to accommodate personal preferences and direct the output to a printer or a file.

WaveStar SNMS Activity Log

The WaveStar SNMS Activity Log provides a historical record of all functions that have been executed on WaveStar SNMS, including functions that are:

- local to WaveStar SNMS, such as adding a new WaveStar SNMS user

- involve interaction with an NE, such as adding a new cross-connect

Both user initiated and system initiated activities, such as scheduled activities, are logged.

This Activity Log enables all management activities to be accounted for and to be traced. The Activity Log includes the following information:

- a date and time stamp

- the user ID

- the final disposition of the request

- the activity category

- the activity name

- a description of the activity (for example: `deleted cross-connect between source address x and destination address y on NE XYZ)`

Users can query, filter, and sort the Activity Log Activity Log for a display that is based on time period, user names, and activities (provisioning, security, software management). Users can configure the display to accommodate personal preferences and direct the output to a printer or a file.

The Activity Log supplements the Command/Response Log, which logs the details of all command/response transactions over the interface to the NEs.

□

OA&M

....

Platform Upgrades
Having a scalable WaveStar SNMS platform enables customers to upgrade at their convenience. As networks grow in size, as element management functions are added through new releases, or as third-party hardware and software platforms are modified, customers must protect their investment. To that end, Lucent Technologies has created a graceful migration plan from one platform to another. This plan is backed by Lucent Technologies' extensive internal testing prior to field deployment.

Installations and Software Upgrades
WaveStar SNMS uses script-based procedures for first-time software installation and for subsequent upgrades. These scripts, which are interactive and menu-driven, minimize the time and effort required to install and upgrade software. The scripts alert users of discrepancies and prompt users for the appropriate actions to be taken.

Self-Monitoring Capabilities
Besides error logging, WaveStar SNMS has administrative and self-monitoring capabilities, such as displaying a color-coded WaveStar SNMS host icon and corresponding alarm list. These capabilities provide the system administrator with real-time information to manage the application proactively.

Startup/Shutdown
WaveStar SNMS enables the system administrator to shut-down the application gracefully, write the data in memory to disk for later startup and comparison, and restart the application when the host HP-UX operating system is rebooted. The administrator is informed of the shutdown progress.

GUI users who exit the application can save any changed window settings. Users who exceed the provisionable time-out period are automatically logged off.

Data Storage
WaveStar SNMS maintains logs of autonomous messages received from the NEs (Alarm/Event Log and Database Change Notification Log) and paired command/response messages to/from the NEs (Command/Response Log). WaveStar SNMS also maintains an activity log and an alarm log of originated error/status messages. Each log can be sized to support a user-definable maximum number of days for recording. A WaveStar SNMS automated process runs on a schedule to purge the logs.

....

Note: The logs are maintained within the WaveStar SNMS database, in addition to the network configuration data, and the PM data collected from the network. The administrator can backup and restore the WaveStar SNMS database to and from disk and tape

☐

User Interface

GUI WaveStar SNMS has a platform-independent, Java-based graphical user interface (GUI), whose design:

- follows the Windows Interface Guidelines

- conforms to TMN architecture (ITU-T M.30 SG 10 Human Machine interface)

- is intended to provide a common look and feel with the ITM product family, WaveStar NMS, and other Lucent Technologies products.

In particular, the WaveStar SNMS GUI has been implemented as a joint development with ITM SNC, and designed in collaboration with the PC-based WaveStar NE CITs.

Hardware Desktop Platforms Supported

The JAVA GUI allows for use of the following desktops:

- *Pentium*® II PC running Windows NT 4.0 with Service Pack 4 or Windows 2000

- HP B2000 Workstation running HP-UX 10.20 or 11.0

- Sun Ultra 5 Workstation running Solaris 2.6/2.7

- X-terminals (via Windows NT 4.0 terminal servers)

The Java GUI is based upon a client-server architecture, with user-friendly installation of the client software on the desktop. The client-server architecture enhances system performance through an efficient distribution of the processing requirements.

The GUI architecture enables an WaveStar SNMS host to support up to 30 simultaneous GUI clients (HP workstations, Sun Workstations, or Windows NT PCs).

GUI Features

The WaveStar SNMS GUI is a common interface to all NEs, regardless of type, and provides a graphical interface for the most frequently used actions. Specifically, the GUI provides the following:

- graphical features such as multilevel displays of the network

- an automatically generated map of the overall managed domain

- hierarchically arranged equipment displays down to the shelf level

- a graphical representation of the cross-connection configuration with point-and-click provisioning

- form and menu based provisioning for viewing and setting provisionable parameters

- the ability to initiate a cut-through session to directly send TL1 commands to NEs, providing the NE type supports TL1 messages over their OS interface

GUI Design

Because the WaveStar SMNS GUI conforms to Windows Interface Guidelines, it provides a powerful, flexible, and friendly interface. Use of the Windows guidelines for look and feel, makes the interface intuitive and easy to learn and use, especially for users who are familiar with PC applications.

Example: By incorporating an Explorer for item selection—such as an NE or a port within an NE—the WaveStar SNMS GUI takes on the Windows look and feel.

The flexibility of the GUI enables users to choose methods of operation that they find most convenient. The GUI also supports numerous customization options so users can tailor displays to their own preferences.

North American and International GUI Display Options

WaveStar SNMS manages global transmission products, supporting both STM (SONET and SDH) products and DWDM products, which are global. WaveStar SNMS supports both SONET and SDH terminology, and provides display options to present information to users in typical North American formats or typical international formats.

Specifically, WaveStar SNMS provides a display option to present:

- date information in the North American (month-day-year) format or the international (day-month-year) format

- alarm severities using North American (critical, major, and minor) nomenclature or international (prompt and deferred) nomenclature

TL1 Based Interface   TL1 cut-through capability is provided by WaveStar SNMS for NEs that support the TL1 syntax over their OS interface. For these NEs, WaveStar SNMS allows users to interact with the NE using the TL1 language directly.

WaveStar SNMS provides TL1 cut-through as a function within the GUI, which gives users a character-based TL1 command/response interface to the managed NEs. WaveStar SNMS's TL1 cut-through is a secure interface that allows users to cut-through only to NEs that are in the user's Target Group and only issue/execute TL1 commands that are in the user's Command Group.

The TL1 cut-through window has an editable command line for input. TL1 cut-through is useful because it includes the capability for users to build custom macros of multiple TL1 commands coupled with a broadcast capability to send the TL1 commands to multiple NEs. TL1 cut-through is necessary for some infrequently used commands that are not supported by the WaveStar SNMS GUI.

Menu Driven TL1 Command Builder

The GUI based TL1 cut-through capability is a menu driven capability that simplifies creating TL1 commands by automatically populating the TID field and providing menu selection for the set of required fields that are common across all TL1 commands (those up to and including the AID field). Users can select a command (from the allowed commands in their Command Group) and AID(s) from scrollable lists.

A filter field is provided so users can rapidly scroll to required commands and AID(s) respectively. The TID field is populated automatically based on the selected NE on entering the TL1 Command Builder feature. The user manually enters all other command variables.

Upon entering the cut-through mode, the system automatically displays an output window, which initially indicates whether communication has been established with the selected NE and subsequently displays all responses to commands sent to the NE.

TL1 Macro Builder

The TL1 Macro Builder is a software tool enables users to create and store TL1 command files with multiple TL1 commands, using the scrollable command and AID lists. The stored files can be restricted for use by the originator or made available to all users.

These TL1 macro files can then be used with the Broadcast Capability so multiple commands can be sent to a single NE or the set of TL1 commands can be repetitively sent to multiple NEs.

Broadcast Capability to Multiple NEs

WaveStar SNMS users can select and broadcast TL1 commands, built via the TL1 Macro Builder, to one or more NEs.

The commands included in these files and the targeted NEs are screened by the WaveStar SNMS security system to ensure that the user has permission to issue the commands included in the TL1 macro and to access the targeted NEs.

Example: These commands can be used to perform routine maintenance and provisioning activities.

☐

Hardware Redundancy

Overview   The WaveStar SNMS hardware redundancy option provides multiple levels of application and host redundancy for backup support and disaster recovery if a failure occurs.

The WaveStar SNMS hardware redundancy options include:

*   local redundancy

*   geographic redundancy

The local and geographic redundancy configurations require two similarly equipped hosts that operate in an active/standby arrangement. The two host computers are linked via a TCP/IP WAN segment and employ data replication to provide near real-time database synchronization of the standby host with the currently active host.

Under normal operating conditions, the WaveStar SNMS application is running on the active host, with that host actively monitoring all NEs in the management domain. The backup host is in a hot-standby state, maintaining data connections to the network and using data replication from the active host to keep its database current. If primary host failure occurs, an automatic switch-over occurs for both the local and the geographical redundant configuration. Upon switch-over, the standby host assumes active control of the network.

Local redundancy   Local redundancy uses two similarly equipped hosts located in the same building (as shown in the following figure). Each host is configured with redundant hardware components. Should the primary

host fail, the backup host is activated automatically without user intervention.

