EMC® Smarts®
Optical Transport Manager

Version 9.4

Adapter for TMF 814 User Guide

P/N 302-001-513
REV 01

EMC²

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Published January 2015

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CHAPTER 1
Introduction

This chapter contains the following sections:

- EMC Smarts Adapter for TMF 814 6
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EMC Smarts Adapter for TMF 814

The EMC® Smarts® Adapter for TMF 814 can be configured to run in two modes:

- As both an Event Adapter and Topology Adapter
  - The TMF 814 Adapter discovers topology and collects events from an element management system (EMS) that manages High Order and Low Order SONET/SDH networks and provides a TMF 814 interface.
- Only as an Event Adapter
  - The TMF 814 Adapter collects events from an EMS that manages High Order SONET/SDH, Low Order SONET/SDH (PDH), or DWDM networks and provides a TMF 814 interface.

Note: The adapter does not discover topology for DWDM networks.

The adapter works in conjunction with the Optical Transport Manager for retrieving and managing EMS data.

Although the TMF 814 standard specifies a set of programmatic interfaces, actual implementations might not support all of the standard interfaces but instead rely on vendor-specific extensions for TMF 814 support. For these reasons, the Adapter for TMF 814 has generic core functionality, with additional functionality added to support vendor-specific EMSs.

Note: Contact EMC for customization of the OTM Adapter for TMF814 in support of specific TMF814 compliant optical network devices.

Supported devices

The EMC Smarts Optical Transport Manager Adapter for TMF 814 supports

- High Order SONET/SDH devices that are managed via Ciena LightWorks ON-Center such as the Ciena CoreDirector network elements.
- High Order SONET/SDH devices that are managed via the Cisco Transport Manager (CTM) such as the Cisco ONS 15454 MSPP network elements.
- Other SONET/SDH and DWDM devices that provide an EMS TMF 814 interface by customizing rule sets for these devices.

Supported cards

The EMC Smarts Adapter for TMF 814 supports the following cards:

- Cisco ONS 15454 MSPP transport I/O cards (such as OCx/STMx, DSx, Ethernet) and cross-connect switch cards.
- Ciena CoreDirector transport I/O cards (such as OCx/STMx, and Ethernet).

EMC Smarts Optical Transport Manager architecture

Figure 1 on page 7 shows the Adapter for TMF 814 communicating with element management systems (EMSs), the Optical Transport Manager, and the Service Assurance Manager (SAM). In addition, it shows an optional integration with a customer inventory system.

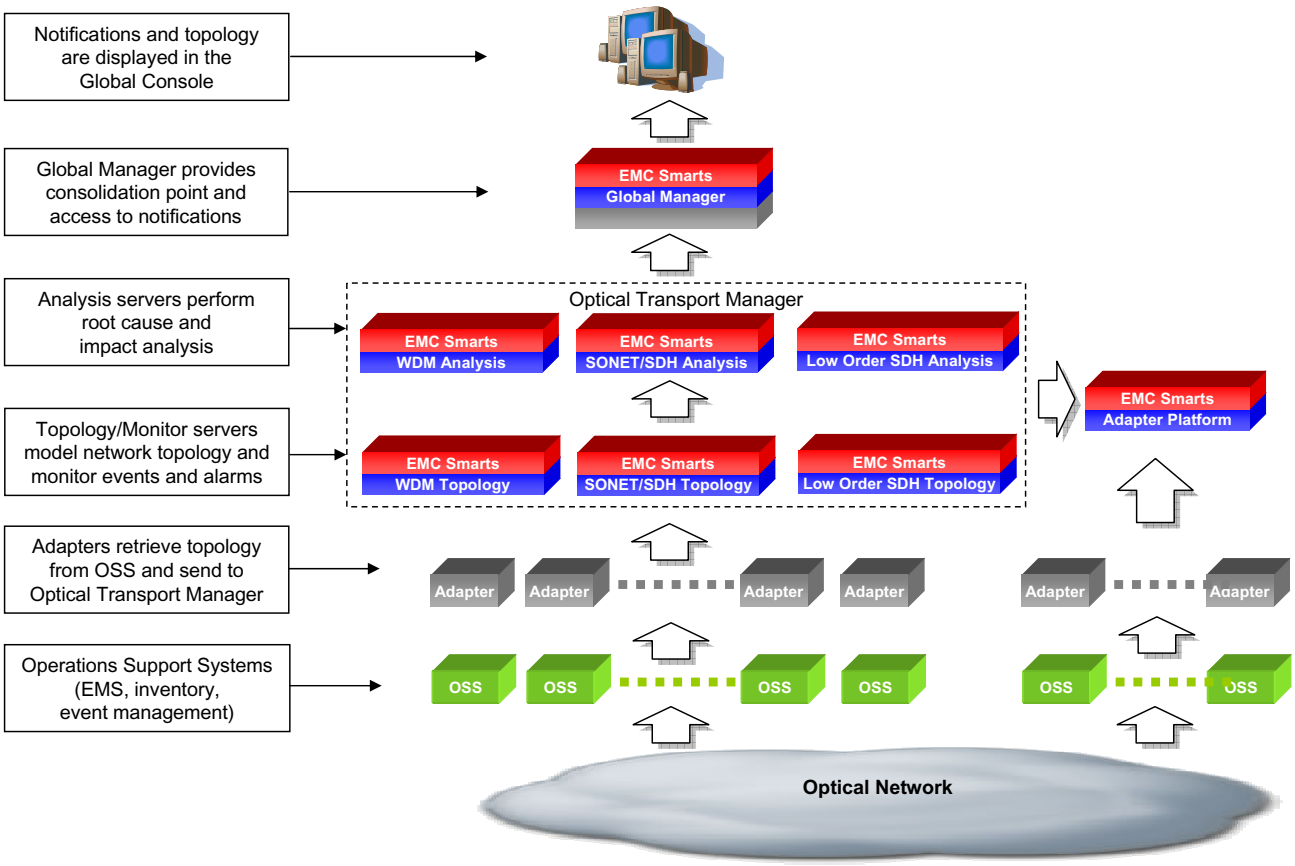

Figure 1 Optical Transport Manager architecture

How the Adapter for TMF 814 works

The EMC Smarts Adapter for TMF 814 uses a subset of the programmatic interfaces specified in the TMF 814 standard to communicate with EMSs.

