

Open-system Management for High-quality Synchronization



**Symmetricom
Innovation for 21st
Century Network
Synchronization**

Open Synchronization
Management Framework
(OSMF)

OSMF Key Functionality

Symmetricon's Open Synchronization Management Framework (OSMF) gives telecommunication service providers the ability to remotely manage their synchronization networks and quickly isolate sync related problems. Key functions and features of the software are:

- Comprehensive, remote management of sync network's fault, performance, configuration, inventory and security functions
- Compliance with ITU-T Telecommunication Management Network (TMN) standards for integration with higher-level network management system functions
- GPS primary reference source (PRS) remote fault management
- Based on OpenView® and Oracle® industry standards
- Reports events including alarms and alarm details
- Event correlation option to ensure operators work on root-cause alarms rather than related alarms
- Displays performance parameters for SSU input channels: TDEV, MRTIE, LMRTIE, FFOFF and SPREAD
- Q Adapter (CMIP, OSI stack), TCP/IP or SQL*Net® connectivity between OSMF and higher-level network management
- TCP/IP, TP4, and X.25 connectivity between OSMF and the SSU network
- Optional standby system for maximum uptime
- SSU and GPS PRS symbols on OpenView® map use color to signify status of SSUs
- Displays synchronization trails
- Configurable network partitioning and management domains for operators
- Multiple security classes to protect synchronization system integrity
- Scrambling techniques to provide data security
- Generates reports on events, performance and configuration
- Automatic system backup and archive
- Maintenance and administration utilities to manage the management system
- Heartbeat function that pings SSUs and GPS PRSs periodically and notifies operator of lost connectivity
- Auto alignment feature that automatically updates the software with current status of SSUs' alarms and configuration
- Firmware upgrades downloaded to SSUs from OSMF
- Inventory management

Synchronization Management

1. Higher-level Network Management System

Network managers can choose from several different levels of integration to link Symmetricon OSMF with the higher-level network management system. Connectivity is based on standard protocols of Q Adapter, TCP/IP or SQL*Net to provide events only or events plus two-way command/response function (see page 6). OSMF can link with HP and many non-HP network management platforms such as SUN® and Windows NT®.

