NETOP SUITE

NETOP ELEMENT MANAGEMENT SYSTEM (EMS)

High-scale, Carrier-class Element and Service Management System for Ericsson Metro-Ethernet Service Transport and Multiservice Edge Routing Deployments

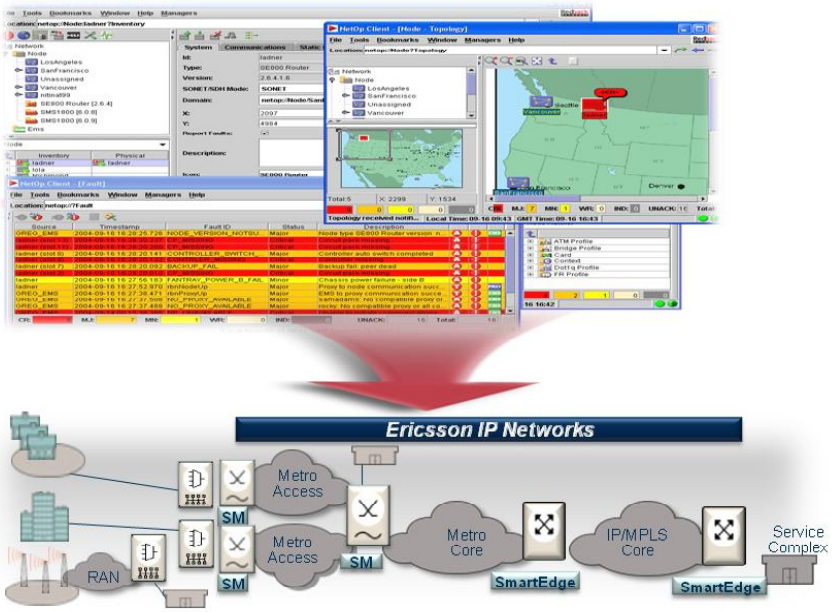

Figure 1) NetOp EMS Overview

Key benefits

- Robust, distributed NetOp architecture enables superior scalability
- Sophisticated NetOp alarm interface delivers advanced trap collection, database logging, filtering, and forwarding features
- Intuitive Graphical User Interface (GUI) simplifies fault isolation and network monitoring
- Rapid service velocity using flow-through provisioning
- Sophisticated user security for NetOp clients allowing customized control of user access to network objects
- Embedded management features offer simplified configuration, efficient data collection and storage
- Bulk Operations infrastructure provides significant efficiency in network administration and operations
- Partnerships with OSS vendors provide a complete network management portfolio
- Zero-Touch IP VPN Provisioning via NetOp Network Service Manager for L2 MPLS VPN, L3 MPLS VPN, ATM PVC and IPSec broadens NetOp EMS service reach beyond regional networks

To capitalize on new revenue opportunities, successful service providers need effective ways of managing, monitoring and accounting for new high-margin services across next-generation networks. The intense pace at which demand for such services is growing necessitates a scalable management solution that can respond quickly to changing business requirements, new protocols and emerging standards, while simplifying the complex tasks that can strain resources. Most importantly, availability and reliability cannot be compromised. Because of these factors, a comprehensive network management solution has become a primary consideration when deploying routing and aggregation platforms in multi-vendor networks.

Ericsson SmartEdge and SM 480 platforms offer superior network and service management through a combination of the NetOp™ Element Management System (EMS) and embedded management features. NetOp EMS software enables highly scalable, network and service management through an intuitive GUI that simplifies critical tasks related to fault and configuration management, inventory management and troubleshooting, helping providers reduce costs and more efficiently manage their