For Operations Support System (OSS) environments that employ an inventory system, a customized EMC Smarts adapter provides the ability to access data and include the data in the Optical Transport Manager repository. This data can include information about links between devices and circuits that span devices that different EMS instances manage.

The EMC Smarts Adapter for TMF 814 architecture is shown in Figure 2 on page 8. As shown in the figure, the Adapter for TMF 814 has generic core functionality, and there are customized EMS adapters (the Cisco, Ciena, and EMS adapters) to support vendor-specific EMSs.

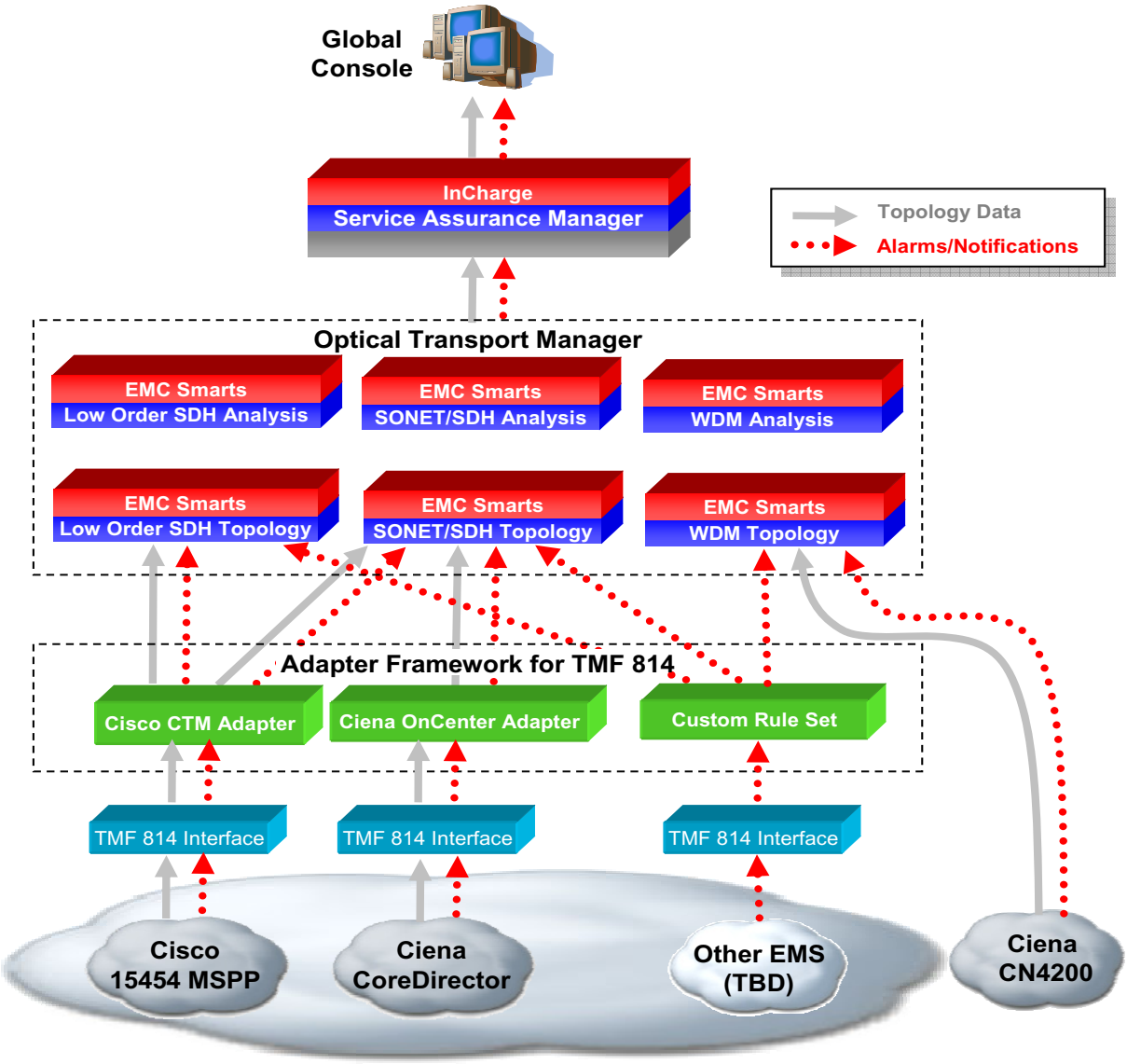

Figure 2 EMC Smarts Adapter for TMF 814 architecture: a high-level view

Adapter topology functionality

The Cisco EMS and Ciena EMS Adapters

- Query their respective EMSs for SONET/SDH network elements and connectivity information to populate the Optical Transport Manager Topology server repository

Note: Currently, only the SONET/SDH and Low Order SONET/SDH adapters support topology population. The WDM Topology server repository is populated via the OTM API.

- Registers with the EMS for object create/delete/change events to keep the repository synchronized

Each EMS requires a separately configured adapter. Once you configure the adapter for a vendor's EMS, the adapter can connect with more than one instance of that EMS.

Event notification flow

Events flow in the following order:

1. The Optical Transport Manager Analysis servers register with the EMS (via Notification Server) to receive alarms.
2. Each EMS publishes events to an event channel
   - When changes occur on managed objects
   - When it receives alarms from network elements
3. The Adapter for TMF 814 subscribes to these events. When it receives an event, the adapter
   - Normalizes it into the EMC Smarts format
   - Forwards it into the Optical Transport Manager Topology server
4. The event is forwarded from the Topology server to Analysis server.
5. The Optical Transport Manager Analysis server
   - Correlates events with objects in the repository
   - Uses events as input for root-cause analysis
6. Service Assurance Manager (SAM) subscribes to events from the Optical Transport Manager Analysis servers, and
   - Uses events as input for impact analysis
   - Displays events on the Global Console

CHAPTER 2
Configuring the Adapter

This chapter includes the following sections:

- Prerequisites..... 12
- Configuring adapterConnections.xml..... 12

Prerequisites

Before you can configure the EMC Smarts Adapter for TMF 814, verify access to your EMS CORBA name server. You must have the URL for the name server's Interoperable Object Reference (IOR), and the adapter must be able to access the name server via TCP.