Figure 2-1 EMS Local Redundancy Configuration
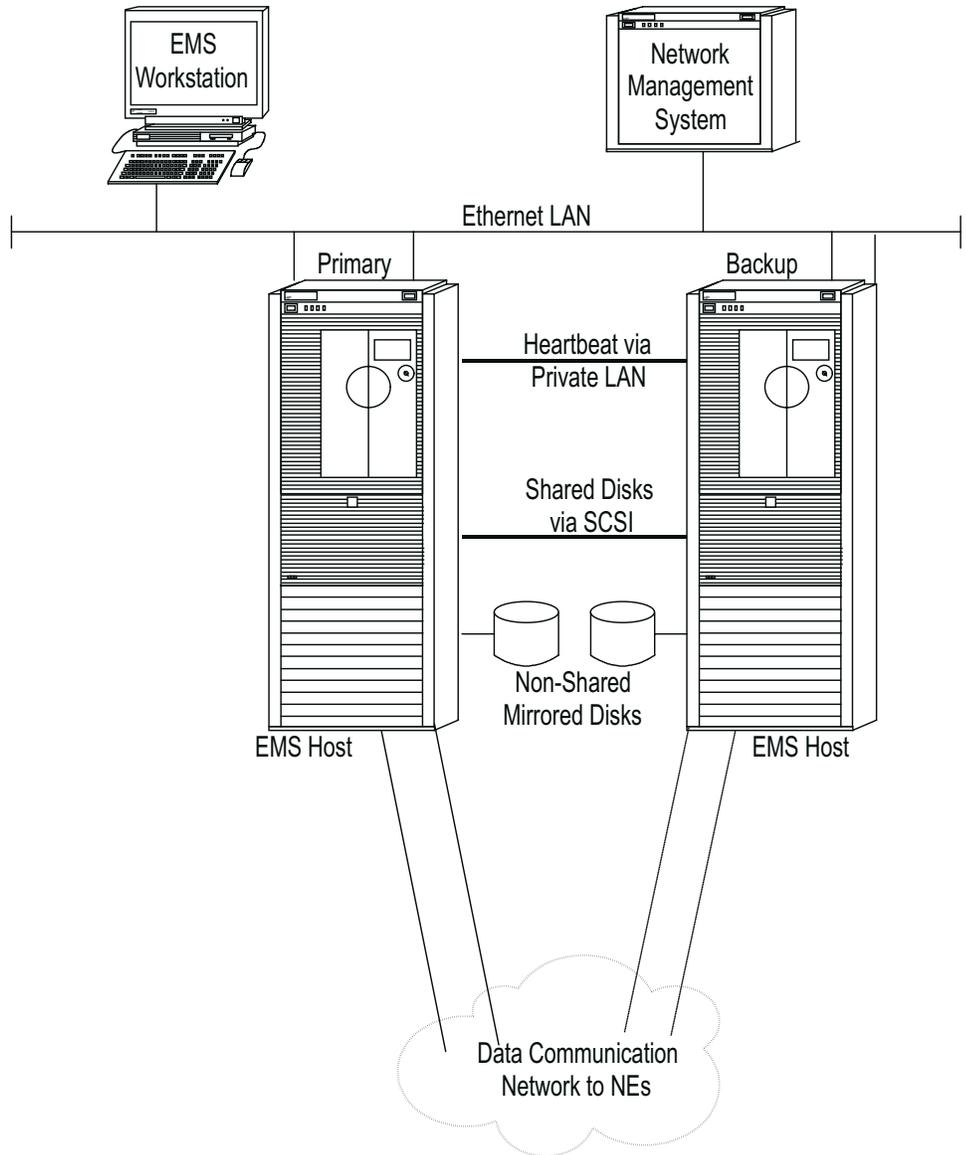
Under normal operating conditions, the WaveStar SNMS host is in service (or is active) on the primary host monitoring all NEs in the database. The backup host exists in a passive (or standby) mode with the WaveStar SNMS application running in a ***read only*** mode. Although the standby host is logged into all network elements, it does

not initiate any event to the network or react to any notifications from the network.

Database synchronization is handled using Informix Enterprise Replication, FTP file transfer, and event forwarding from the active host. If a primary host failure occurs, control is automatically switched from the primary to the backup host, changing the WaveStar SNMS application from standby to active service without user intervention. Once the primary host failure is repaired, manual intervention is required to synchronize the database and switch control back to the primary host.

Geographic Redundancy   Geographic redundancy (as shown in the following figure) relies on two similarly equipped hosts located in different geographical locations, for example: Atlanta, Georgia and Denver, Colorado. Each host is configured with redundant hardware components, and resides on a TCP/IP WAN segment. Data replication and event forwarding via WAN are used to maintain EMS database and UNIX file system synchronization.

Figure 2-2 EMS Geographic Redundancy Configuration
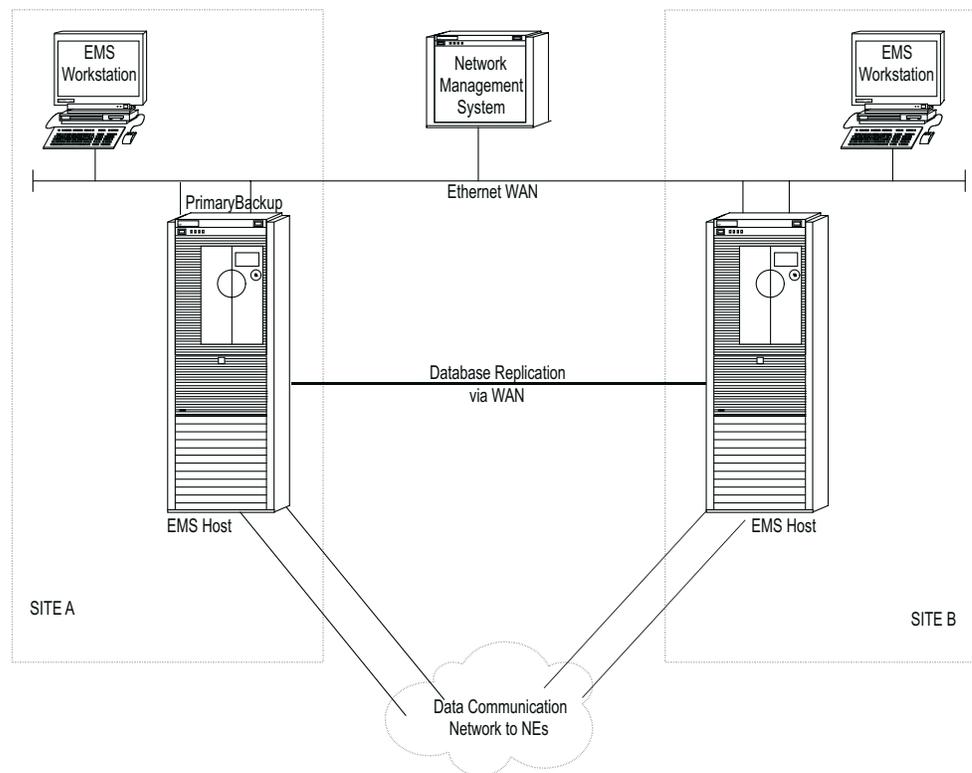
Under normal operating conditions, the WaveStar SNMS application is in service (or active) on the primary host monitoring all NEs in the database. The backup host exists in a passive (or standby) mode with the WaveStar SNMS application running in a read only mode. Although the standby host is logged into all networks, it does not initiate any event to the network or react to any notification from the network.

Database synchronization is handled using Informix Enterprise Replication, FTP file transfer, and event forwarding from the active host. If a primary host failure occurs, control can be manually switched from the primary to the backup host changing the WaveStar SNMS application from standby to active service.

Both local and geographic redundancy provide automatic switchover. For geographically redundant systems, automatic switchover can also be performed via the cluster administration GUI.

Once the primary host failure is repaired, manual intervention is required to synchronize the database and switch control back to the primary host.

☐

3 Software Planning and Engineering

Overview

Purpose   This chapter provides planning and engineering information on the software related to the use of WaveStar SNMS.

Contents

Third Party Software

Third Party Software The following tables show names and the particular releases of the third party software that is required to run WaveStar SNMS R6.0

Table 3-1 Third Party Software Required for WaveStar SNMS R6.0

Software Description	Software Version
Operating System (32-bit for K-Class)[1]	HP-UX 11.0
Informix - Online DS (32-bit version on HP-UX 11.0)	R7.31uc3
Persistence Object Builder/Server	R3.562
IONA OrbixMT	R3.0.1
IONA OrbixWeb (for HP workstation serving as a client)	R3.01
Open Link (option for ITM DNA interface)	A.2.6
RogueWave Thread.h++	R1.3.0
RogueWave Tools.h++	R7.1.0
HP R11.0 JRE (for an HP workstation serving as a Java GUI client)	R1.1.8
HP OpenView DM Kit (for NEs managed using CMISE)	R5.03
ATOS OSIAM (OSI Stack)	R2.6F
X.25/ACC (required if managing NEs using different X.25 connections)	Z7476AA B.03.10.01
HP MC/ServiceGuard (for Redundancy only)[1]	A.11.09
HP MirrorDisk/UX (for Redundancy/ Mirrored Disks only)[2]	B.11.00
HP EMS (Event Monitoring Services) (for Redundancy only)[2]	A.03.20
HP OmniBack II (optional package for OmniBack DLT, tape backup)	A.03.00

**Table 3-1   Third Party Software Required for WaveStar SNMS
R6.0   (continued)**

Software Description	Software Version
Windows JRE (for Windows PC serving as Java GUI Client)	1.18
SunSoft JRE (for Sun Workstation serving as a JAVA GUI client)	1.1.8
SunSoft Java Swing Set	1.1
Driver for HSC 100BT LAN Card	J3514A B.11.00.05[2]
Driver for PB 100BT LAN Card	J2759BA B.11.00.06[2]
Driver for PCI 100BT LAN Card	J4253AA B.11.00.05[2]
General Release Bundle	December 2000 version
Hardware Enablement and Critical Bundle	December 2000 version
HP-UX Unlimited User License	B.11.00.02, December 2000 version

Notes:

1.   From HP-UX 11.0 Core OS CD, November 1999 version.

2.   From HP-UX 11.0 Application Software CD, September 2000 version.

◻

Sizing the System

Guidelines to Sizing the System

System sizing is a function of the following:

- the capacity of the WaveStar SNMS application and platform

- the load that the managed NEs place upon the applications and platform

The load generated while managing the network depends on the numbers, types, and equipages of the managed NEs, the manner in which the NEs are connected to WaveStar SNMS, and the management operational profile.

