

Integrating Cisco Transport Manager into an Overall Operations Support System Environment

Overview

Service providers face a challenging landscape. Success hinges on providing a flexible range of services, in a timely manner, at competitive rates. The degree to which a service provider achieves these success factors depends not only on its network technology, but also on its operations support system (OSS) infrastructure. The Telecommunications Act of 1996 and the simultaneous widespread adoption of the Internet caused an unprecedented expansion in network infrastructure and the number of service providers. Today, service providers are focusing on maximizing operational efficiencies and taking advantage of revenue-generating network resources.

A prudent selection of OSS products, effectively integrated, is vital to the success of a service provider. More service providers are relying on commercial off-the-shelf OSS products, which often have cost and time-to-market advantages over internally developed systems. Service providers look increasingly to their network equipment vendors to provide element-management layer and network-management layer (EML/NML) solutions that smoothly integrate into their OSS environments. To meet the needs of its service provider customers, Cisco offers comprehensive and flexible OSS solutions for the Cisco IP+Optical portfolio of networking products. These OSS solutions are made up of a combination of Cisco developed systems and best-of-breed third-party OSS products that have been optimized and integrated for the management of a Cisco IP+Optical network.

Cisco Transport Manager is a fundamental component of an OSS solution that involves the management of the Cisco ONS 15000 family of optical products. Cisco Transport Manager provides key EML/NML functions and provides interfaces to higher-layer OSS components.

The Cisco Transport Manager Value Proposition

EML/NML functionality is necessary in any OSS solution. The close interaction between the element management system (EMS) and the network elements positions the network elements vendor to offer a highly effective and timely EMS solution. Cisco Transport Manager provides world-class EML/NML support for the Cisco ONS 15000 family of optical products. Cisco Transport Manager provides a comprehensive set of value-added features to the OSS solution, including:

- Intuitive, user-friendly graphical user interface
- Unified management of the Cisco ONS 15000 family of optical products
- Equipment and facility provisioning
- Real-time fault management
- Advanced software download capabilities
- Automatic network elements memory backup
- A-to-Z circuit provisioning
- Inventory management
- Performance management collection and display



- High Availability (HA) deployment option
- Advanced security features
- Open interfaces for OSS integration

These features allow a service provider to efficiently operate a Cisco optical network. In conjunction with other OSS products, Cisco Transport Manager can serve as the foundation for important capabilities such as flow-through service provisioning and the ability to offer differentiated services.

Cisco Transport Manager: Open Interfaces for OSS Integration

Cisco Transport Manager provides a number of open, industry-standard interfaces to allow easy integration with other OSSs, which form the overall OSS solution.