Examples of valid URLs include

- file:path/to/ior/file/nameserver.ior
- corbaloc::160.45.110.41:38693/StandardNS/NameServer-POA/_root
- http://www.x.y.z/~user/NS_Ref

Configuring adapterConnections.xml

To allow the Adapter for TMF 814 to communicate with each vendor's EMS and the domain managers, the adapterConnections.xml file must be edited. This file can be found in the adapter's conf directory. For Cisco, this is

BASEDIR/smarts/conf/tmf814Cisco

For Ciena, this is

BASEDIR/smarts/conf/tmf814Ciena

Open the **adapterConnections.xml** file using sm_edit. Appendix A, "Understanding the sm_edit Utility," provides instructions on using sm_edit.

Only the parameters in Table 1 on page 12 and should be customized. Other parameters should be kept at default values. These parameters are found under the "connect to the Cisco EMS" and "connect to the Ciena EMS" sections and use the connect action.

Table 1 Configuration parameters for connection to Cisco and Ciena EMSs

Parameter	Description
otm.basedir	Installation path of OTM. Must end with "/OTM".
connectionType	A string describing the type of connection, e.g., TMF814.
ems.instanceName	EMS instance name. (This is the name of the EMS that will be created on the domain manager.)
ems.emsType	A string describing the EMS type, e.g., CiscoCtm.
ems.interfaceClass	The Java class that contains the specific vendor EMS interface implementation. For Cisco: com.emc.smarts.optical.tmf814.ciscoCtm.CiscoCtmEmsInterface For Ciena: com.emc.smarts.optical.tmf814.cienaOnctr.CienaSnmEmsInterface
ems.sessionFactory	The EMS session factory (provided by customer). For Cisco: Cisco Systems/CTM_78.EmsSessionFactory For Ciena: CIENA/LightWorks_ON-Center.EmsSessionFactory

Table 1 Configuration parameters for connection to Cisco and Ciena EMSs

ems.sessionFactoryBackup	The backup EMS session factory (provided by customer).
ems.userName	The EMS user name (provided by customer).
ems.password	The EMS password (provided by customer).
ems.nameServerIors	URL that resolves to the IOR file for one or more name servers. A valid URL must be provided. The URL is passed to the local CORBA ORB. corbaloc::160.45.110.41:38693/StandardNS/NameServer-POA/_root **Note:** Note that the URL is system-specific when a “file:” URL is specified. A Win32 filename should be specified like “file:///c:/a/b/c.ior” using forward slashes and three slashes between “file:” and the drive letter. Examples (from JacORB documentation): corbaloc::160.45.110.41:38693/StandardNS/NameServer-POA/_root file:c/:/NS_Ref http://www.x.y.z/~user/NS_Ref
ems.emsTracerFile	If the default tracer file directory needs to be specified, it can be added after the "/logs" in the desired path.
ems.logToFilePath	Full path and filename of adapter log.
ems.discovery	To use the TMF814 Adapter for discovery and event processing, set “on”. For event processing only, set to “off”.

The parameters listed in Table 1 on page 12 are used to connect to the SONET/SDH server. Only the parameters in Table 2 on page 13 and should be customized. Other parameters should be kept at default values. These parameters are found under the “connect to SONET,” “connect to PDH” and “connect to WDM” sections and use the otmConnect action.

Note: “Connect for SONET” indicates High-order SONET/SDH.
“Connect for PDH” indicates Low-order SONET and SDH.

Table 2 Configuration parameters for connection to OTM domain managers

Parameter	Description
connectionName	Connection name (can be any string, e.g., “SONET-1”)
connectionType	OTM-SDH-TOPOLOGY, OTM-PDH-TOPOLOGY, or OTM-WDM-TOPOLOGY

Table 2 Configuration parameters for connection to OTM domain managers

connectionSyncher	For a High Order SONET/SDH connection: com.emc.smarts.ce.jablOtmInterface.connection.otmSonetSyncher For a Low Order SONET/SDH (PDH) connection: com.emc.smarts.ce.jablOtmInterface.connection.otmPdhSyncher For a WDM connection: com.emc.smarts.ce.jablOtmInterface.connection.otmDwdmSyncher
icDomain	The domain name (given by the -n argument of sm_server)
managedEms	The name of the managed EMS
pingFrequency	Frequency, in seconds, in which the adapter sends pings to the domain manager.