2. Symmetricon OSMF Graphical User Interface (GUI)

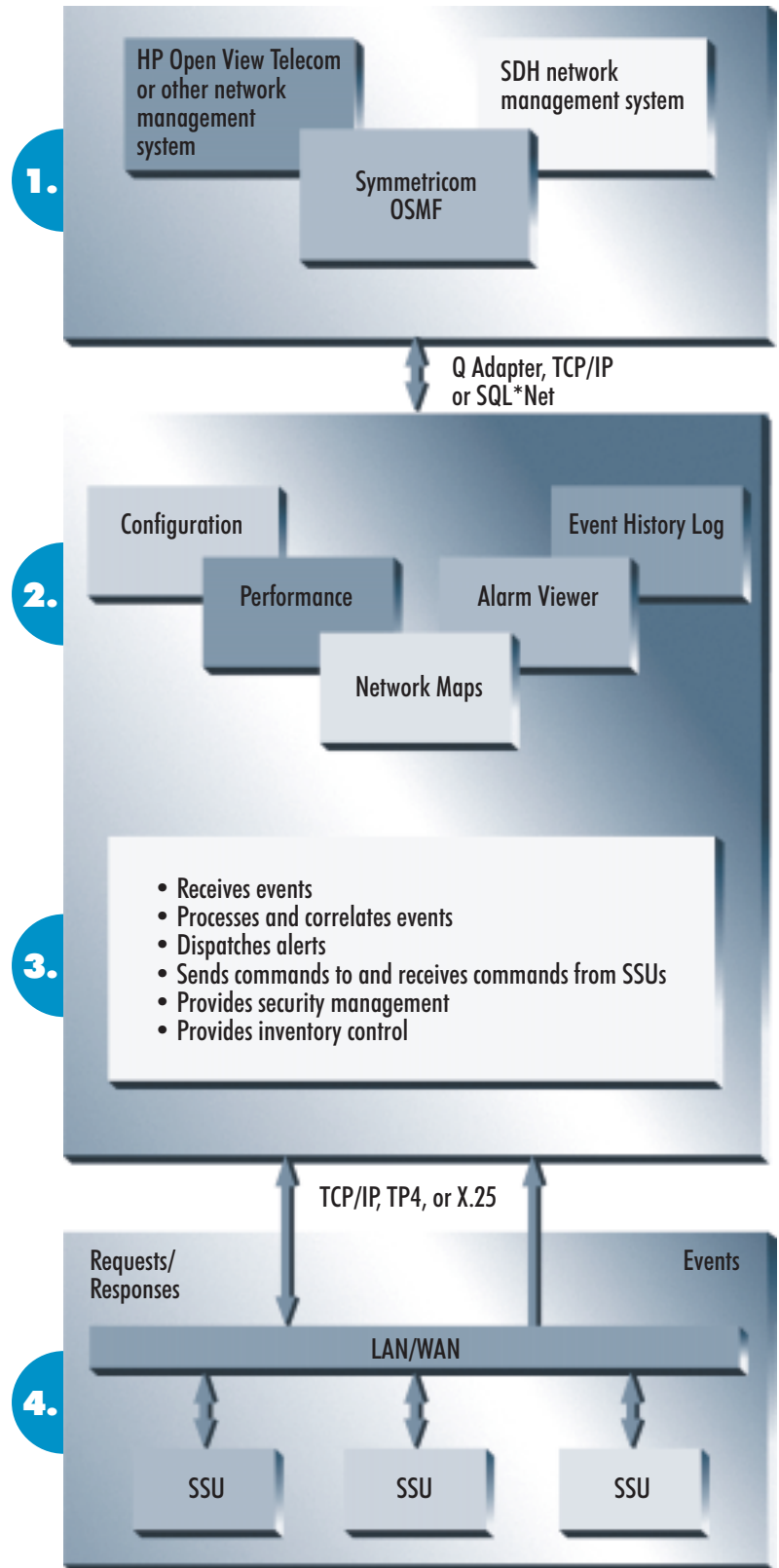
OSMF software gives telecommunications service providers the ability to remotely view synchronization network topology using a GUI that can also be made available to the higher-level network management system. The GUI displays a map and submaps of the network that includes sync trails. Forms are displayed to show fault, configuration, performance, inventory and security data either in tabular/text or graphical format.

3. Symmetricom OSMF Synchronization Management

OSMF manages virtually all functions of individual Symmetricom or non-Symmetricom Synchronization Supply Units (SSUs) at remote locations in the telecommunications network and forwards events to the higher-level management system for correlation with data from other network elements. The software also receives events from GPS PRSs to offer comprehensive management capability. Symmetricom OSMF is the only synchronization management application that is certified in the HP OpenView® Telecom Solution Partner Program.

4. Synchronization Network

SSUs distribute accurate timing synchronization to sensitive electronic equipment such as switches and routers located in central offices. OSMF software is designed to use the real-time measurements, large set of TL1 commands and vast memory of up to 1,000 events of the Symmetricom Network Synchronization Units, called SmartSSU, to provide management capabilities previously unavailable. A TCP/IP, TP4, or X.25 network connection links the workstation on which OSMF resides with the SSUs.



OSMF Sync Management for High Quality of Service

Isolate synchronization related problems and resolve root causes before quality of service is affected.

SDH/SONET is sensitive to timing quality

New technologies are more sensitive to timing quality than their analog and older digital technology predecessors. When timing problems occur on a network based on SONET/SDH, quality of service deteriorates to a level that is unacceptable to customers. Network managers are often unaware of the cause of service problems reported by their customers. Because they have no visibility into their sync systems, they waste valuable time looking for the cause in the wrong place.

Symmetricon OSMF rapidly identifies sync problems

Using Symmetricon OSMF, telecommunication service providers can quickly isolate synchronization related problems in their networks, identify root causes and take immediate, corrective action. Operators can

send a technician directly to the original source with the appropriate replacement cards to resolve the root cause before quality of service is affected.

The software gives network managers the ability to remotely view synchronization network topology, manage faults in GPS PRSs and manage virtually every function of individual SSUs in local offices. An easy-to-use GUI displays network events and performance data collected by the software at the synchronization management level and/or at the higher-level network management system.