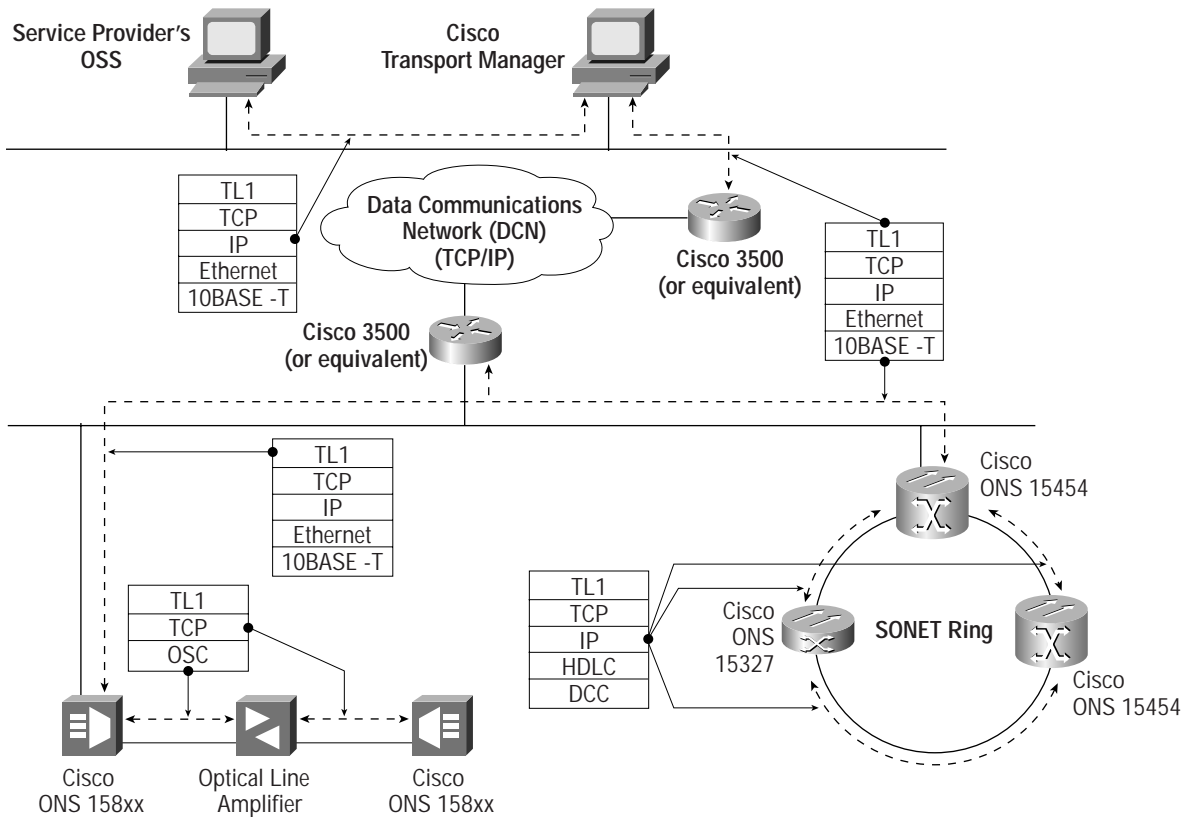
GateWay/TL1

Transaction Language 1 (TL1) is the most widely used protocol for the management of telecommunications transport and access technologies. Part of TL1's popularity owes to its readability by both humans and computers. The Cisco ONS 15327, 15454, 15800, 15801, and 15808 each support a TL1 interface. The Cisco Transport Manager GateWay/TL1 feature provides a number of advantages over an OSS accessing the TL1 interface directly on each network element.

First, GateWay/TL1 allows multiple OSSs to share the same TL1 session on a network element. The number of simultaneous TL1 sessions permitted on a given network element is limited, so GateWay/TL1 provides a way to efficiently use this limited resource.

GateWay/TL1 also provides advantages in minimizing the amount of TL1 traffic carried on the data communications network (DCN). For example, instead of sending autonomous TL1 notifications from the network element to each interested OSS over the wide-area DCN, one notification can be sent to Cisco Transport Manager in the network operations center (NOC). Cisco Transport Manager can then forward the notification to the set of OSSs that are typically located in the same NOC. Cisco Transport Manager provides the ability to define filters on GateWay/TL1 such that only the notifications of interest are forwarded to a given OSS. Lastly Cisco Transport Manager provides a number of useful EMS-level TL1 commands that can be used by the OSS. For example, GateWay/TL1 provides a TL1 command to obtain a list of all the network elements managed by Cisco Transport Manager, which allows an OSS to autodiscover network elements present in the network. Figure 1 illustrates Gateway/TL1.

Figure 1
GateWay/TL1



GateWay/SNMP

Simple Network Management Protocol (SNMP) is the predominant protocol used for the management of data technologies such as Ethernet switches, IP routers, DSLAMs, and so on. The Cisco ONS 15200, 15327, 15454, and 15540 each support a SNMP interface. GateWay/SNMP provides a trap-forwarding service that offers some of the advantages discussed for GateWay/TL1, such as limited use of DCN traffic in the case of multiple OSS trap destinations. GateWay/SNMP supports the definition of up to 16 trap destinations. It is only necessary to configure a single trap destination on each network element, namely the Cisco Transport Manager server, and then all other OSS trap destinations can be centrally managed from Cisco Transport Manager. SNMP set-and-get operations continue to take place directly between the OSS and the network element and do not involve Cisco Transport Manager GateWay/SNMP.

GateWay/CORBA

GateWay/Common Object Request Broker Architecture (CORBA) represents an exciting advancement in the area of OSS integration. In network management, the ability to seamlessly manage a multivendor, multitechnology network is critical.

Initial network management efforts were based on standardizing the OS/network element interface, using Common Management Information Service Element/Guidelines for the Definition of Managed Objects (CMISE/GDMO). While detailed specifications were produced, the higher cost and complexity of CMISE, with limited added benefits, resulted in very few commercial implementations. The next efforts focused on defining a standard interface between the EMS and NMS, the so-called network layer view. These efforts were also based on CMISE/GDMO, but likewise failed to gain industry traction.