Example adapterConnections.xml file

This ruleset defines an adapter called “OTM-TMF814-ADAPTER”. The STARTUP rule executes the connect and otmConnect actions if the AdapterName variable is “OTM-TMF814-ADAPTER.” In this example the connect action connects to the Cisco EMS and the otmConnect action connects to the OTM-SDH-TOPOLOGY server.

```
<?xml version="1.0" encoding="UTF-8"?>
<ruleset>
    <!-- global settings -->
    <globals
        otm.basedir="/opt/InCharge7/OTM-5.0/OTM"
    />

    <!-- this creates our adapter -->
    <adapter
        AdapterName="OTM-TMF814-ADAPTER"
        AdapterClass="com.emc.smarts.optical.OtmAdapter"
    />

    <!-- this rule runs at STARTUP time -->
    <rule type="STARTUP">
        <!-- for the adapter called OTM-TMF814-ADAPTER -->
        <condition varName="AdapterName"
   varValue="OTM-TMF814-ADAPTER"/>

        <!-- connect to the Cisco EMS -->
        <action type="java" javaClass="connect">
            <params
                connectionType="TMF814"
                connectionFactory= "com.emc.smarts.optical.tmf814.\
                    emsInterface.OtmTmf814ConnectionFactory"
                connectionSyncherFactory="com.emc.smarts.optical.\
                    tmf814.emsInterface.OtmTmf814SyncherFactory"
                ems.instanceName="Cisco-EMS"
                ems.emsType="CiscoCtm"
                ems.interfaceClass="com.emc.smarts.optical.\
                    tmf814.ciscoCtm.CiscoCtmEmsInterface"
                ems.sessionFactory="Cisco
   Systems/CTM_78.EmsSessionFactory"
                ems.sessionFactoryBackup="Cisco
   Systems/CTM_78.EmsSessionFactory"
                ems.userName="smarts"
                ems.password="smarts123"
                ems.nameServerIors=\
```

```
"corbaloc::lglob070:7685/StandardNS/NameServer-POA/root"
                ems.emsTracerFile="$otm.basedir$/smarts/local/logs"
                ems.trackEventsAndAudit="false"
                ems.saveForSimulator="false"
                ems.supplierProxyDir=""
                ems.emsSwitchingTimeInMinutes="5"
                ems.numberOfTries="2"
                ems.logToFilePath=\
"$otm.basedir$/smarts/local/logs/CiscoAdapter.log"
                ems.maxFileSize="1GB"
                ems.maxBackupIndexForFile="1"
                ems.logFileDuration="14"
                ems.memoryThreshold="10"
                ems.eventChannel="on"
                ems.discovery="on"
                ems.structuredProxyPushSupplierIsPersistent="false"
                ems.maxEventsInTimeslice="1000"
                ems.eventProcessorSleepMsec="10"
                ems.monitorConnection="true"
                ems.connectAttemptMsec="30000"
                ems.emsConnectionPollMsec="5000"
                ems.watchdogTimeoutMsec="3600000"
                ems.managedElementChunkSize="50"
                ems.equipmentChunkSize="50"
                ems.topologicalLinkChunkSize="50"
                ems.subnetworkChunkSize="50"
                ems.subnetworkContainmentChunkSize="50"
                ems.subnetworkConnectionChunkSize="50"
                ems.eventChunkSize="50"
                ems.adapterWorkThreads="6"
            />
        </action>

        <!-- connect to SONET -->
        <action type="java" javaClass="otmConnect">
            <params
                connectionName="OTM-SONET"
                connectionType="OTM-SDH-TOPOLOGY"
                connectionSyncher="com.emc.smarts.ce.\
                   jablOtmInterface.connection.otmSonetSyncher"
                icDomain="OTM-SDH-TOPOLOGY"
                managedEms="Cisco-EMS"
                pingFrequency="30"
            />
        </action>
    </rule>
</ruleset>
```

CHAPTER 3
Processing Managed Element Names

The Adapter for TMF 814 processes the name information found in the EMS to create strings that are used in the Optical Transport Manager. The name information in the EMS is encoded as a set of name/value pairs that are concatenated to form the Optical Transport Manager name.

This chapter contains the following sections:

- Managed element names for SONET devices 18

Managed element names for SONET devices

The examples in this section illustrate, for each class, how the Optical Transport Manager processes the managed element name, along with any other information such as rack, slot, and port, from the EMS record.

OpticalNetworkElement

Table 3 on page 18 shows sample entry items for the OpticalNetworkElement class.

Table 3 Sample OpticalNetworkElement entry items

Item Name	Value
EMS	Cisco Systems/CTM_HA
ManagedElement	Node1

In Optical Transport Manager, the information appears as

```
Node1
```

where the value for Managed Element Name is Node1.

Equipment

Table 4 on page 18 shows sample entry items for the Equipment class.

Table 4 Sample Equipment entry items

Item Name	Value
EMS	Cisco Systems/CTM_HA
ManagedElement	Node1
EquipmentHolder	/rack=1/shelf=1/slot=6
Equipment	OC192

In Optical Transport Manager, the information appears as

```
Node1/1-1-6
```

where the values are

- Managed Element Name = Node1
- Rack = 1
- Shelf = 1
- Slot = 6

Port Termination Point (PTP)

Table 5 on page 19 shows sample entry items for the PTP class.

Table 5 Sample PTP entry items

Item Name	Value
EMS	Cisco Systems/CTM_HA
ManagedElement	Node1
PTP	/rack=1/shelf=1/slot=2/port=3

In Optical Transport Manager, the information appears as

`Node1/1-1-2/3`

where the values are

- Managed Element Name = Node1
- Rack = 1
- Shelf = 1
- Slot = 2
- Port = 3

Connection Termination Point (CTP)

Table 6 on page 19 shows sample entry items for the CTP class.

Table 6 Sample PTP entry items

Item Name	Value
EMS	Cisco Systems/CTM_HA
ManagedElement	Node1
PTP	/rack=1/shelf=1/slot=2/port=3
CTP	/sts1_au3-j=1-k=1

In Optical Transport Manager, the information appears as

Node1`/1-1-2/3/1`

where the values are

- Managed Element Name = Node1
- Rack = 1
- Shelf = 1
- Slot = 2
- Port = 3
- CTP Identifier = 1

TopologicalLink

Table 7 on page 20 shows sample entry items for the TopologicalLink class.

Table 7 Sample TopologicalLink entry items

Item Name	Value
EMS	Cisco Systems/CTM_HA
TopologicalLink	TL1
A-End ManagedElement	Node1
A-End PTP	/rack=1/shelf=1/slot=2/port=3
Z-End ManagedElement	Node2
Z-End PTP	/rack=1/shelf=1/slot=2/port=4

In Optical Transport Manager, the name indicates a logical link between two managed elements and appears as

```
Node1/1-1-2/3->Node2/1-1-2/4
```

where the values are

- A-End Managed Element Name = Node1
- A-End Rack = 1
- A-End Shelf = 1
- A-End Slot = 2
- A-End Port = 3
- Z-End Managed Element Name = Node2
- Z-End Rack = 1
- Z-End Shelf = 1
- Z-End Slot = 2
- Z-End Port = 4

ProtectionGroup

Table 8 on page 20 shows sample entry items for the ProtectionGroup class.