Detailed sizing guidelines and a capacity estimation tool are available to configure WaveStar SNMS systems to efficiently meet your needs. These detailed sizing guidelines use, as input, information describing the network to be managed and and the NE management operational profile. Load factors are applied based on the input to allow for differences in the size and complexity of the different NEs and the operational profile.

Capacity Affecting NE Parameters

The following parameters have the most impact on overall EMS capacity:

- MFA database size (number of records)

- relative activity—a factor that represents the relative degree of EMS activity required to manage a particular NE type under typical operating and load conditions, as compared to that needed for an FT-2000 and its successor, the WaveStar 2.5G

- number supported LAN associations

- configuration factor

See your Lucent Technologies' sales representative for details on sizing your system.

☐

4   Hardware Planning and Engineering

Overview

Purpose   This chapter explains the supported hardware platform for WaveStar SNMS. The WaveStar SNMS hardware platform provides a valid operation environment for all WaveStar SNMS activities and includes host hardware configurations, GUI workstation configuration, and host/workstation-related software configurations.

WaveStar SNMS runs on a scalable hardware platform that supports small to large-scale networks. The WaveStar SNMS application software and its release are independent of the hardware platform. The characteristics and needs of the customer's network determine choice of the hardware platform.

Contents

☐

Configurations

Architecture Overview   WaveStar SNMS consists of the following hardware devices:

- Hewlett-Packard (HP) *servers*, which function as WaveStar SNMS hosts

- *workstations* and/or *PCs*, which function as the WaveStar SNMS GUI client or the WaveStar SNMS cluster administration GUI

- *PCs* which function as the system console for HP K-Class servers or *laptops*, which function as the web console for HP L-Class and N-Class servers

- *printers*, which provide hardcopies of WaveStar SNMS GUI output

These devices are connected via an 802.3 Ethernet LAN; and optionally, can be interfaced to a WAN. For large, geographically dispersed configurations, a WAN/PSN can concentrate access from WaveStar SNMS to the managed subnetworks (access NEs with OSI LAN, NEs serving as transport bridges, or gateway NEs). The same WAN/PSN can also access other network management systems or OSs. Every WaveStar SNMS installation requires data connections to each managed subnetwork. The southbound WAN from WaveStar SNMS to the NEs must support an OSI/LAN interface and/or an IP/LAN interface.

WaveStar SNMS Configurations Defined   A WaveStar SNMS hardware configuration is a supported set of hardware devices that function with the current release of WaveStar SNMS. In the broadest sense, WaveStar SNMS supports the following two types of hardware configurations:

- *standalone configurations*, which include any one of the supported HP servers, mirrored disks, and the appropriate number of supported GUI clients

- *redundant configurations*, which include a minimum of any two supported identical HP servers, along with mirrored disks and the appropriate number of supported GUI clients

Both standalone and redundant hardware configurations have *Performance Monitoring (PM)* of data, which measures the quality of service and identifies degrading or marginally operating systems before an alarm can be generated.

In addition, both standalone and redundant hardware configurations can have ***multiple CPUs***, and redundant configurations can be configured for local or geographic (remote) redundancy.

Standalone Configuration Options

Standalone configurations include one HP server, the appropriate number of supported GUI clients, and mirrored disks on the L2000. Standalone configurations are provided with PM and with from one to eight CPUs.

The K-Class, L-Class, and N-Class servers are offered in standalone configurations.

Table 4-1   HP Standalone Server Configurations

Standalone Model	Number of CPUs Supported	Mirrored Disk Supported?
K380	1	no
	2	no
K580	4	no
	6	no
L2000	1	yes
	2	yes
	4	yes
N4000	8	no

Redundant Configuration Options

A redundant configuration includes a minimum of any two supported identical HP servers, along with mirrored disks and the appropriate number of supported GUI clients. Redundant servers are configured

with and/or without PM and from two to six CPUs in the following locations:

- *Local redundancy* uses two similarly equipped hosts located in the same building. Each host is configured with redundant hardware components. Should the primary host fail, the backup host is activated automatically without user intervention. The shared lock and its mirror disk must be accessible by both servers in a local redundancy configuration.

- *Geographic redundancy* relies on two similarly equipped hosts located in different geographical locations, for example: Chicago and Denver. Each host is configured with redundant hardware components, and resides on a TCP/IP WAN segment. Data replication and event forwarding via WAN are used to maintain EMS database and UNIX file system synchronization.

The K-Class and L-Class servers are both offered in redundant configurations. The N-Class server is not offered in a redundant configuration.

Table 4-2   HP Redundant Server Configurations

Standalone Model	Number of CPUs Supported	Mirrored Disk Supported?
K380	2	yes
K580	4	yes
	6	yes
L2000	2	yes
	4	yes

The kernel setting for a redundant configuration is the same as that for a standalone configuration.

Terminator cables are sometimes used in redundant configurations. If terminator cables are used, the resistors on the HSC SCSI card must be removed. Refer to the appropriate HP support person or documentation for the appropriate procedures.

Supported Disk Enclosures The HVD10 is the disk enclosure system that replaces the HASS for the K-Class servers.

The SC10 is the disk enclosure that interworks exclusively with the L-Class and N-Class servers.

☐

GUI Client

....

GUI Client Platforms   The WaveStar SNMS GUI Client can be run on an industry-standard personal computer (PC), an HP B2000 workstation, or a SUN Ultra5 workstation.

In addition, WaveStar SNMS supports the use of Citrix Metaframe software to export the display of a WaveStar SNMS GUI client running on a Windows NT and/or a Windows 2000 terminal server to a client workstation.

PCs as the Primary GUI Client Platform   PCs are the primary GUI platform for the current release of WaveStar SNMS. PCs with the recommended configuration are available from different vendors; however, each vendor manufactures its equipment differently. To avoid problems on various PC platforms, only the following PC vendors are supported:

- Compaq—visit them up at *www.compaq.com*

- Dell—visit them up at *www.dell.com*

- HP—visit them up at *www.hp.com*

The following table lists the primary configuration for the GUI client platform, which is an industry standard PC.

Table 4-3   Primary GUI Client Platform (PCs)

Item	Supported PC (Compaq, Dell, or HP)
CPU	450 MHz Pentium II processor
RAM	256MB or more
Disk	6GB or more
Video	video card with at least 8MB VRAM
Network Card	10/100BaseT
Monitor	19 inch or larger
Sound Card	sound card with speakers
CD_ROM	24X
OS	Windows NT 4.0 ServicePack 4 or Windows 2000
Other	floppy drive, keyboard, and mouse

....

Workstations as the Secondary GUI Client Platform

The following table lists the secondary configuration for the GUI client platform, which is an HP or Sun workstation.

Table 4-4　　Secondary GUI Client Platforms (Workstations)

Item	HP B2000 Workstation	Sun Ultra 5 Workstation
CPU	300 MHz	360 MHz UltaSPARC
RAM	256MB	256MB
Disk	8GB	8GB
Video	built-in	built-in
Network Card	10/100 Ethernet NIC	10/100 Ethernet NIC
Monitor	21 inch	21 inch
Sound Card	built-in	built-in
CD-ROM	Fast	Fast
OS	HP-UX 10.20/11.0	Solaris 2.6/2.7
Other	keyboard and mouse	keyboard and mouse

Secure WebConsole

Overview   The L-Class and N-Class servers can support a typical system console; however, HP ships these servers with its secure WebConsole.

The WebConsole, which, resides at the back of the L-Class or N-Class server, enables installers and administrators to access the server remotely via a laptop, a LAN connection, a Web browser, and an IP address.

The WebConsole is connected to the office LAN and has a unique IP address—meaning, its IP address is different from the server's IP address. It is connected to the server by a serial cable.

Security Features   The WebConsole has built-in security features that include the following:

- password encryption
- scrambling of data
- download protection

The WebConsole's security features do not compromise or replace the original security features of the server.

Access   The WebConsole enables up to four operators in different locations to access the HP server; but, only one user, who has the highest privilege, can interact with the server at any given time.

□

K380 Configurations

....

Standalone Specifications
This table lists the specifications for a standalone K380 server with one CPU.

Table 4-5   K380 (1 CPU) Standalone Specifications

Item	Standalone Specifications[1]
Number of CPUs	1
HP-UX Version	11.00 (32 bit)
Memory	768MB
Swap/Dump Space	2248MB
WaveStar SNMS Disk Space	54GB with PM data collection
with PM	six, 9GB drives or three, 18GB drives
without PM	three 9GB drives
Additional Disk Space for TMF	Included (2GB)
DAT	DDS3
CD-ROM Drive	DVD
X.25 (optional)	1 ACC MUX
SCSI Controller	2
LAN Cards	2
Supported Workstations/PCs	20
Disk Enclosure	HVD10
Bus Mode	Full Bus/Dual Connection
Jumper Settings	1111
Number of Simultaneous NE Backups (On-demand or Scheduled)	4

Notes:

1.   Also applies to the K360, which HP has already discontinued.

Standalone and Redundant Specifications
This table lists the specifications for a single and redundant K380 server with two CPUs.

....