With OSMF managing their sync networks, service providers can roll out new, high-revenue data services to their customers with confidence, knowing that their underlying sync networks will support the digital technologies required.



OSMF Offers High Quality of Service at Low Cost

Engineers designed the Symmetricom SmartSync product family in response to service providers' need for a cost-effective synchronization solution.

To improve synchronization, service providers first can place very accurate clocks at all levels of the network. The HP 5071A Primary Frequency Standard is the primary reference clock used at international gateways for the highest level of synchronization quality available. This clock is based on HP's advanced cesium technology that is used to set and keep the world's time at national timekeeping bureaus and standards labs around the world. For timing at lower network levels, the Symmetricom GPS Primary Reference Source provides low-cost, highly accurate GPS timing.

Next, service providers can place Symmetricom Smart SSUs in central offices throughout the network to distribute accurate timing to SDH/SONET network elements. The SmartSSU is designed specifically for SDH/SONET networks with better quality timing, built-in comprehensive monitoring and management tools, and upward scalability.

Finally, service providers can use Symmetricom OSMF to change synchronization from an unmanaged to a managed function.

By viewing and controlling your entire synchronization network remotely, you can avoid sending a technician with a PC from office to office to locate the source of a synchronization problem.

Designed to be managed

Nowhere was collaboration among Symmetricom's engineers more thorough than on the SmartSSU and OSMF management software. The result gives network operators the ability to view and manage virtually every function of the SmartSSU from either the synchronization management or higher-level network management system. OSMF uses the SmartSSU's real-time measurements and large set of TL1 commands to provide management capabilities previously unavailable. Network operators can manage the fault, configuration, performance, inventory and security functions of SSUs. OSMF enables the synchronization system to communicate with all other TMN-compliant systems at various levels of the TMN hierarchy. OSMF also manages GPS SmartPRS faults.

View your synchronization network and manage sync performance remotely with OSMF

Symmetricon OSMF enables your synchronization system to communicate with all TMN-compliant systems.

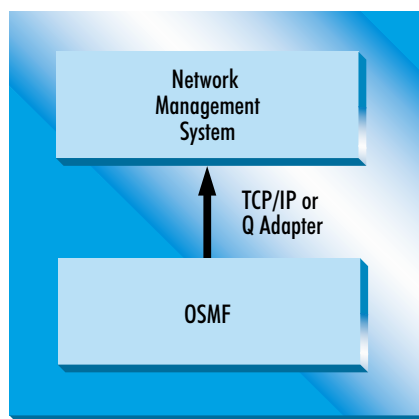
Connectivity matches needs

OSMF uses TCP/IP, TP4, or X.25 connections to manage the synchronization units that are at remote locations in large networks. At the higher-level management system, service providers can choose among several different levels of integration that are based on standard protocols to link with OSMF, depending on the degree of synchronization management needed:

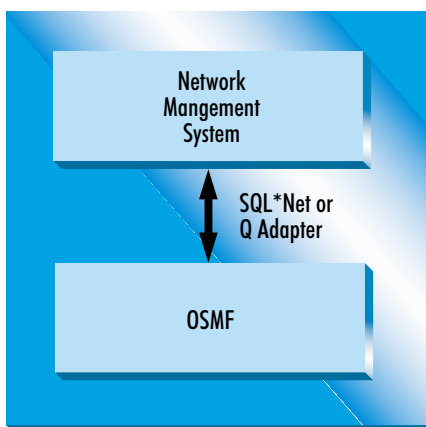
- One-way communication that offers event forwarding only using either a TCP/IP or Q Adapter interface. This option passes SSU and GPS PRS alarm and nonalarm events through OSMF to the higher-level network management system.
- Two-way communication that offers both event forwarding and command/response functions using either an SQL*Net or Q Adapter interface. This option lets network operators at the higher-level network management system issue commands to and receive responses from the synchronization network.

Symmetricon's Q Adapter is developed using standard products such as OTS 9000 and OpenView Telecom, making it easy to integrate with higher-level management solutions. The Symmetricon Q Adapter is implemented at the OSMF management level rather than at the SSUs to reduce costs and make it easier to upgrade.

Event Forwarding Only



Event Forwarding and Command Response



Depending on the degree of synchronization management needed, service providers can choose one-way or two-way communication between synchronization management and the higher level network management system.