Table 8 Sample ProtectionGroup entry items

Item Name	Value
EMS	Cisco Systems/CTM_HA
ManagedElement	Node1
ProtectionGroup	Node1/PG1

In Optical Transport Manager, the information appears as

`Node1/PG1`

where the values are

- Managed Element Name = `Node1`
- ProtectionGroup = `PG1`

High Order Trail (HO_Trail)

Table 9 on page 21 shows sample entry items for the HO_Trail class.

Table 9 Sample HO_Trail entry items

Item Name	Value
EMS	Cisco Systems/CTM_HA
SubnetworkConnection	SNC1
A-End ManagedElement	Node1
A-End PTP	/rack=1/shelf=1/slot=2/port=3
A-End CTP	/sts1_au3-j=1-k=1
Z-End ManagedElement	Node2
Z-End PTP	/rack=1/shelf=1/slot=2/port=4
Z-End CTP	/sts1_au3-j=1-k=1

In Optical Transport Manager, the information appears as

`Node1/1-1-2/3/1->Node2/1-1-2/4/1`

where the values are

- A-End Managed Element Name = Node1
- A-End Rack = 1
- A-End Shelf = 1
- A-End Slot = 2
- A-End Port = 3
- A-End CTP = 1
- Z-End Managed Element Name = Node2
- Z-End Rack = 1
- Z-End Shelf = 1
- Z-End Slot = 2
- Z-End Port = 4
- Z-End CTP = 1

Note: In the Ciena EMS TMF814 model, there is no direct relationship between SubnetworkConnection (SNC) and TopologicalLink (TL). Instead, an SNC rides over one or multiple working RoutingLink (RL) objects, and each RL consists of one or multiple TLs. Since the RL is not modeled in the OTM Adapter for TMF814, each HO_Trail (i.e., SNC) will be LayeredOver multiple TLs. During root cause analysis, for each PTP alarm processed, the corresponding TL will be Down and it will impact all the Underlying HO_Trails.

Low Order Trail (LO_Trail)

Table 10 on page 22 shows sample entry items for the LO_Trail class.

Table 10 Sample LO_Trail entry items

Item Name	Value
EMS	Cisco Systems/CTM_HA
SubnetworkConnection	SNC2
A-End ManagedElement	Node1
A-End PTP	/rack=1/shelf=1/slot=2/port=3
A-End CTP	/sts1_au3-j=1-k=1/vt15_tu11-l=1-m=1
Z-End ManagedElement	Node2
Z-End PTP	/rack=1/shelf=1/slot=2/port=4
Z-End CTP	/sts1_au3-j=1-k=1/vt15_tu11-l=1-m=1

In Optical Transport Manager, the information appears as

```
Node1/1-1-2/3/1-1->Node2/1-1-2/4/1-1
```

where the values are

- A-End Managed Element Name = Node1
- A-End Rack = 1
- A-End Shelf = 1
- A-End Slot = 2
- A-End Port = 3
- A-End CTP = 1-1
- Z-End Managed Element Name = Node2
- Z-End Rack = 1
- Z-End Shelf = 1
- Z-End Slot = 2
- Z-End Port = 4
- Z-End CTP = 1-1

CHAPTER 4
Analyzed Alarms

This chapter lists Cisco and Ciena device alarms that the TMF 814 Adapter receives. The TMF 814 Adapter translates it into an OTM attribute of the OTM object. The Domain Manager polls the OTM objects and sends notifications to the Service Assurance Manager to display as an event.

This chapter contains the following sections:

- Supported Cisco Alarm Mapping 24
- Supported Ciena Alarm Mapping 25
- Impact of EMS link failures on notifications 25

Supported Cisco Alarm Mapping

Table 11 on page 24 shows the mapping between the Cisco alarms and the OTM attributes.

Table 11 Cisco Alarm Mapping

TMF814 Alarm Attribute			OTM Attribute	OTM Object Class
Object Type	Probable Cause	Native Probable Cause		
OT_CONNECTION_TERMINATION_POINT	AIS		AISDetected	CTP
	BER_SD		SDDetected	
	BER_SF		SFDetected	
	LOP		LOPDetected	
	LOS		LOSDetected	
	PLM		PLMDetected	
	RAI		RDIDetected	
	TIM		TIMDetected	
	UNEQ		UNEQDetected	
	UNIDENTIFIED	Payload Defect Indication	PDIDetected	
OT_PHYSICAL_TERMINATION_POINT	AIS		AISDetected	PTP
	BER_SD		SDDetected	
	BER_SF		SFDetected	
	DCC_FAILURE		IsDCCDown	
	LOF		LOFDetected	
	LOP		LOPDetected	
	LOS		LOSDetected	
	RAI		RDIDetected	
	TIM		TIMDetected	
	UNIDENTIFIED	Carrier Loss on the LAN	LOSDetected	
OT_EQUIPMENT	EQPT	Equipment Failure	IsDown	Equipment
	EQPT	Improper Removal	IsUnavailable	
	EQPT	Automatic Laser Shutdown	IsLaserDown	
	EQPT	Facility Termination Equipment - Receiver Missing	IsRxUnavailable	
	EQPT	Facility Termination Equipment - Transmitter Missing	IsTxUnavailable	
	EQPT	Inhibit Size to Protect Request on Equipment	IsSwitchInhibited	
	EQPT	Inhibit Size to Working Request on Equipment	IsSwitchInhibited	
	EQPT	Internal Fault	IsUnavailable	
		Mismatch of Equipment and Attributes	IsMismatch	
	EQPT	Receiver Failure	IsRxDown	
	EQPT	Transmit Failure	IsTxDown	
	EQPT	Replaceable Equipment/Unit Is Missing	IsUnavailable	
OT_EMS	EMS	Loss of Communication	CommunicationState	OpticalNetworkElement
OT_MANAGED_ELEMENT	EQPT	Fan Failure	failedFanCount	
	ENV	NE Power Failure at connector [AB]	failedPsCount	

Supported Ciena Alarm Mapping

Table 12 on page 25 shows the mapping between the Ciena alarms and the OTM attributes.