Table 4-6   K380 (2 CPUs) Standalone and Redundant Specifications

Item	Standalone Specifications[2]	Redundant Specifications[3]
Number of CPUs	2	2
HP-UX Version	11.00 (32 bit)	11.0 (32 bit)
Memory	1024MB	1024MB
Swap/Dump Space	2248MB	2248MB
WaveStar SNMS Disk Space[1]	99GB with PM	108GB
with PM	eleven, 9GB drives or six, 18GB drives	eleven, 9GB drives or six, 18GB drives
without PM	five, 9GB drives	five, 9GB drives
Base Disk Space (minimum)	N/A	18GB x 2
PM + NB Log Disk Space (minimum)	N/A	26GB x 2
Additional Disk Space for TMF	Included (2GB)	Included
DAT	DDS3	DDS3
CD-ROM Drive	DVD	DVD
X.25 (optional)	2 ACC MUX	N/A
SCSI Controller	3	4
LAN Interface (including CORE I/O card)	3	5
Cabinet	2.0m	2.0m, 1 per host
Supported Workstations/PCs	30	30
Disk Enclosure	HVD10	HVD10
Bus Mode	Full Bus/Dual Connection	Split Bus/Dual Connection
Jumper Settings	1111	01111

Notes:

1. Assumes that the user will be collecting PM data.

2. Also applies to the K460, which HP has already MD'd, and the K580.

3. Also applies to the K360, which HP has already MD'd.

K580 HVD10 Disk   The HVD10 disk enclosure system replaces the HASS for the K-Class
Enclosure   servers.

□

K580 Configurations

K580 (4 CPUs) Standalone and Redundant Specifications

This table lists the specifications for a standalone and redundant K580 with four CPUs.

Table 4-7   K580 (4 CPUs) Standalone and Redundant Specifications

Item	Standalone Specifications[1]	Redundant Specifications
Number of CPUs	4	4
HP-UX Version	11.00 (32 bit)	11.00 (32 bit)
Memory	1280MB	1280MB
Swap/Dump Space	2248MB	2248MB
WaveStar SNMS Disk Space	180GB with PM	288GB
with PM	twenty, 9GB drives or ten, 18GB drives	twenty, 9GB drives or ten, 18GB drives
without PM	six, 9GB drives	six, 9GB drives
Base Disk Space (minimum)	N/A	18GB x 2
PM + NB Log Disk Space (minimum)	N/A	94GB x 2
Additional Disk Space for TMF	Included (4GB)	Included
DAT	DDS3	DDS3
CD-ROM Drive	DVD	DVD
X.25 (optional)	2 ACC MUX	N/A
SCSI Controller	4	6
LAN Interface Card including the CORE I/O card)	3	5
Cabinet	2.0m	2.0m, 2 per host
Supported Workstations/PCs	30	30
Disk Enclosure	HVD10	HVD10

**Table 4-7   K580 (4 CPUs) Standalone and Redundant
            Specifications   (continued)**

Item	Standalone Specifications[1]	Redundant Specifications
Bus Mode	Split Bus/Dual Connection	Split Bus/Dual Connection
Jumper Settings	01111	01111

Notes:

1.   Also applies to the K460, which HP has already MD'd.

K580 (6 CPUs) Standalone and Redundant Specifications

This table lists the specifications for a standalone and redundant K580 with six CPUs.

**Table 4-8   K580 (6 CPUs) Standalone and Redundant
            Specifications**

Item	Standalone Specifica-tions	Redundant Specifications
Number of CPUs	6	6
HP-UX Version	11.00 (32 bit)	11.00 (32 bit)
Memory	2048MB	4096MB
Swap/Dump Space	2248MB	4296MB
WaveStar SNMS Disk Space	180GB	360GB
with PM	twenty, 9GB drives or ten, 18GB drives	twenty, 9GB drives or ten, 18GB drives
without PM	six, 9GB drives	six, 9GB drives
Base Disk Space (minimum)	N/A	20GB x 2
PM + NB Log Disk Space (minimum)	N/A	156GB x 2
Additional Space for TMF	Included (4GB)	Included
DAT	DDS3	DDS3
CD-ROM Drive	DVD	DVD

Lucent Technologies - Proprietary
                    See notice on first page   Issue 1, October 2001

Table 4-8   K580 (6 CPUs) Standalone and Redundant Specifications   (continued)

Item	Standalone Specifica-tions	Redundant Specifications
X.25 (optional)	2 ACC MUX	N/A
SCSI Controller	4	8
LAN Interface Card	3	7[1]
Cabinet	2.0m	2.0m, 2 per host
Supported Workstations/PCs	30	30
Disk Enclosure	HVD10	HVD10
Bus Mode	Split Bus/Dual Connection	Split Bus/Dual Connection
Jumper Settings	01111	01111

Notes:

1.   Seven LAN cards are needed because the system supports pure OSI and OSI and/or TCP/IP NEs. The WaveStar SNMS application, as configured in installEms, supports pure OSI redundancy and MC/ServiceGuide supports to redundancy TCP/IP LAN.

☐

L2000 Configurations

L2000 (1 CPU) Specifications This table lists the specifications for a standalone L2000 with one CPU.

Table 4-9   L2000 (1 CPU) Standalone Specifications

Item	Standalone without Mirrored Disk	Standalone with Mirrored Disk
Number of CPUs	1	1
HP-UX Version	HP-UX 11.0 (64 bit)	HP-UX 11.0 (64 bit)
Memory	1GB	2GB
Swap/Dump Space	2248MB	2248MB
Internal Disk	0	0
WaveStar SNMS Disk Space	90GB	360GB
Number of Disk Drives	five, 18GB drives	ten, 36GB drives
Additional Disk Space for TMF	Included (2GB)	Included (2GB)
DAT	DDS3x1	DDS3x1
CD-ROM Drive	DVDx1	DVDx1
SCSI Controller	2	2
PCI LAN (100BaseT)	2	2
X.25 (Optional)	N/A	N/A
Disk Enclosure	SC10	SC10
Bus Mode	Split Bus/Dual Connection	Split Bus/Dual Connection
Jumper Setting	01111	01111

L2000 (2 CPUs) Specifications This table lists the specifications for a standalone and redundant L2000 with two CPUs.

Table 4-10   L2000 (2 CPUs) Standalone Specifications

Item	Standalone with Mirrored Disk	Redundant Specifications
Number of CPUs	2	2
HP-UX Version	HP-UX 11.0 (64 bit)	HP-UX 11.0 (64 bit)
Memory	2GB	2GB
Swap/Dump Space	2248MB	2248MB
Internal Disk	0	0
WaveStar SNMS Disk Space	360GB	180GBx2
Number of Disk Drives	ten, 36GB drives	ten, 36GB drives
Additional Disk Space for TMF	Included (2GB)	Included
DAT	DDS3x1	12GB DDS
CD-ROM Drive	DVDx1	DVD
SCSI Controller	2	5
PCI LAN (100BaseT)	2	5
X.25 (Optional)	N/A	N/A
Disk Enclosure	SC10	SC10
Bus Mode	Split Bus/Dual Connection	Split Bus/Dual Connection
Jumper Setting	01111	01111

L2000 (4 CPUs) Standalone and Redundant Specifications

This table lists the specifications for a standalone and redundant L2000 with four CPUs.

Table 4-11   L2000 (4 CPUs) Standalone and Redundant Specifications

Item	Mirrored Standalone Configuration	Mirrored Redundant Configuration
HP System Model	L2000	L2000-440
Number of CPUs	4	4
HP-UX Version	Release 11.0 (64 bit)	Release 11.0 (64 bit)

Table 4-11   L2000 (4 CPUs) Standalone and Redundant Specifications   (continued)

Item	Mirrored Standalone Configuration	Mirrored Redundant Configuration
Memory	4GB	4GB
Swap/Dump Space	4296MB	4296MB
Internal Disk	0	0
WaveStar SNMS Disk Space	504GB	252GB x 2
Number of drives with PM	fourteen, 36GB drives	fourteen, 36GB drives
Additional Disk Space for TMF	Included (4GB)	Included
DAT	DDS 3 x 1	12GB DDS
CD-ROM Drive	DVD x 1	DVD
SCSI Controller	2	7
PCI LAN (100Base T)	2	5
X.25 (Optional)	N/A	N/A
Cabinet	1.25m	1.25m, 1/host
Disk Enclosure	SC10	SC10
Bus Mode	Split Bus/Dual Connection	Split Bus/Dual Connection
Jumper Setting	0111	0111

☐

N4000 Configuration

....

Standalone Specifications   This table lists the specifications for a standalone N4000 with eight CPUs.

Table 4-12   N4000 (8 CPUs) Standalone Specifications

Item	Standalone Specifications
HP System Model	N4000
Number of CPUs	8
HP-UX Version	HP-UX 11.0 (64 bit)
Memory	8GB
Swap/Dump Space	8392MB
Internal Disk	36GB / 9GB
WaveStar SNMS Disk Space	288GB
Number of Disk Drives	eight, 36GB
Additional Disk Space for TMF	Included (8GB)
DAT	DDS3x1
CD-ROM Drive	DVDx1
SCSI Controller	2
PCI LAN (100BaseT)	2
X.25 (Optional)	2 ACC MUX
Disk Enclosure	SC10
Bus Mode	Split Bus/Dual Connection
Jumper Settings	01111

N4000 Racking Specifications   HP has three specifications for server cabinets, which can be one of the following:

- E25 (25EIA units)

- E33 (33 EIA units)

- E41 (41 EIA units)

To better use floor space, the following table provides the racking specifications for N4000 server configuration. As an example, based upon the following specifications, two of any kind of N4000

....

Lucent Technologies - Proprietary
See notice on first page

configuration can be put in one E33.

**Table 4-13   N4000 (8 CPUs) Physical and Electrical
Specifications**

Item	Specification
Server	10 EIA
Smart Storage	2 EIA
Disk Enclosure	4 EIA
Total EIA Height	16 EIA
Total Power (at 220V)	< 20 Amps

**N4000 SC10 Disk
Enclosure**
The SC10 is the disk enclosure that interworks exclusively with the N4000 servers.

☐

5 NE Interworking

Overview

Purpose This chapter provides a overview of the Network Elements (NEs) that WaveStar SNMS supports and details regarding the interworking of each NE and WaveStar SNMS.