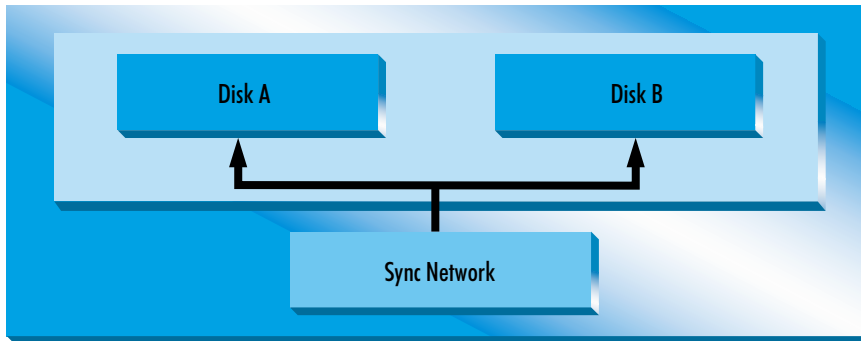
Integrates with standard telecom management

OSMF is the only synchronization management application certified in the HP OpenView Telecom Solution Partner Program. As the defacto telecommunications industry standard, HP OpenView Telecom is used as a network management platform by virtually all leading telecom manufacturers and most service providers. An Oracle relational database stores the current synchronization status of the monitored network elements.

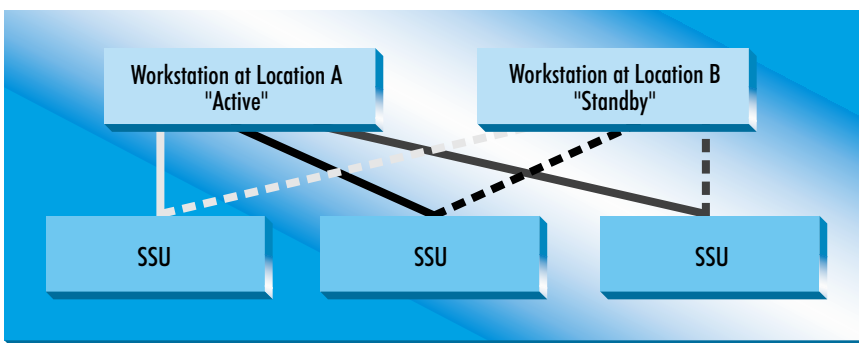
OSMF can be integrated with other HP OpenView applications that manage network elements, including applications that manage multivendor SSUs. Because the OpenView network management system is TMN-compliant, it can correlate synchronization events with other network events.

OSMF also integrates with other SDH/SONET element management systems to get a full view of the SDH transmission network and integrates with HP and non-HP network management platforms such as SUN® and Windows NT®. The software uses platform-independent Oracle® forms that are launched from OpenView® to forward SSU information to the higher-level network management system.

Disk Mirroring for Redundancy



Standby Workstation for Resiliency



Disk mirroring and an optional standby workstation ensure that synchronization management is always available.

Redundancy and resiliency for maximum uptime

To ensure that synchronization is always available, network operators want redundant inputs and clocks built into their SSUs. Similarly, operators concerned about maximum uptime want redundant, resilient synchronization network management.

In OSMF, disk mirroring provides redundancy by mirroring data onto a duplicate disk in each workstation.

OSMF also provides resiliency in which the “active” workstation shares sync network data in real time with the “standby” workstation at a different location.

In the event of failure of the “active” workstation, the “standby” workstation immediately takes over resulting in a virtual guarantee that synchronization management will always function.

OSMF advantage

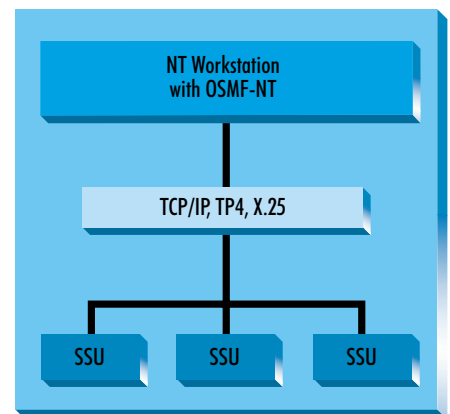
Because Symmetricom’s OSMF is based on the widely tested and deployed platform of HP OpenView Telecom, it offers the advantages of OpenView® reliability. The software’s certification in the HP OpenView Telecom Solution Partner Program indicates that it complements the functionality of the HP OpenView Telecom.