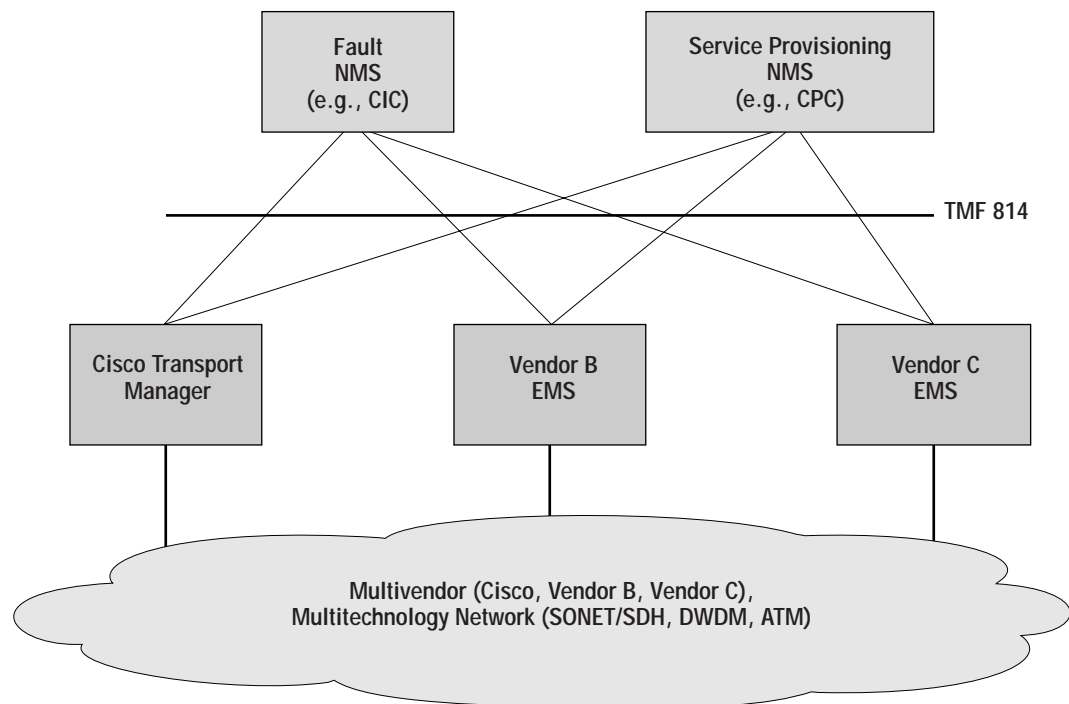
The approach of a standard EMS/NMS interface was taken up by a group of Synchronous Optical Network (SONET) equipment vendors that started using CORBA as the protocol-taking a highly pragmatic approach to the information modeling to ensure ease of implementation. This effort expanded and later came under the TeleManagement Forum (TMF) as the Multitechnology Network Management team. Version 2 of the EML/NML interface was approved in October 2001 and published as a set of documents: TMF 509, TMF 608, and TMF 814. Most importantly, the EML/NML interface defined by the TMF has begun to reach critical mass in terms of equipment vendor, independent software vendor (ISV), and service provider acceptance and implementation.



The TMF Version 2 standard covers SONET, Synchronous Digital Hierarchy (SDH), dense wavelength division multiplexing (DWDM), and Asynchronous Transfer Mode (ATM) technologies. The interface makes it possible to readily achieve integrated management across these technologies and across multiple vendors. Each equipment vendor provides an EMS that supports its equipment, allowing one or more network management systems (NMSs) to interface with each relevant EMS.

Many combinations are possible. Figure 2 depicts a network consisting of Cisco ONS 15000 equipment managed by Cisco Transport Manager. Equipment from Vendor B and Vendor C is also part of the network; Vendor B and Vendor C each provide an EMS supporting the TMF interface. Integration is achieved at the NML. In Figure 2, the service provider has chosen to deploy a separate NMS for fault and service provisioning. Examples of a fault NMS/service management solution (SMS) and service provisioning NMS/SMS are Cisco Info Center and Cisco Provisioning Center, respectively.

Figure 2
Application of a Standard EMS/NMS Interface



GateWay/CORBA can also be used to achieve scalability. While Cisco Transport Manager supports the ability to manage an increasing number of network elements, the size of some service provider networks will exceed the capacity of a single Cisco Transport Manager instance. In these cases, multiple Cisco Transport Manager instances can be deployed and then tied together for a unified view at the NMS layer.

The Cisco Transport Manager GateWay/CORBA feature is compliant with the TMF 814 standard. As of Cisco Transport Manager Release 3.0, GateWay/CORBA supports the following TMF 814 modules:

- Inventory
 - EMS
 - Multilayer subnetwork
 - Managed element
 - Physical termination point (PTP)
- Alarm notification
- Retrieval of active alarms on objects where inventory is available
- Subnetwork connection (SNC) provisioning