Contents

□

MetroDMX

Overview

The *Metropolis*™ DMX Access Multiplexer (MetroDMX) is a single shelf network multiplexer that is designed primarily for access transport, business access, and regional interoffice applications that transport voice and data at the OC-48 level via unidirectional path switched rings.

The DMX supports wideband and broadband transport, including the traditional SONET transport of DS1, DS3, EC-1, OC-3, OC-12, and OC-48 signals as well as 10/100/1000 Mbs LAN transport. The shelf can be equipped to serve many diverse network applications and supports a variety of operations interfaces for current and evolving network operations.

MetroDMX enables reliable transport, a smooth transition from TDM to IP Services, and a cost-point architecture that provides a low *first cost* while enabling support for high-margin services necessary for survival in today's competitive service provider marketplace.

Releases Supported

WaveStar SNMS R6.0 supports the R1.1 release of the MetroDMX.

File Transfers and Remote Software Downloads

The MetroDMX does not support file transfer over the OS interface; consequently, it does not support remote software downloads.

Software Copying between NEs

The MetroDMX does support copying software between NEs. Copying software does enables more efficient use of the bandwidth of the data communications network because it allows software to be copied from nearby NEs rather than always from the EMS that may be several hops away.

Port Protection Group Constraint

With the MetroDMX protection groups are fixed in accordance with associated circuit pack slots. The MetroDMX has a service CP slot and a protection CP slot. The configurability is limited to identifying whether the port pairs associated with those slots are independent and unprotected, or whether they are in a protection arrangement with each other.

Example: The port pairs can be provisioned to be independent, 1+1 protection group, or UPSR protection group. This provisioning is done as a part of port provisioning.

FTP File Transfers Not Supported for R1.1

MetroDMX R1.1 does not support file transfers using FTP. WaveStar SNMS does not support memory backup and restore for the MetroDMX R1.1.

The MetroDMX R2.0 will support FTP and WaveStar SNMS will support memory backup and restore for that release.

☐

WaveStar BWM

Overview   The WaveStar Bandwidth Manager (BWM) integrates the multiplexing capabilities of a traditional Add/Drop Multiplexer (ADM), which includes supporting rings, and the cross connection capabilities and capacity of a traditional Digital Cross Connect System (DCS). In addition, the WaveStar BWM provides flexible bandwidth management at the Synchronous Transfer Mode (STM)—the SONET/SDH—layer.

The WaveStar BWM is a modular product with a 4608 STS-1 and/or 1536 STM-1 capacity switching fabric and up to 24 I/O shelves for transmission interfaces. It has the following:

- 2.5G (OC-48 / STM-16o) shelves supporting transmission rates up to 2.5G

- 10G (OC-192 / STM-64o) I/O shelves supporting the 10G interfaces

Supported Releases   WaveStar SNMS R6.0 supports the R4.1 release of the WaveStar BWM.

In addition, WaveStar SNMS R6.0 is backward compatible with WaveStar BMS R4.0.2 and R4.1.

Support in General   WaveStar SNMS provides full support for the WaveStar BWM. However, in terms of configuration management, keep in mind that the WaveStar BWM, is an STM bandwidth management element.

Southbound Interfaces   The WaveStar SNMS southbound interface supports OSI and OSI over TCP/IP communications with the NEs. The WaveStar BWM only supports an OSI interface. However, since the WaveStar NCC acts as a transport bridge, WaveStar SNMS also supports an OSI over TCP/IP interface to the WaveStar BWM via a transport bridge.

File Transfer Protocol Supported   The WaveStar BWM supports File Transfer, Access, and Management (FTAM) file transfer protocol.

NE User Login Management   Currently, NE user login management with form and menu based screens is now supported for the WaveStar BWM.

Provisioned via TL1 Cut-Through

The WaveStar BWM relies on WaveStar SANS's TL1 cut-through capability to provision the following on each NE:

- the description of the environmental alarms (also called *scan points* or *miscellaneous discrete inputs*)

- control points (also called *miscellaneous discrete outputs*)

Synchronization Management

WaveStar SNMS provides Synchronization Management functions to facilitate user operations for configuring, managing, and controlling the timing sources and distribution of outgoing timing for the WaveStar Bandwidth Manager.

WaveStar TDM NEs support external timing references, support (OC-n/STM-n) line timing, and have their own internal clocks. Synchronization management includes functions to:

- provision incoming and outgoing external timing ports

- establish timing references and their relative priority

- provision system timing parameters

- display the current synchronization status

- support the remote execution of manual synchronization controls such as forcing switches in the selected source of synchronization timing and changing clock modes

As with other WaveStar SNMS provisioning features, synchronization management features use a form-based display of the current values, typically with selection from lists of allowable values to make configuration changes.

Test Access Connection Management

WaveStar SNMS supports test access connection management for the WaveStar BWM.

The WaveStar BWM supports test access connections, which provide access for external test systems to both monitor and test signal paths. The WaveStar BWM supports non-intrusive monitoring and provides intrusive access to inject test signals and monitor outputs.

New for R6.0   The ***BLSR Ring Map*** for the WaveStar BWM NEs is a GUI feature that allows the user to view a list of NEs and protection groups in a 2-Fiber or 4-Fiber BLSR ring. The user can also create a new ring map, which is built on the TID and protection group AID of a local NE, and define a list of NEs (by TID) that are connected to the local NE on the ring. A new view of each ring map can be obtained by providing the TID of a different NE in the ring.

Password Aging Feature   To ensure network security, the WaveStar BWM has a password aging feature that relies on the use of two default passwords. WaveStar SNMS interworks with the WaveStar BWM by using these default passwords along with two if its own alternate default passwords. Be aware that during the natural lifecyle of a password and during the software upgrade process, WaveStar SNMS relies on these passwords to access the NE. Refer to *Provisioning Guide* and the *Administration Guide* for details on this interworking.

☐

WaveStar LambdaRouter-256

Overview
The WaveStar LambdaRouter-256 is a true optical cross-connect system that makes cross-connections in the optical domain. Because it operates in the optical domain, the WaveStar LambdaRouter-256 is bit rate and format independent:

- With its bit rate independence, the WaveStar LambdaRouter-256 can handle today's 10Gbps signal rates and operate at any optical layer rate including 40Gbps and beyond.

- With its format independence, the LambdaRouter-256 is not limited to SONET and SDH data streams. It can also can cross-connect Asynchronous Transfer Mode (ATM), Internet Protocol (IP), and gigabit Ethernet data streams.

The WaveStar LambdaRouter-256 has an optical switch fabric based on Micro-ElectroMechanical Systems (MEMs) technology.

Release Supported
WaveStar SNMS R6.0 supports the R2.0 release of the WaveStar LambdaRouter-256.

In addition, WaveStar SNMS R6.0 is backward compatible with the R1.0 and R2.0 release of the WaveStar LambdaRouter-256.

Support in General
WaveStar SNMS provides full support for the WaveStar LambdaRouter-256. However, in terms of configuration management, keep in mind that the LambdaRouter-256 is an optical bandwidth management element.

In addition, cross-connection provisioning is a function unique to the WaveStar LambdaRouter-256.

Important! Because the WaveStar LambdaRouter-256 operates solely in the optical domain, it does not collect PM data.

NE User Login Management
NE user login management with form and menu based screens is now supported for the WaveStar LambdaRouter-256.

Network Discovery
The WaveStar LambdaRouter-256 connects to OSs using IP connections. Therefore, the WaveStar LambdaRouter-256 is not compatible with the OSI directory.

The WaveStar LambdaRouter-256 initiates network discovery by adding the NE—supplying the information needed for WaveStar SNMS to make a connection to the WaveStar LambdaRouter-256—into WaveStar SNMS via the **Add-an-NE** screen. The Wave Star LambdaRouter-256 does not have an embedded DCC or operations interworking; thus, the connection information for each WaveStar LambdaRouter-256 must be manually entered into WaveStar SNMS database.

File Transfer Protocol Supported

The WaveStar LambdaRouter-256 supports file transfer protocol (FTP) file transfer protocol.

No Support for Embedded DCC

The WaveStar LambdaRouter-256 does not support an embedded Data Communications Channel (DCC); each WaveStar LambdaRouter-256 NE must have a LAN/WAN connection to WaveStar SNMS.

Provisioned via TL1 Cut-Through

The WaveStar LambdaRouter-256 relies on WaveStar SANS's TL1 cut-through capability to provision the following on each NE:

- the description of the environmental alarms (also called *scan points* or *miscellaneous discrete inputs*)

- control points (also called *miscellaneous discrete outputs*)

□

WaveStar NCC

Overview
The WaveStar Network Communications Controller (NCC) provides data communications and/or data networking functions for operations interworking among the NEs and also with OSs. The WaveStar architecture centralizes these functions in the WaveStar NCC, which avoids the costs of implementing them on the NEs and the complexity of administering them as distributed functions.

A key purpose of the data communications functions is to enable remote operations access to the transport NEs, and to provide this access via a variety of protocols (OSI and TCP/IP). The WaveStar NCC provides functions, such as interworking between data communications protocols (serving as a transport bridge between TCP/IP and OSI), and supporting a centralized directory and directory server function for name-address resolution.

Supported Releases
WaveStar SNMS R6.0 supports the R3.3 release of the WaveStar NCC.

In addition, WaveStar SNMS R6.0 is backward compatible with the R3.2 release of the WaveStar NCC.