Table 12 Ciena Alarm Mapping

TMF814 Alarm Attribute		OTM Attribute	OTM Object Class
Object Type	Probable Cause		
OT_CONNECTION_TERMINATION_POINT	AIS	AISDetected	CTP
	DEGRADED_SIGNAL	SDDetected	
	EXCESSIVE_BER	SFDetected	
	LOSS_OF_POINTER	LOPDetected	
	PATH_TRACE_MISMATCH	TIMDetected	
	PAYLOAD_DEFECT	PDIDetected	
	REMOTE_DEFECT_INDICATION	RDIDetected	
	REMOTE_FAILURE_INDICATION	RDIDetected	
	UNEQUIPPED	UNEQDetected	
OT_PHYSICAL_TERMINATION_POINT	AIS	AISDetected	PTP
	DEGRADED_SIGNAL	SDDetected	
	EXCESSIVE_BER	SFDetected	
	LOSS_OF_FRAME	LOFDetected	
	LOSS_OF_SIGNAL	LOSDetected	
	SECTION_TRACE_MISMATCH	TIMDetected	
OT_MANAGED_ELEMENT	LOSS_OF_COMMUNICATION	CommunicationState	OpticalNetworkElement
OT_EQUIPMENT	COMMUNICATION_SUBSYSTEM_FAILED	IsDown	Equipment
	REPLACEABLE_UNIT_MISSING	IsUnavailable	
	REPLACEABLE_UNIT_PROBLEM	IsDown	
	REPLACEABLE_UNIT_TYPE_MISMATCH	IsMismatch	
	SERVICE_UNSUPPORTED	IsMismatch	
	FAN_LOW_RPM	failedFanCount	OpticalNetworkElement
	POWER_PROBLEM	failedPsCount	

Impact of EMS link failures on notifications

When an EMS link failure occurs, the EMS and the TMF 814 Adapter cannot communicate with each other. This disconnect can be the result of an EMS issue or a TMF 814 Adapter issue. Depending on which component has caused the disconnect, you may or may not be able to retrieve events/alarms that occur during the downtime.

This section describes the two possible scenarios.

Disconnect due to EMS failure

If the link failure is due to a problem with the EMS:

1. The TMF 814 Adapter notifies SAM that the EMS is not available.
2. SAM displays a notification in the Global Console.

Note: For information about notifications and impacts, see the *EMC Smarts Optical Transport Manager User Guide*.

3. While the EMS is down, it cannot send any events/alarms to the TMF 814 Adapter.
4. When the EMS is restored and resumes monitoring, it queries the managed network for status and synchronizes the alarms with the Adapter.

Disconnect due to TMF 814 Adapter failure

If the link failure is due to a problem with the TMF 814 Adapter:

1. SAM displays a notification in the Global Console.
2. While the Adapter is down, the EMS caches all new events/alarms.
3. When the Adapter is restored, it sends a request to the EMS for all active events/alarms.
4. The Adapter maps all events/alarms to EMC Smarts ICS notification attributes and forwards them to the remote client.

CHAPTER 5
Configuring Cross-Domain Circuits

This chapter includes the following sections:

- Creating cross-domain circuits 28
- Automatic circuit creation 29

Creating cross-domain circuits

The existing Topology adapters for OTM are not be able to discover the full, end-to-end topology. Each adapter communicates with an EMS (like the TMF814 adapter) or the optical network elements directly (like the SNMP adapter) to gather topology. These adapters are only able to report topology for their own sub-network. The processing described in this section allows for the creation of end-to-end circuits that traverse multiple sub-networks.

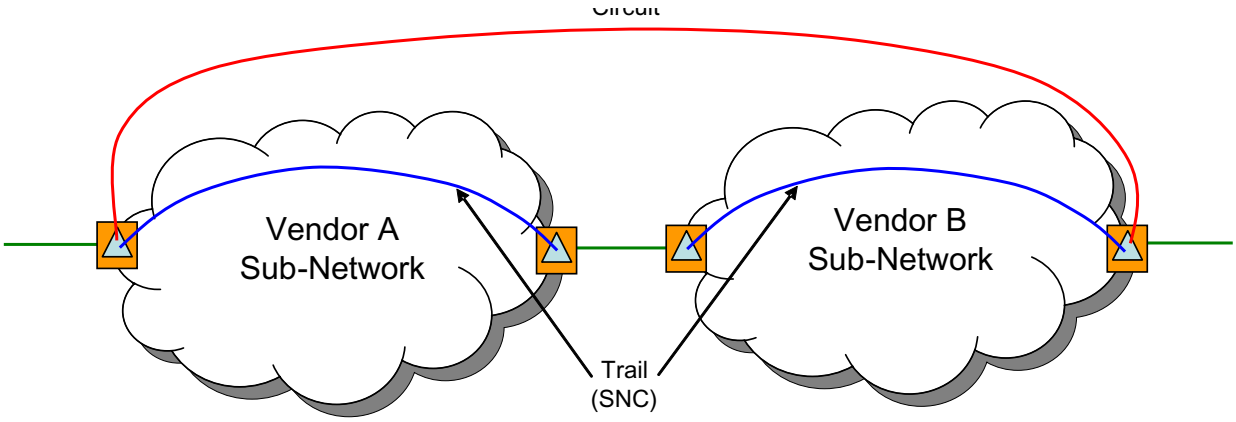

Figure 3 Example of a circuit that spans multiple sub-networks

---

Note: The terms Circuit and Trail are used generically within this section. These may actually be HighOrder_Circuit, LowOrder_Circuit, ClientCircuit, HighOrder_Trial, LowOrder_Trial, or ClientTrail depending on the context.

Circuit creation files

The information for creating end-to-end circuits is specified in text files that will be parsed and processed after the other OTM adapters create the sub-network topologies.

There is a single data file for each OTM domain that contains the circuit data for that domain (SONET/SDH, LO-SONET/SDH, DWDM). By default, the files are:

- conf/sonet-sdh-circuit-create.txt
- conf/lo-sonet-sdh-circuit-create.txt
- conf/wdm-circuit-create.txt

Each circuit record contains enough information to create the Circuit object (for example, A-end and Z-end CTPs) and to create the relationships (for example, LayeredOver and Underlying) with the Trails (sub-network connections (SNCs)) that carry the Circuits.