SQL

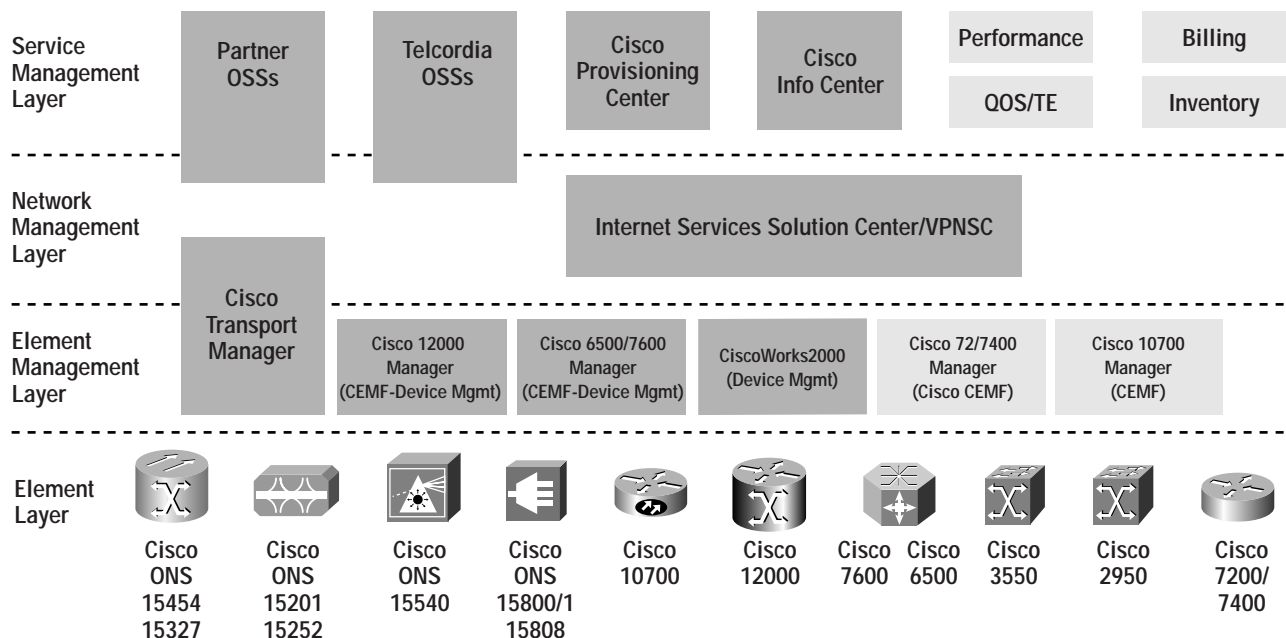
In some instances, an OSS may not support using one of the Cisco Transport Manager GateWay interfaces. The OSS has the additional option of accessing the Cisco Transport Manager Oracle database using the standardized query language (SQL). Cisco provides up-to-date documentation on the Cisco Transport Manager database schema. An OSS application using SQL access of the Cisco Transport Manager database should typically be limited to read-only access. A disadvantage of this approach is turnover in the schema, which can occur from release to release of Cisco Transport Manager. For this reason, it is generally preferable to rely on a standard interface such as GateWay/CORBA.

Cisco IP+Optical OSS

The Cisco IP+Optical OSS solution addresses management of the Cisco suite of IP and optical network equipment, including the Cisco 12000 Series and Cisco ONS 15000 family of optical products. Key management components used in the Cisco IP+Optical OSS solution include EMS for the IP product family and Cisco Transport Manager for the Cisco ONS 15000 family, as well as network- and service-management applications such as Cisco Info Center, Cisco Provisioning Center, and the Cisco Virtual Private Network (VPN) Solution Center.

The Cisco IP+Optical OSS solution architecture also uses technology and products available from Cisco ecosystem partners, including inventory, billing, and performance-management OSSs. This architecture enables the integration of different OSS components with minimum effort. Where appropriate, Cisco also participates in Telcordia’s OSMINE process for the integration of Cisco network elements into OSSs developed by Telcordia such as TIRKS, NMA, and TEMS.

Figure 3
Cisco IP+Optical OSS Solution



Currently, Cisco Transport Manager integrates into the Cisco IP+Optical solution using the GateWay/TL1 interface. Moving forward, GateWay/CORBA will become the interface of choice for integration.

Summary

Cisco Transport Manager provides powerful EML/NML features for the Cisco ONS 15000 family of optical products. The combination of these features with the open, standard interfaces provided by Cisco Transport Manager allows Cisco Transport Manager to serve as the foundation for a complete OSS solution. GateWay/CORBA offers the best potential for realizing seamless management of multivendor, multitechnology networks. Cisco offers a complete OSS solution for the management of a Cisco IP+Optical network using a combination of Cisco and best-in-breed ecosystem partner OSS components. The open, standard interfaces that allow Cisco Transport Manager to integrate so well into the Cisco IP+Optical OSS solution allow Cisco Transport Manager to integrate equally well into a service provider's existing or in-house-developed OSS environment.



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