Support in General
SNMS provides full support for the WaveStar NCC; however, many configuration management functions, such as those pertaining to transport management (configuring transmission interfaces, such as OC-48s and DS3s, and establishing cross connections), are not applicable to the WaveStar NCC.

Southbound Interfaces
The WaveStar SNMS southbound interface supports OSI and OSI over TCP/IP communications with the NEs. The WaveStar NCC supports both an OSI and OSI over a TCP/IP interface.

NE User Login Management
Currently, NE user login management with form and menu based screens is now supported for the WaveStar NCC.

File Transfer Protocol Supported
The WaveStar NCC supports File Transfer, Access, and Management (FTAM) file transfer protocol.

**Provisioned via TL1
Cut-Through**

The WaveStar NCC relies on WaveStar SANS's TL1 cut-through capability to provision the following on each NE:

- the description of the environmental alarms (also called ***scan points*** or ***miscellaneous discrete inputs***)

- control points (also called ***miscellaneous discrete outputs***)

□

MetroEON

Overview
The Metropolis Enhanced Optical Networking (MetroEON) (OLS40G/80G) is a flexible, high capacity lightwave system comprised of end terminals that multiplex digitally encoded information (contained in up to 16 different wavelengths) on one end, transmit the resulting combined signal through the optical fibers, and then demultiplex the information at the other end. Repeater terminals are used to re-amplify the optical signal on an optical line between adjacent end terminal and repeater sites or between adjacent repeater sites.

MetroEON supports applications that need to expand to accommodate increasing amounts of information. MetroEON supports wavelength growth and, when equipped with the Optical Translator (OT), a highly flexible form of Wavelength Add/Drop (WAD) is also possible. Wavelength growth increases capacity and decreases the need for fibers, especially useful in cases of fiber exhaust. Utilizing Dense Wave Division Multiplexing (DWDM) technology, the MetroEON can handle transmission of up to 16 wavelengths over a single fiber; each channel can be equipped in any order.

As a member of the OLS Product Family, the MetroEON addresses an application domain that extends from long haul transport to regional/interoffice facility transport. The MetroEON system, with its higher capacity and support for up to 80 wavelengths, primarily addresses long haul transport applications.

Supported Releases
WaveStar SNMS R6.0 supports the R8.0 release of the MetroEON.

File Transfers and Remote Software Downloads
The MetroEON does not support file transfer over the OS interface; consequently, it does not support remote software downloads.

Software Copying between NEs
The MetroEON does support copying software between NEs. Copying software does enables more efficient use of the bandwidth of the data communications network because it allows software to be copied from nearby NEs rather than always from the EMS that may be several hops away.

Optical Association Provisioning Consideration

The optical association provisioning feature for the MetroEON includes associations that can be specified during provisioning for alarm correlation (to suppress symptomatic alarms). Their use is optional. These associations are provisioned as part of OTU provisioning (port provisioning).

File Transfer Protocol

The MetroEON does not support file transfer. Instead of using file transfer for the MetroEON WaveStar SNMS provides memory backup and restore using the NE's TL1 command/response interface; issuing TL1 retrieve commands to backup the NEs' current configuration data, and reformatting this information into the corresponding TL1 enter and set commands to restore the NE to that configuration.

☐

WaveStar OLS 1.6T (400G/800G)

Overview   The WaveStar OLS 1.6T System (400G/800G) is the latest generation in Lucent's Optical Line System (OLS) Long Hall Product, formerly the OLS 400G.

The WaveStar OLS 1.6T is a modular optical transmission system that offers up to 160Gps (Gigabits per second) wavelengths, for a total capacity of 1.6Tbps (Terabits per second) over a single strand of fiber, which is the equivalent of sending 320 million one page e-mails per second.

The WaveStar OLS 1.6T architecture provides a scalable, flexible solution for long-haul applications and builds on the technology platform of the Lucent Technologies WaveStar OLS 400G.

Supported Releases   WaveStar SNMS R6.0 supports the R6.0 release of the WaveStar OLS 1.6T.

WaveStar SNMS R6.0 is backward compatible with the R5.0 release of WaveStar OLS 1.6T.

Support in General   WaveStar SNMS provides full support for the WaveStar OLS 1.6T. However, in terms of configuration management, keep in mind that the WaveStar OLS 1.6T is a DWDM bandwidth management element. In addition, association provisioning is unique to the WaveStar OLS 1.6T.

Southbound Interfaces   The WaveStar SNMS southbound interface supports OSI and OSI over TCP/IP communications with the NEs. The WaveStar OLS 1.6T supports both an OSI and OSI over a TCP/IP interface. The WaveStar OLS 1.6T supports TCP/IP and can also perform transport bridging.

Lucent Technologies - Proprietary
See notice on first page

CMISE Southbound

The Common Management Information Services Element (CMISE) southbound subsystem consists of two processes to support the WaveStar 1.6T NEs:

- Gateway (GW) process, which:
  - serves as a bridge process between the Management Functional Area (MFA) and the Q3 Manager
  - receives requests from MFA and the Connection Manager, and sends them to the Q3 Manager through a socket interface
  - receives responses and autonomous notifications from the NE via socket interfaces and sends them to MFA or the Connection Manager as required.
  - logs command and responses via the Log Server and Log library.
- Q3 Adaptor process

NE User Login Management

Currently, NE user login management with form and menu based screens is only supported for the WaveStar OLS 1.6T.

File Transfer Protocol Supported

The WaveStar OLS 1.6T supports File Transfer, Access, and Management (FTAM) file transfer protocol.

TCA Profiles

The WaveStar OLS 1.6T does not support the concept of TCA profiles.

Optical Association Provisioning Consideration

The WaveStar OLS 1.6T NEs require associations to be provisioned that specify the connectivity between external terminals, Optical Translator Unit (OTU) ports, Optical Multiplexer Unit (OMU) ports, Optical Demultiplexer Unit (ODU) ports, and Wavelength Add/Drop (WAD) ports. These associations are used for internal alarm correlation and to enable OTU outputs.

WaveStar SNMS provides a GUI based function to create, delete, and view these associations. As with other functions, SNMS supports this provisioning with user-friendly windows with selection from lists of allowable choices, which ensures that only available ports in valid combinations are selected for a new association. Deleting an

association is done by simply selecting from the set of existing associations.

Besides providing a capability to create and delete individual optical associations, WaveStar SNMS enables users to establish a complete optical connection through an WaveStar OLS 1.6T NE. This function supports the user in establishing all optical associations for the complete connection of an optical wavelength through the NE. Similar to the function for creating an individual optical association, this function ensures that only valid ports in valid combinations are selected for each of the optical associations that comprise the complete optical connection.

Software Copying between NEs

The WaveStar OLS 1.6T does support copying software between NEs. Copying software does enables more efficient use of the bandwidth of the data communications network because it allows software to be copied from nearby NEs rather than always from the EMS that may be several hops away.

Provisioned via TL1 Cut-Through

The WaveStar OLS 1.6T relies on WaveStar SANS's TL1 cut-through capability to provision the following on each NE:

- the description of the environmental alarms (also called ***scan points*** or ***miscellaneous discrete inputs***)

- control points (also called ***miscellaneous discrete outputs***)

□

WaveStar TDM 2.5G/10G (SONET)

Overview   The WaveStar TDM 2.5G/10G (SONET) is a modular Add/Drop Multiplexer (ADM) for cost-effective bandwidth management at the STM (SONET) layer.

Architecturally, the WaveStar TDM 2.5G/10G has a modular design consists of the following:

- 2.5G shelf, which supports OC-48 2-fiber BLSR rings
- 10G shelves, which support OC-192 2-fiber BLSR rings

This flexible architecture allows configurations from a single stand-alone 2.5G shelf (which is a single, low speed shelf) up to a configuration with a 10G shelf and two 2.5G shelves, and economically supports a wide range of application sizes.

The WaveStar TDM 2.5G/10G re-uses WaveStar BWM hardware (BWM I/O shelves and circuit packs) and software assets; thus, it reduces costs and simplifies product interworking and operations.

Supported Releases   WaveStar SNMS R6.0 supports the R6.0.1 and R6.1.1 releases of the WaveStar TDM 2.5G/10G (SONET).

WaveStar SNMS R6.0 is backward compatible with the R5.x and R6.x releases of the WaveStar TDM 2.5G/10G (SONET).

Support in General   WaveStar SNMS provides full support for the WaveStar TDM 2.5G/10G (SONET). However, in terms of configuration management, keep in mind that the WaveStar TDM 2.5G/10G (SONET) is an STM bandwidth management element.

Southbound Interfaces   The WaveStar SNMS southbound interface supports OSI and OSI over TCP/IP communications with the NEs. The WaveStar TDM 2.5G/10G (SONET) only supports an OSI interface. However, since the WaveStar NCC acts as a transport bridge, WaveStar SNMS also supports an OSI over TCP/IP interface to the WaveStar TDM 2.5G/10G (SONET) via a transport bridge.

NE User Login Management   Currently, NE user login management with form and menu based screens is now supported for the WaveStar TDM 2.5G/10G (SONET).

File Transfer Protocol Supported   The WaveStar TDM 2.5G/10G (SONET) supports File Transfer, Access, and Management (FTAM) file transfer protocol.

Provisioned via TL1 Cut-Through   The WaveStar TDM 2.5G/10G (SONET) relies on WaveStar SANS's TL1 cut-through capability to provision the following on each NE:

- the description of the environmental alarms (also called *scan points* or *miscellaneous discrete inputs*)
- control points (also called *miscellaneous discrete outputs*)

Test Access Connection Management   WaveStar SNMS supports test access connection management for the WaveStar TDM 2.5G/10G (SONET).