Symmetricom’s synchronization equipment is the only product designed to be managed.

For smaller networks or local office applications

OSMF is also available for local office applications or for small networks using Windows® NT. To commission SSUs and perform local troubleshooting, service providers install 55450A LocalCraft Terminals on laptops running Windows® operating systems. To manage small networks, service providers install the software on a PC or workstation running Windows® NT, to view SSUs remotely.

OSMF Functionality Using OSMF-NT



Service providers install OSMF-NT to manage small networks running Windows® NT.

Knowledge is Power

OSMF provides the information that network operators need to make confident, intelligent decisions about their network synchronization. The software provides an easy-to-use GUI to manage SSUs on a network. Operators have comprehensive knowledge of what is occurring on their synchronization networks and can:

- View the topology of the synchronization network
- Manage the configuration of individual SSUs in the network
- Receive and display alarms and other events
- Collect and graphically display network performance data

In compliance with ITU-T TMN standards, OSMF manages the fault (alarms and events), configuration, performance and security functions on a synchronization network.

Fault management

Alarms occur on a synchronization network when events happen that may require network operator attention. Examples might be loss of inputs, input quality that has deteriorated below standards or SSU hardware malfunction.

OSMF summarizes alarm and event activity from managed SSUs and GPS PRSs, then sorts and filters alarms and events according to user preference, such as time or severity.

Details shown in both the active Alarm Viewer window and the Event History Log window (see below) include:

- Severity level of the event (critical, major, minor, nonalarm or clear)
- Assessment of whether or not telecommunication service is likely to be affected
- SSU or GPS PRS source that generated the event

- Specific card or sub-assembly channel that generated the event
- Date and time event occurred
- Description of event
- Chronological “event” and “clear event” numbers that are assigned when events are logged by the software

An optional event correlation service is the key to real-time improvement of synchronization quality. By correlating events, OSMF ensures that operators work on the root-cause alarms rather than wasting time on related alarms.



Event History Log summarizes expired and cleared alarms and all nonalarm events. A sorting function sorts events into groups—such as severity rating or time. A filter function lets the operator view specific kinds of events—such as those emanating only from SSUs at certain locations or only those of a certain type or severity.

Alarm Viewer screen tells the user the source and severity of alarms so problems can be diagnosed quickly. Alarms are sorted and filtered according to criteria set by the operator. Alarm details screen gives additional information on a specific alarm.



Configuration management

Using OSMF, network operators can view or modify the configuration of any SSU that is actively being managed by the software. Eight SSU settings can be viewed and modified:

- Network connection between the OSMF host and the SSU
- SSU input channel selection, qualification and measurement of reference input signals
- Output signals from the Output Cards
- Event severity-level designations (minor, major, critical, nonalarm)
- Information Management Card local serial data port settings

- such as baud rate and automatic output of messages
- Performance measurement threshold values and criteria for action taken by the system when thresholds are crossed
- Input Track & Hold Card input qualification function
- Security levels required to execute given TL1 commands

A “heartbeat” task pings each SSU and GPS PRS periodically to check the status of the link between the unit and the management station. If a unit does not respond, OSMF determines the unit is unavailable. When connectivity to the unit is restored, if the unit and the OSMF database agree regarding status of