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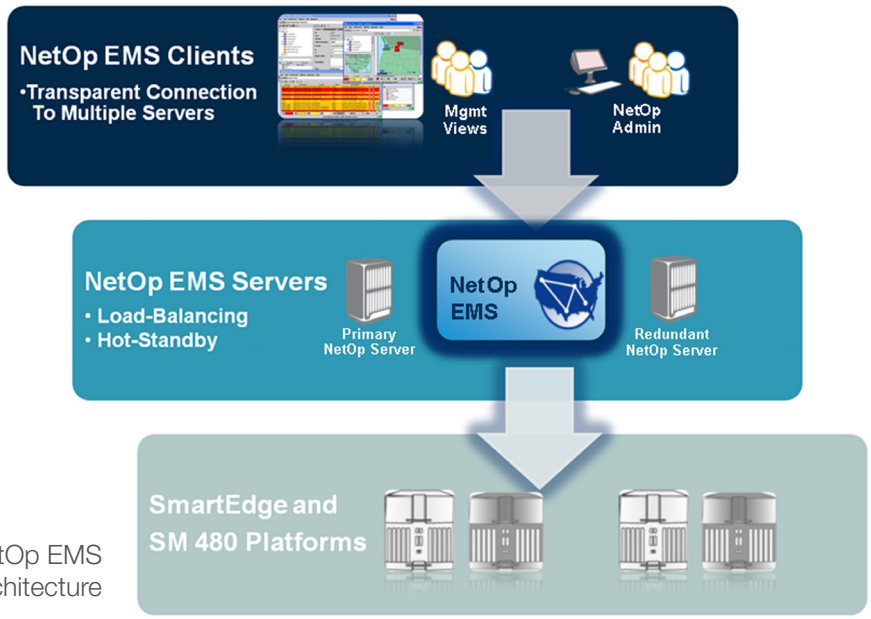

Figure 2) NetOp EMS System Architecture

networks. Provisioning features for high frequency tasks with an automated northbound CORBA and SOAP/XML are available for flow through provisioning. In addition, embedded management functionality including command-line interface (CLI), SNMP and BulkStats enables efficient platform configuration and monitoring, greatly reducing the time it takes to deliver new services to customers. By partnering with leading OSS vendors to supply critical management functions and multi-vendor support, Ericsson delivers a complete management solution for its platforms.

NetOp EMS system architecture (figure 2)

The NetOp EMS is a client/server software system that provides a robust, scalable platform required for the service provider's mission-critical operations environment. It provides real-time information for each node, displaying a network-wide view that enables providers to detect and analyze network-wide faults and ensure secure operation.

The NetOp EMS client acts as the primary interface for monitoring and managing all nodes in a network group. After state changes in the nodes are communicated to the NetOp server through the Admin Layer API, the server sends those changes in the form of objects to the client using the Java Agent Management (JAM) protocol, thereby ensuring synchronization. Synchronized Objects allow the network nodes, server and manager to always be synchronized with the true state of the network element, eliminating cases in which the configuration data stored in the server or client doesn't reflect the true state of the node. In turn, this feature enables operators to view real-time information through the GUI and take advantage of inventory tracking, fault management and network event logging features.

NetOp EMS multi-server model (figure 3)

NetOp multi-server model offers load-balancing, redundancy and higher scalability. A multi-server is implemented by deploying two or more EMS servers and two database hosts. Nodes are distributed among the EMS servers to share the load. EMS servers offer hot-standby support to each other; when one server fails, nodes managed by that server are picked up by other servers. The database redundancy is provided by designating one host as primary and the other as secondary (hot-standby). Critical data, including node and link inventory, are replicated to the Oracle database of the secondary host, so that the information necessary for network operation is available if the primary database host system fails.