Any physical topology (TopologicalLinks, DropSideTopologicalLinks) will be created by the adapters and the adapters will create relationships to the Trails when necessary.

- The circuit creation data files must always be present in the /conf (or /local/conf) area.

- The default files are empty except for comments. Therefore, the Automatic circuit creation is disabled by default. ?gAutomatic circuit creation?h on page 34 provides more information.

When the circuit data file for an OTM domain is populated with circuit records, all of the circuits to be created within the topology of the domain must be in the data file. This includes circuits that only span a single sub-network. In other words, either all circuits are created from circuit records or all circuits are created automatically.

Automatic circuit creation

If all of the Circuits within the customer network only span a single sub-network, the circuit data file can contain a single line with the string, AUTOMATICALLY-GENERATE-CIRCUITS.

In this case, the circuit names will automatically be generated based on the Trail A-end and Z-end points.

SONET/SDH and Low-Order SONET/SDH

Circuits will be generated based on Trails that are marked as SNC-created Trails and these Circuits will be layered directly over the Trial (one Circuit over the single Trail). The SNC indication is held in the UserLabel attribute field of the Trails. Any Trail that has the sub-string “SNC” within the UserLabel attribute will be considered an SNC-related Trail.

The names for the automatically generated circuits will be generated based on the A-end and Z-end CTPs from the Trail. The CTP names are parsed from the Trail name so the Trail name needs to contain the A-end and Z-end CTP names separated by an arrow, “->”.

WDM

Circuits will be generated for all Trails within the topology. The names for the automatically generated circuits will be generated based on the A-end and Z-end Port information from the Trail. The names of the A-End Input Port and the Z-End Output Port are used (based on relationships from the Trail directly to these end points).

Record format

This section describes the records that can be included within a data file used for OTM circuit topology creation. This file is a plain text file with each line as an individual record. The fields for each record are separated by pipe delimiters ?g|?h.

- Field separator is the pipe delimiter | and therefore, this symbol cannot be part of any actual data.
- Any field that is specified as Optional must still have a field separator but no data is required, for example, | |.
- Comment lines within the file start with #.
- Blank lines are allowed in the files.
- When object names are required within the data, the names should not include the prefix added by the OTM object factory. For example, CRCT-, CTP-. The EMC Smarts Optical Transport Manager User Guide provides more information.

The individual records, a single line in the file, are composed of a record header and a record body. The record header will have the same format for all records. The record body will have varying formats based on the record type.

Record header format

Table 13 on page 30 shows the record header format. It is common to all records.

Table 13 Record header format for all record types

Field number	Field name	Sample value	Type	Comments
1	Record ID	1000	Integer	Currently there are no checks on the integer values. Ideally there would be a unique value for each record. This is useful when looking into the log files to identify the record within the data file.
2	Record Type	CIRCUIT	String	In this release, the only valid value will be CIRCUIT. In future releases, additional record types may be added such as TL and TLG.
3	Domain	SONET-SDH	String	Identifies the domain that the record should be processed in. The valid values are: SONET-SDH, LO-SONET-SDH, WDM.

Record body format

The basic format for each record body will include some Circuit information followed by sequences of varying number, length and type.

The Circuit data provides the Circuit name, type, A-end, and Z-end CTPs or Ports. The Circuit data format is largely similar for each of the domains, though there some differences. Table 14 on page 31 provides information about the format of the Circuit segment of the body.

The sequence data can be of two types, specifying either the underlying Trails or setting attributes for the Circuit. Table 15 on page 32 provides the format of the Trails segment of the record body and Table 16 on page 32 provides the format of the attribute setting segment

Table 14 Format of circuit segment of record body

Field Number	Field name	Circuit name	Type	Comment
3	Circuit Name	Node1/1-1-8/1/25-› Node3/1-1-8/1/25	String	This field is Optional. If not specified, the circuit name will be created using the A & Z end CTP names for SONET/SDH and Low-order SONET/SDH: (aEndCtpName-›zEndCtpName) or, for DWDM, created using the A-end Input Port name & the Z-end Output Port name. (aEndInputPortname-›zEndOutputPortName)
4	Circuit Type	STS1	String	This field is Optional. If not specified, the LayerRate will be populated with LR_UNKNOWN. This field is not used at this time for DWDM and should be left blank. If populated, the valid circuit types for SONET/SDH include: STS1, STS3, STS3c, STS12, STS12c, STS24c, STS48, STS48c, STS192c, AU3, AU4, AU4_4, AU4_8c, AU4_16, AU4_16c, AU4_64c Valid circuit types for Low-order SONET/SDH include: C2, C11, C12, VC2, VC11, VC12, AU2, AU11, AU12
5	A-End CTP	Node1/1-1-8/1/25	String	CTP name of A end of Circuit (for SONET/SDH or Low-order SONET/SDH) A End Input Port name (for DWDM).
6	Z-End CTP	Node3/1-1-8/1/25	String	CTP name of Z end of Circuit (for SONET/SDH or Low-order SONET/SDH) Z End Input Port name (for DWDM).

A sequence is used when there may be multiple instance of some group of data. The sequence can be repeated multiple times with incrementing sequence numbers. Sequence types can be mixed in the same record. The type of sequences supported for each record is dependent on the Record Type. Table 15 on page 32 shows the record format for the TRAIL sequence.

Table 15 Format for TRAIL circuit type

Field number	Field name	Sample value	Type	Comment
	Sequence Number		Integer	Starts at 1 and increments for each sequence within the record
	Sequence Type	TRAIL	String	TRAIL
	A-end CTP (for High- and Low-order SONET/SDH) A-end Input Port (for DWDM only)	Node 1/1-1-8/1/25	String	A-end of the Trail or Sub-network (for High- and Low-order SONET/SDH) A-end Input Port of the Trail or Sub-network (for DWDM only)
	Z-end CTP (for High- and Low-order SONET/SDH) Z-end Output Port (for DWDM only)	Node 3/1-1-8/1/25	String	Z-end of the Trail or Sub-network (for High- and Low-order SONET/SDH) Z-end Input Port of the Trail or Sub-network (for DWDM only)

The attribute sequence specifies an attribute name and the associated attribute value to be set.