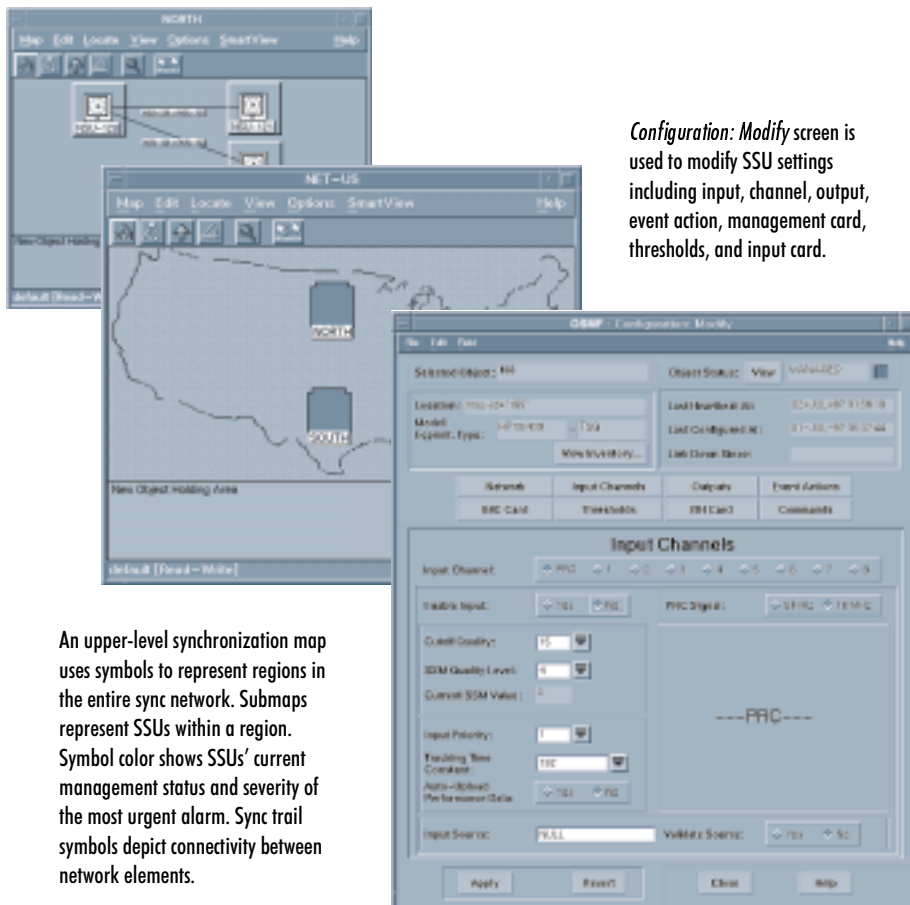
the unit, it is put back into a managed state. If they do not agree, the unit continues to operate in an unaligned state until OSMF updates its database.

Performance management

Symmetricon SSUs constantly monitor the phase deviation of their reference inputs and compare them to network performance parameters as one way to qualify inputs. These calculations are uploaded to OSMF for display. OSMF also displays a comparison of the phase deviation measurements to standards using built-in masks. The network operator can use this data to manually override the SSU’s input selection decision.

The software generates standard or custom reports showing the following five SSU performance measurements in real time, on-line graphs, column (bar) graphs or in text format:

- Time Deviation (TDEV)
- Maximum Relative Time Interval Error (MRTIE)
- Latest Maximum Relative Time Interval Error (LMRTIE)
- Fractional Frequency Offset (FFOFF)
- Frequency Spread (SPRD)



OSMF time stamps measurement data received from each SSU and stores it in a database for later recall and comparison with current data. Historical performance data can be correlated to time-of-day history for trend analysis to identify problems that occur only during specific timeframes.

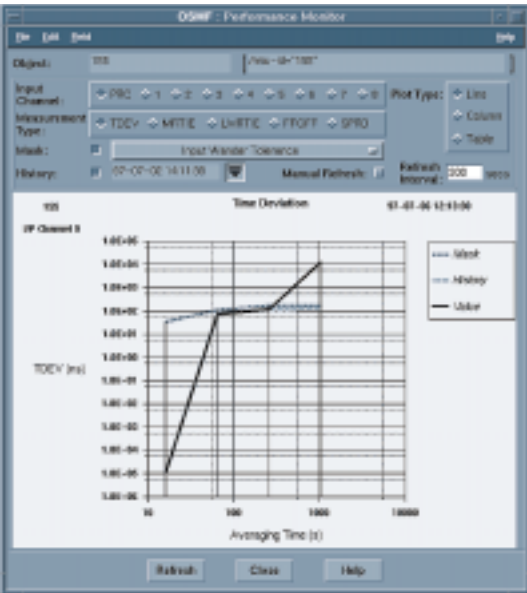
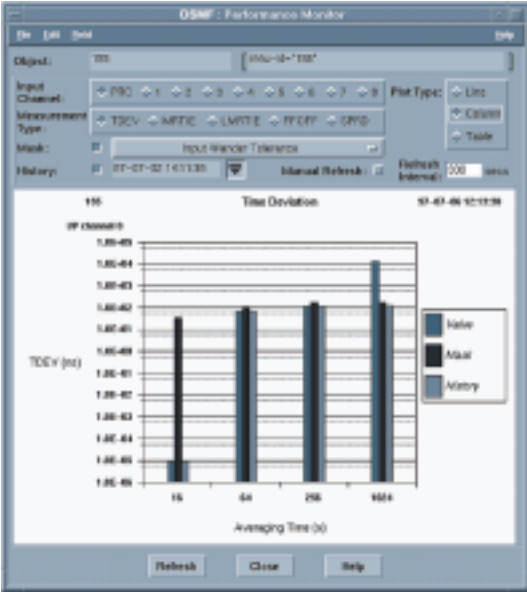
Security management