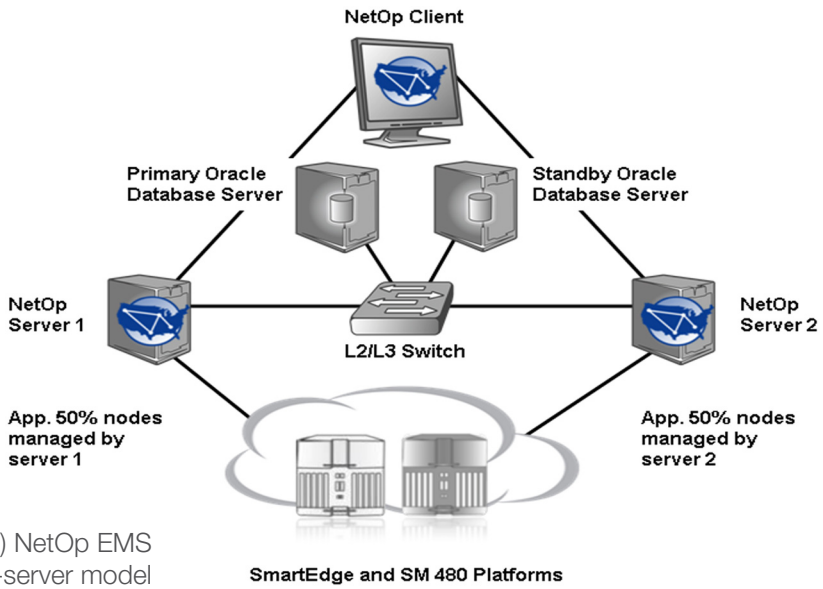

Figure 3) NetOp EMS multi-server model

Figure 4) NetOp EMS real time statistics & graph display

Intuitive GUI enables fast, effective management

Operators can perform fault and security management for the Ericsson platforms using the NetOp EMS software's intuitive GUI.

Superior fault management: NetOp EMS offers robust fault management and isolation functionality for enhanced network performance and reliability. Operators can monitor and address a potentially steady stream of alarm events through the GUI at different geographic locations and apply sophisticated filtering to distinguish between the severity type, time/date, and more of event notifications, traps or alarms. Simply clicking on icons on the map enables the operator to view the alarms generated from a particular network element, which helps to isolate the problem. Alarms are automatically cleared once the problem is corrected, and a written history is stored in the Oracle database.

NetOp EMS feature overview

A Flow Through Service Provisioning: NetOp EMS supports CORBA and SOAP/XML north bound interfaces for Flow Through Service Provisioning. This helps the service provider reduce the following:

- Provisioning Time
- Operation Training
- Operational Errors

This also helps the service provider in reaching faster time to revenue by increasing service velocity and simplifying new service rollout.

Efficient inventory management: The NetOp EMS allows providers to view all hardware information on managed network elements, including node, port and slot-level details. The software detects hardware changes and signals the operator to update the inventory information, greatly reducing operational costs, particularly in larger networks with many nodes and subscribers. NetOp stores changes to managed elements in the NetOp server logs, which can be readily viewed using the GUI for up-to-the-minute reports on the state of the network.

Configuration Management: The Configuration Management feature in NetOp allows the service provider to maintain a consistent version of the node software and configuration across the network. The configuration of the nodes can be automatically backed up based on schedule determined by the carrier.

Real Time Statistics & Graph Display (figure 4): The Real Time Statistics display can prove to be of tremendous help for a network operator trouble shooting a subscriber circuit. The real time traffic statistics for a Port/Channel/Sub-Channel/Circuit can be displayed through the GUI. The statistics update interval to the GUI is user configurable. The operator can clear the statistics in the GUI in order to observe the increments in the traffic. The operator can select the circuit attributes that need to be monitored for display in a Graphical format.

Auto Node Discovery: The Auto Discovery mechanism allows the network operator to discover the nodes in the network and create a managed object for each new discovered node. The traditional management centric node discovery mechanisms implemented in SNMP based Element Managers take a very long time and generate a lot of network traffic to discover the nodes. Ericsson has implemented a newer mechanism for quick and efficient discovery of nodes.

Security: To guarantee a high degree of network security, the NetOp EMS supports role-based, secured access for both users and groups all the way down to a card-level granularity, and at multiple security points. Users are assigned to a particular security type depending on their activities related to network management-read only, read and write or "Superuser." User access can also be limited to a subset of GUI views depending on the role or level of the individual operator.

Bulk Operations: Service providers can derive high operational efficiencies where a network operator can change the configuration of multiple nodes using a single GUI instead of performing the same change by connecting one node at time. NetOp EMS can perform a scheduled bulk software image, ATM profile and QoS policy download to multiple nodes in the network.

Embedded management in Ericsson platforms complements NetOp EMS functionality

In addition to the NetOp element management system, the Ericsson platforms offer embedded management capabilities for configuration, troubleshooting, statistics collection and accounting functions.

CLI: Ericsson has implemented an industry standard CLI, which makes it easier for the service provider to use existing pool of Network Engineers with minimal additional training for configuration of the Ericsson platforms. The CLI that provides an extensive command set to aid in provisioning and troubleshooting and allows operators to rapidly become familiar with the commands and configurations of the Ericsson platforms. The provider can use the CLI Reach-Through feature on the NetOp EMS software to launch a window and open a CLI session using Telnet or SSH. CLI is the primary mechanism to configure the Ericsson platforms.