                                                                                              □

WaveStar TDM 10G (STM-64)

Overview
The WaveStar 10G Time Division Multiplexer (TDM) (STM-64) is a two shelf Add/Drop Multiplexer (ADM) that consists of the following:

- a main shelf
- an optional second shelf for larger applications

The WaveStar TDM 10G (SDH) provides cost-effective bandwidth management at the STM (SDH) layer, supporting both 2-fiber STM-64o MS-SPRings and 2-fiber STM-16o MS-SPRings.

The WaveStar TDM 10G (SDH) re-uses WaveStar BWM hardware (circuit packs) and software assets, thus it reduces costs and simplifies product interworking and operations.

Supported Releases
WaveStar SNMS R6.0 supports the R4.0 release of the WaveStar TDM 10G (STM-64).

WaveStar SNMS R6.0 is backward compatible with R3.0 and R4.0 releases of the WaveStar TDM 10G (STM-64).

Support in General
WaveStar SNMS provides full support for the WaveStar TDM 10G (STM-64) However, in terms of configuration management, keep in mind that the WaveStar TDM 10G is an STM bandwidth management element.

NE User Login Management
NE user login management with form and menu based screens is currently supported for the WaveStar TDM 10G (STM-64).

File Transfer Protocol Supported
The WaveStar TDM 10G (STM-64) supports File Transfer, Access, and Management (FTAM) file transfer protocol.

Provisioned via TL1 Cut-Through
The WaveStar TDM 10G (SDH) relies on WaveStar SNMS' TL1 cut-through capability to provision the following on each NE:

- the description of the environmental alarms (also called *scan points* or *miscellaneous discrete inputs*)
- control points (also called *miscellaneous discrete outputs*)

Password Aging Feature   To ensure network security, the WaveStar TDM 10G (SDH) has a password aging feature that relies on the use of two default passwords. WaveStar SNMS interworks with the WaveStar BWM by using these default passwords along with two if its own alternate default passwords. Be aware that during the natural lifecyle of a password and during the software upgrade process, WaveStar SNMS relies on these passwords to access the NE. Refer to *Provisioning Guide* and the *Administration Guide* for details on this interworking.

□

6   Product Services and Support

Overview

Purpose   This chapter provides and overview of the services and support offered for the WaveStar SNMS.

Contents

☐

Purchasing Lucent Products

How to Buy   Lucent is dedicated to providing a streamlined buying experience:

- Companies who have a direct purchase agreement with Lucent can use our CustomerCenter and our BusinessPartner Center to select, configure, price, and order products directly online.

- Companies who do not have a direct purchase agreement can purchase Lucent products and solutions through Lucent authorized resellers.

- Prospective customers can also contact a Lucent account executive to establish an account.

Visit *www:lucent.com/products/howtobuy* for more information.

Buying Direct   Lucent customers can buy direct with the help of our Customer Center and our BusinessPartner Center.

Lucent customers can have a personalized ***Customer Center*** account. Customers simply can log in to get convenient access to Lucent products, services, and solutions. The Customer Center also makes product pricing, ordering, and configuration fast and easy.

Lucent BusinessPartners receive privileged access to our ***BusinessPartner Center***. This comprehensive storehouse of specialized tools and information gives our BusinessPartners quick access to Lucent products, services, and solutions. The BusinessPartner Center also leverages the Web to streamline product pricing, ordering, configuration, installation, training, and certification.

With a Lucent Customer Center or BusinessPartner account, customers can:

- view the entire Lucent catalog of communication products and services

- find the solutions to their business problems by matching their specific business needs with our expertise in data network design, implementation, management, and support

- collaborate with colleagues to enhance their team's cooperation and efficiency

- manage product lists

- get alerts, news, and events

- download important documents such as case studies, white papers, catalogs, and expert articles

- obtain industry intelligence, which includes articles, white papers, and other documents that we have selected for their relevance to, and impact on, the customer's specific industry.

Buying through a Reseller   Those companies who do not have a direct purchase agreement can purchase Lucent products through an authorized Lucent reseller:

- To purchase products through a reseller in the United States, call 1-888-4-LUCENT.

- To purchase products through a reseller outside of the United States, call 1-314-317-6869.

                                                                                                   ☐

Warranties and Maintenance

Warranty Definition

Under a warranty, the provider replaces or repairs any equipment or software found defective within a specified period of time without charge to the customer. Labor required to isolate and repair the defect is also supplied without extra cost during the warranty period.

Lucent Technologies passes on to WaveStar SNMS customers all warranties received by outside vendors.

Hardware Warranties

The major hardware suppliers for WaveStar SNMS are:

- Hewlett-Packard Company (HP)
- Sun Microsystems
- PC vendors

Each supplier has its own warranty.

HP Warranties

HP furnishes the servers, the associated HP server consoles, and the any associated printers.

HP warrants its hardware for one year from arrival at the customer location. The location can be the operational site or a warehouse. The warranty provides on-site, four-hour response time Monday through Friday for the server and integrated peripherals, and on-site repair with a guaranteed response time of within 72 hours for stand-alone peripherals. Customers requiring a faster response should order a system support option.

Sun Microsystems Warranties

Sun Microsystems furnishes the workstations used as desktops.

Sun Microsystems warrants its hardware for one year from its ship date to the customer location. The warranty is a ***return to factory*** type of warranty. Customers requiring a faster response can order a system service agreement.

Hardware Maintenance and Repair

The customer is responsible for all hardware maintenance, which is performed through a specific contract or through a time and materials arrangement. Maintenance includes both preventive procedures as well as reactive maintenance as a result of a failure. WaveStar SNMS customers are urged to contact hardware vendors regarding their hardware maintenance arrangements soon after the hardware is installed and operable, before any warranties expire.

Both HP and Sun Microsystems offer hardware maintenance contracts on their equipment. Contracts should be negotiated during the warranty period to assure continual coverage after warranty expiration.

A major design consideration of the WaveStar SNMS system is to provide high availability. The server configuration can be redundant and a sufficient number of desktops allow temporary swapping with an unused unit. In general, faulty hardware can be swapped from the system and operations can continue until the faulty unit can be repaired.

Software Warranties

Lucent Technologies warrants the its application software for 90 days from its installation on any HP server or desktop. Integrated third party software is warranted for one year.

The software warranty includes fixes to all reported severity 1 and 2 defects and work-arounds for severity 3 and 4 defects.

Lucent Technologies does not warrant any general purpose software.

Software Maintenance

Software maintenance is the modification and the subsequent installation and/or re-installation of software programs that is required to maintain current system operations. Software maintenance does not include major functional changes or enhancements that are made to the product.

Software maintenance is performed through a specific contract that includes application software and integrated third party software as *separate line items*. Negotiations for software not included in a software maintenance contract should be held with the particular vendor.

WaveStar SNMS customers should contact their Lucent Account Representatives regarding software maintenance arrangements:

- soon after their system is installed and operable

- *and* before any warranties expire

Software Maintenance Releases

Lucent issues periodic software maintenance releases for the WaveStar SNMS product, which are also known as ***point releases***. Releases contain core maintenance updates, minor enhancements, and fixes to problems reported by the user community.

Maintenance releases are included as part of the service contract or can be purchased separately. Individual fixes or enhancements cannot be purchased separately. A maintenance release is designed, tested, and documented as a package.

☐

Technical Assistance

Lucent's New One Number Interface

As Lucent restructures to become a smaller and more efficient company, US customers in need of technical assistance only have to dial one number to reach 24-hour support from Lucent experts:

1-866-LUCENT8 (1-866-582-3688)

Lucent's new *one number interface* pairs customers with Lucent professionals from the Technical Assistance Centers (TACs), product support teams, and all US call centers in an effort to integrate different and emerging technologies.

Customers will have received the official notification letter of the one number interface in late July. All existing service numbers will remain operational for three months with a message that alerts callers to the new number before auto-forwarding them to it.

For technical assistance outside of the United States, customers can contact their Local Customer Support (LCS) or the support organization designated by their Lucent customer team representative. Customers who are unsure of whom to call, can contact the Global TSS Contact Center at 1-630-224-4672.

☐

Training

Training Courses Available	WaveStar SNMS offers instructor-led training courses for end users and system administrators.

WaveStar SNMS courses are conducted by the ***Lucent Learning*** Organization at the following locations:

- Lucent's Training Facility in Altamonte Springs, Florida
- Lucent's Training Facility in Nuremberg, Germany
- the customer's site

In all courses, students input and manipulate data on desktops to become familiar with the aspect of WaveStar SNMS that is appropriate to their job function and the particular course.

Training Course Materials

Each course provides the student with the following training materials:

- A ***student guide*** is provided to each student that presents the material taught. The student guide is divided into modules or sections, which contain objectives, the material associated with the topic, and related exercises.
- Other appropriate ***customer documentation*** pertaining to the particular course is provided.

Product Training Catalog

Lucent's on-line ***Product Training Catalog*** lists all courses that Lucent Technologies offers to its customers for its entire product line. To find the description of a course or a course number in the ***Product Training Catalog***, use the following procedure.

To access the Product Training Catalog from your web browser, enter the following URL:

http://www.lucent-product-training.com/SabaWeb

Lucent's Product Training web site is displayed. Use the course numbers provided in the following section as search criteria. A course description appears that includes the following information:

- an explanation of the intended audience for the course
- a course overview
- course objectives
- course prerequisites
- media used in the course

- equipment required for suitcasing the course or for self-paced learning

- any related courses

- curriculum paths to follow

- the duration of the course

Scheduling through 1-888-LUCENT8

The courses listed in the following table can be scheduled by calling:

1-888-LUCENT8, prompt 2, prompt 2.