To control access and protect the integrity of the synchronization system, OSMF defines three user classes: User, Administrator, and Security. Users must have the system-designated “security clearance” to perform various management tasks. The security management function also defines “management

domains,” usually geographic, and allows specific operators to access higher-security functions for their assigned regions. Communication between OSMF and SSUs can be scrambled to prevent accidental or unauthorized control of SSUs.

Inventory management

The software also functions as an inventory management tool for Symmetricom synchronization equipment on the network. A database of information about each SSU provides comprehensive inventory management including serial number, model numbers of all cards installed, and revision level of cards and firmware.



The Performance Monitor screen displays TDEV, MRTIE, LMRTIE, FFOFF, and SPRD, measurements of specified input channels. Data is displayed in line, column (bar) or tabular formats.

Key Specifications

Integration with higher-level management systems

Symmetricom OSMF provides various options to the user for integration with higher-level management systems:

- Event forwarding mechanism.
All events are forwarded over TCP/IP to a higher-level management platform.
- Q Adapter offers a bidirectional integration of higher-level management systems with OSMF. All events are forwarded over the 7-layer OSI compliant stack (provided by the HP OTS/9000) using CMIP following the X.73x event reporting format standards to higher level management systems. The Q Adapter also offers the capability for the higher-level management system to send commands/receive responses to/from OSMF over the 7-layer OSI stack.
- OSMF client software allows the user interface (GUI) to reside on another workstation and access the OSMF host database over the network using Oracle SQL*Net.

Hardware Requirements

- HP C200 workstation with the following configuration:
- 384 MB RAM
- 4 GB HDD (an additional 4 GB required for disk mirroring)
- HP Surestore DAT drive (for backups)
- HP OTS/9000
- HP 9000 X25 card (for X.25 connectivity)
- CD-ROM

Software Requirements

- HP-UX 10.20
- HP OpenView DM 4.21
- Oracle Server 7.3.3
- Oracle Developer 2000 version 1.3.2
- HP OpenView Telecom Event Correlation Services (for event correlation option)

Standards Compliance

- The Q Adapter uses the HP OTS/9000 to provide the 7-layer OSI compliant stack. It uses the OpenView Telecom stack to provide CMISE. It follows the ITU-T X series and the M.3xxx series.

Connectivity to SSUs

- TCP/IP
- TP4
- X.25

Connectivity to GPS PRSs

- TCP/IP

In addition to this OSMF brochure, application notes, product brochures and specifications are available. Contact your local Symmetricom sales office for the following:

Product	Description
55460A	Network Sync Audit Service and Planning
55400A	Network Synchronization Unit ("SmartSSU")
55300A	GPS Telecom Primary Reference Source
GPS-ACIC	GPS Antenna Cables/Interconnect Cables
Application Note	Title
APP/STN-BC	Synchronizing Telecommunications Networks: Basic Concepts
APP/STN-SDH/SONET	Synchronizing Telecommunications Networks: Synchronizing SDH/SONET
APP/STN-FSP	Synchronizing Telecommunications Networks: Fundamentals of Synchronization Planning
APP/SCT	Symmetricom SmartClock Technology: Improving Oscillator Long-Term Stability for Synchronization Applications



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