SNMP: The Ericsson platforms have an embedded SNMP agent, with support for SNMP v1, v2c and v3. The embedded SNMP agent can be used to collect statistics for both Enterprise and IETF standards based MIBs, and it can also be configured to generate SNMP traps. These traps can be automatically forwarded by the NetOp EMS platform to SNMP trap receivers as required by the service provider. Because Ericsson has partnered with multiple OSS vendors, such as Micromuse, the provider can leverage a higher-level OSS to receive the traps over a single aggregate trap feed through the NetOp EMS software for all networked Ericsson platforms. This feature eliminates the need to configure a separate connection from each Ericsson platform to its higher-order alarm OSS directly.

BulkStats: Protocols such as SNMP add a lot of overhead because of the complexity of collecting SNMP per object statistics. To alleviate this problem, the BulkStats feature in the Ericsson platforms samples and stores system, network, traffic and error statistics at configurable sampling intervals and periodically transmits data to a primary or secondary receiving station. Statistics can be collected on specified objects, such as global or port/ circuit objects.

BGP Attribute-Based Accounting: Embedded support for the Border Gateway Protocol (BGP) policy accounting enables providers to account for IP traffic differentially and apply billing according to the route it traverses. For example, providers can account for traffic routed domestically, internationally, terrestrially or via satellite and bill for it on a customer usage basis.

NetOp Network Service Manager (NSM) module

To offer MPLS VPN services such as L3 VPN, VLL and VPLS effectively and reliably, service providers need a management solution that provides comprehensive, reliable & scalable set of features to design, deploy, activate and monitor MPLS VPN deployments.

NetOp Network Service Manager (NeOp NSM), an add-on module to NetOp EMS, addresses these needs seamlessly with web-based GUI interface. NetOp NSM is a customer and service aware module, which enables Service Provider to deploy the solution and offer the services quickly by eliminating the tools development and OSS integration time.

The management features offered by NetOp NSM include designing service using service templates, managing customer profiles, provisioning, monitoring & troubleshooting and reporting. NetOp NSM supports user access control feature using which NetOp NSM administrator could allow these features to users based on their role, such as Service Architect, Service Administrator, Activation user and Operations user.

OSS partners

Ericsson is committed to delivering a complete network and service management solution for multi-vendor networks. To that end, Ericsson partners with a range of OSS vendors that together provide a comprehensive set of management capabilities. Currently, Ericsson's impressive list of leading OSS partners includes Subex Azure (Syndesis), IBM (Netcool and Proviso), CA (Concord), Narus and Visionael.

- VPN and QOS provisioning
- Multi-vendor provisioning
- Fault monitoring
- Statistics collection and mediation
- SLAs
- Inventory reporting

Product specifications for NetOp Element Management System

Fault
- Alarm and event collection, storage and display with filtering
- Color-coding for alarm severity
- Configurable alarm thresholding
- SNMP trap aggregation, filtering & forwarding
- Oracle Database storage with GUI interface

Provisioning
- Flow through provisioning through CORBA and SOAP/XML north bound interface
- Templates for multiple node provisioning
- Transaction session management
- Circuit provisioning for ATM, VLAN & Frame Relay
- Bulk ATM profile & QoS policy provisioning
- Context & Interface provisioning
- L2TP provisioning
- BGP provisioning
- CLI cut-through
- Bulkstats provisioning
- SNMP provisioning

Performance
- Real time Port/channel/sub-cannel/circuit statistics and summary information
- Real time Graph display for statistics
- Bulkstats data collection, aggregation, forwarding and reporting

Security
- Role-based user classes
- Secured communication between client, server and node objects
- Audit logging and reporting
- Templates for node configuration audit

Inventory
- Automated node discovery
- Node Inventory discovery and storage

Graphical interface
- Topological maps with zoom
- Detailed view of nodes, ports and cards
- Alarm and event view with export functions
- Tree based navigation
- Scheduled operations for config file & software image
- Java Web Start launch
- CLI-passthru for Monitoring/Troubleshooting

OSS interfaces
- CORBA v2.3
- SOAP/XML
- SNMP v1, v2c and v3

Network Element Support
- SmartEdge OS Release 5.0.7 or greater
- SM 480 OS Release 6.1.5.1 or greater

Platforms
- NetOp EMS Server Solaris 10 Operating System
- NetOp EMS Client Windows XP or Solaris 10 Operating System

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