Outside the continental United States, customers can dial the following number:

1-407-767-2798

All customers can call from:

8 to 6 Eastern Standard Time (EST), Monday through Friday

Table 6-1   Courses to be Scheduled Through 1-888-LUCENT8

Course ID	Course Title	Conducted At
TR4510	WaveStar SubNetwork Management System User Training	Altamonte Springs Training Facility and/or Customer Site
TR4511	WaveStar SubNetwork Management System Administration Training Using the GUI	Altamonte Springs Training Facility and/or Customer Site

Registration Information

When calling to schedule training, the registrar requires the following information:

Table 6-2   Checklist of Information Needed to Schedule Training

✓	Item
	Course number
	Course name
	Approximate dates or actual course dates
	Location of training

**Table 6-2   Checklist of Information Needed to Schedule
Training   (continued)**

✓	Item
	Number of students
	Student name(s)
	Student social security number(s)
	Student telephone(s) and FAX number(s)
	Payment method(s) (credit card, contract number, organization number, purchase order number)

Customer Documentation

....

Types of Documentation   The WaveStar SNMS documentation library consists of the following documents:

- Customer documents that accompany the product

- Student Guides that are furnished during WaveStar SNMS classes

These documents are created and maintained by the ***Lucent Learning*** organization.

Customer Documents   The following customer documents are available for WaveStar SNMS R6.0:

- *WaveStar SubNetwork Management System (SNMS) Provisioning Guide*

- *WaveStar SubNetwork Management System (SNMS) Maintenance Guide*

- *WaveStar SubNetwork Management System (SNMS) Administration Guide*

- *WaveStar SubNetwork Management System (SNMS) Installation Guide*

- *WaveStar SubNetwork Management System (SNMS) Applications and Planning Guide*

Documents Included with Purchase   Customer documentation is included on-line with the Application Software media. Optionally, hardcopies or a CD-ROM can be ordered from the Lucent Learning Organization. Refer to the section titled .

Document Ordering Information   Documents can be ordered from Lucent Learning by Comcode. Refer to for a list of document Comcodes.

Table 6-3   Document Ordering Information

Lucent Learning Web Site	*http://www.lucent8.com or http://www. lucentdocs.com*
Address	Attn: Order Entry, POB 19901, 2855 North Franklin Road, Indianapolis, IN 46219-1385
Origin of Request	***Phone Numbers and Email Addresses***

....

Table 6-3   Document Ordering Information   (continued)

United States	call: 1-888-LUCENT8 (1–888–582–3688) fax: 1–800–566–9568
Canada and North America	call:: 1–317–322–6615 (telephone) email: intlnaorders@lucent.com fax: 1–317–322–6699
Africa, Asia, China, the Carribean, Europe, Latin America, the Middle East, and the Pacific	call: 1–317–322–6416 email: intlorders@lucent.com fax: 1–317–322–6699

Ordering and Installation

Product Ordering For all orders of WaveStar SNMS, contact your local sales representative. Customers are responsible for ordering PCs for the WaveStar SNMS GUI client.

Purchasing Responsibilities For international installations of WaveStar SNMS, Lucent recommends that HP equipment is purchased locally in the particular country.

The customer must purchase all desktops. The desktop must have the minimum configuration supported, which is explained in Chapter 4, "Hardware Planning and Engineering".

Installation Responsibilities The following parties are responsible for the particular installations cited:

- HP installs all HP servers.

- Lucent installs the WaveStar SNMS Application Software and all third party software.

- The customer installs the communications network between the NEs and the HP server, and the WaveStar SNMS GUI client and the HP servers.

List of Orderable Items The WaveStar SNMS application is ordered by calling a Lucent sales representative.

The following table lists the items that can be ordered for WaveStar SNMS R6.0:

Table 6-4   WaveStar SNMS Orderable Items for Release 6.0

Description	NJ08745A-1	Comcode
Application Software		
WaveStar SNMS Application Software R6.0	Not Assigned	109-169-805
WaveStar SNMS Application Northbound TMF CORBA Application Software for R6.0	Not Assigned	109-175-281
WaveStar SNMS RTU for MetroDMX	Not Assigned	109-161-349

**Table 6-4   WaveStar SNMS Orderable Items for Release 6.0
(continued)**

Description	NJ08745A-1	Comcode
WaveStar SNMS RTU for WaveStar BWM	Not Assigned	109-165-225
WaveStar SNMS RTU for WaveStar OLS 1.6T (400G/800G)	Not Assigned	109-165-233
WaveStar SNMS RTU for WaveStar TDM 2.5G/10G	Not Assigned	109-165-241
HP Servers - L-Class		
L2000 1 CPU Server with OSI Interface	Not Assigned	408-552-800
L2000 1 CPU with Mirrored Disks and OSI Interface	Not Assigned	408-651-198
L2000 2 CPU Server with OSI Interface	Not Assigned	408-552-818
L2000 2 CPU Server with Mirrored Disks and OSI Interface	Not Assigned	408-651-206
L2000 4 CPU Server with OSI Interface	Not Assigned	408-552-826
L2000 4 CPU Server with Mirrored Disks and OSI Interface	Not Assigned	408-651-214
Redundant L2000 2 CPU Server with OSI Interface	Not Assigned	408-651-222
Redundant L2000 4 CPU Server with OSI Interface	Not Assigned	408-552-834
Redundant L2000 4 CPU Server with OSI Interface; two servers in a single cabinet <special configuration>	Not Assigned	408-533-974
HP Servers - N-Class		
N4000 8 CPU Server with OSI Interface	Not Assigned	408-555-842

Table 6-4   WaveStar SNMS Orderable Items for Release 6.0 (continued)

Description	NJ08745A-1	Comcode
HP Servers - K-Class		
K380 Server with OSI Interface	List 151	408-389-203
K380 2 CPU Server with OSI Interface	List 153	408-389-237
K380 2 CPU Server with OSI Interface and Redundancy	List 155	408-389-252
K380 4 CPU Server with OSI Interface	List 126	408-094-183
K380 4 CPU Server with OSI Interface and Redundancy	List 127	408-389-179
K380 6 CPU Server with OSI Interface	List 128	408-389-187
Third Party Software		
Informix for all servers (Runtime) R7.31uc3 (For R5.0 and beyond)	Not Assigned	408-560-969
Informix for all servers (Assurance) R7.31uc3 (For R5.0 and beyond)	Not Assigned	408-560-985
Informix for a K380 Server R7.31uc3 (Runtime and Assurance)	List 14	408-389-013 & 408-389-120
Informix for a K580 Server R7.31uc3 (Runtime and Assurance)	List 15	408-389-138 & 408-389-153
Persistence for a K380 and L2000 (1 CPU) Server (Runtime and Support)	List 16	407-947-449 & 407-947-480
Persistence for a K580, L2000 (2-4 CPUs), and N4000 Server (Runtime and Support)	List 17	407-947-472 & 407-947-506
IONA Orbix MT Runtime R3.0.1 (required for every CPU; for R5.0 and beyond)	Not Assigned	408-552-263

Table 6-4   WaveStar SNMS Orderable Items for Release 6.0 (continued)

Description	NJ08745A-1	Comcode
ATOS Stack Runtime R2.6F	List 19	408-164-655
Rouge Wave SourcePro Core R8.0 (required for every CPU; for R4.2 and beyond)	Not Assigned	408-646-107
HP OpenView (OV DM TMN Agent) for K380 Server and L2000 Servers	List 201	408-164-663 & 408-164-721
HP OpenView (OV DM TMN Agent) for K580 Server and N4000 Servers	List 202	408-164-762 & 408-164-721
Citrix Metaframe R1.8 for Windows NT/2000; one user license (order the Comcode 15 times)	Not Assigned	109-152-074
Citrix Metaframe R1.8 for Windows NT/2000; media on CD-ROM	Not Assigned	408-649-259
Services		
Custom Services (Site or Customer Specific)	List 2	108-098-245
Application Software Upgrade Installation	List 3	108-098-351
Custom Development	List 4	108-098-435
Consulting Services	List 5	108-098-195
Professional Services Organization	List 6	108-098-500
Application Software and Installation & Hardware Integration on Customer Premises	List 31	108-098-898
Application Software and Installation & Hardware Integration on Lucent Premises	List 32	108-099-318

Table 6-4   WaveStar SNMS Orderable Items for Release 6.0 (continued)

Description	NJ08745A-1	Comcode
Training		
WaveStar SNMS User Level Training (TR4510) 3 days	List 44	108-456-948
WaveStar SNMS Administration Level Training (TR4511) 2 days	List 43	108-456-914
Documentation		
WaveStar SubNetwork Management System (SNMS) Provisioning Guide	190-224-139	109-175-224
WaveStar SubNetwork Management System (SNMS) Maintenance Guide	190-224-140	109-175-232
WaveStar SubNetwork Management System (SNMS) Administration Guide	190-224-141	109-175-240
WaveStar SubNetwork Management System (SNMS) Installation Guide	190-224-142	109-175-257
WaveStar SubNetwork Management System (SNMS) Applications and Planning Guide	190-224-143	109-175-265
WaveStar SubNetwork Management System (SNMS) Terminology Guide	190-224-144	109-175-273
Software Support Agreements		
24 Hour/7 Day Coverage (Gold Uplift Level)	List 21	108-097-262
Monday through Friday 8AM to 5PM (Gold Level)	List 22	108-097-312

□

Index

190-224-143
Issue 1, October 2001

Lucent Technologies - Proprietary
See notice on first page

INDEX
IN - 1

190-224-143
Issue 1, October 2001

Lucent Technologies - Proprietary
See notice on first page

INDEX
IN - 3

INDEX
IN - 4

Lucent Technologies - Proprietary
See notice on first page

190-224-143
Issue 1, October 2001

190-224-143
Issue 1, October 2001

Lucent Technologies - Proprietary
See notice on first page

INDEX
I N - 5