Table 16 on page 32 shows the record format for the attribute sequence format for the TRAIL sequence.

Table 16 Format for Attribute sequence type

Field number	Field name	Sample value	Type	Comment
	Sequence Number		Integer	Starts at 1 and increments for each sequence within the record
	Sequence Type	ATTRIBUTE	String	ATTRIBUTE
	Attribute Type	STRING	String	STRING, INTEGER, BOOLEAN
	Attribute Name	Owner	String	Attribute Name
	Attribute Value	XYZ Corp.	Based on Attribute Type	Attribute Value to be set (true/false for BOOLEAN)

Examples

The following is an example of the record creating a Circuit in SONET/SDH. (Type this string as one line; line feeds in this example have been added for readability.)

```
1000|CIRCUIT|SONET-SDH|||
Node1/1-1-8/1/25|
```

```
ME3/1-3-1-5/1/25|
1|TRAIL|Node1/1-1-8/1/25|Node3/1-1-8/1/25|
2|TRAIL|ME1/1-3-16-2/1/25|ME3/1-3-1-5/1/25|
3|ATTRIBUTE|STRING|Owner|Acme Corp
```

The following text is an example of the record creating a Circuit in DWDM. (Type this string as one line; line feeds in this example have been added for readability.)

```
11000|CIRCUIT|WDM|||
Node1/Node1/2/2/8/1/UNDEFINED/OCN/IN|
Node1/Node1/2/2/7/1/UNDEFINED/OCN/OUT|
1|TRAIL|
Node1/Node1/2/2/8/1/UNDEFINED/OCN/IN|
Node1/Node1/2/2/7/1/UNDEFINED/OCN/OUT|
2|ATTRIBUTE|STRING|ServiceName|NY-to-LA
```

Executing the circuit creation program

The circuit creation processing runs as part of post-processing for each of the OTM Topology servers and may also be invoked manually. Post-processing runs after any topology change initiated by a topology adapter, it runs when the Discover All or Discover Pending commands are initiated by a user, and also may run periodically based on the pending interval if configured by a user. (Pending interval defaults to 6 hours.)

To invoke the processing manually the following command can be run from the /bin area:

```
sm_circuit_create -f <Full Path to the Data File> -s <Server Name> -b
   <Broker> [-o <Log File Name>] [-d (Debug Mode)] [-h (Help)]
```

Note: Type commands as one line. The parameters shown in square brackets are optional.

This same command can be run against each of the OTM Topology servers with parameters specific to each domain. For example:

```
sm_circuit_create -f /opt/InCharge7/smarts/install/local/conf/circuit-
   create.txt -s OTM-SDH-TOPOLOGY -b localhost:42624 -d
```

Circuit deletion

To allow changes to the circuit topology, we support the ability to delete circuits that were previously created by the circuit creation processing. The processing gets circuit names from the data file, searches the topology for an existing circuit with this name, and if found, removes the circuit. This is then repeated for each record in the circuit deletion data file.

IMPORTANT

Before running the Circuit Deletion command, open the corresponding Circuit Creation data file (sonet-sdh-circuit- create.txt, lo-sonet-sdh-circuit-create.txt, or wdm-circuit-create.txt) and comment out or delete the lines containing the circuits to be deleted. Otherwise, the circuits will be created again on server startup.

Deletion file format

The circuit deletion data file requires each line to list the name of a circuit to be deleted.

- Each line contains a circuit name only and no extra data is allowed on the line.
- Comment lines within the file start with “#”.
- Blank lines are allowed in the file.

When object names are required within the data, the names should not include the Prefix added by the OTM object factory. For example, CRCT-, CTP-.

Example file for circuit deletion

```
# This data file is used to delete circuits within the OTM Domain
Managers
ME1/1-3-16-2/1/25->ME3/1-3-1-5/1/25
ME3/1-3-1-4/1/13->ME1/1-3-8-6/1/16
Node1/1-1-8/1/22->Node8/1-1-8/1/22
Node1/1-1-8/1/25->Node3/1-1-8/1/25
```

Executing the circuit deletion program

This circuit deletion processing is invoked manually and is not run as part of the topology server post-processing. This was done to avoid deletion and re-creation of circuits every time post-processing runs.

To invoke the processing manually for the OTM Topology servers, the following command can be run from the /bin area:

```
sm_circuit_delete -f /opt/InCharge7/smarts/install/local/conf/circuit-
   delete.txt -s OTM-SDH-TOPOLOGY -b localhost:42624 -d
```

Note: Type commands as one line. The parameters shown in square brackets are optional.

Log files for creation and deletion

By default, separate log files are created for log messages related to circuit creation and deletion. The name of the creation log file is the name of the related topology server with the “circuit-create.log” suffix. For example, OTM-SDH-TOPOLOGY-circuit-create.log. Similarly, the name of the deletion log file is the name of the related topology server with the “circuit-delete.log” suffix.

An indication within the server log file indicates each time the circuit creation processing starts and finishes so that the relative time of processing can be seen.

There is a single RECORD_ERROR message in the log file for each record that is not fully processed to success. RECORD_ERROR can be searched for in the log file to identify all of the “Fallouts”. Additional error messages may be included in the log file to give more details of the error when possible. Also, each time either process runs there are some basic statistics printed at the end of processing (number of circuits created, number of erred records, etc.).

CHAPTER 6
Adapter for TMF 814 Log Files

This chapter includes the following sections:

- Ciena EMS Adapter logs 36
- Cisco EMS Adapter logs 38

For additional information about logging, see the *EMC Smarts Optical Transport Manager User Guide* and the *EMC Smarts System Administration Guide*.

Ciena EMS Adapter logs

Table 17 on page 36 describes the Ciena EMS Adapter log files.

Table 17 Ciena EMS Adapter logs

Log file	Description	Used in production ?	Java-generated ?	Standard sm_server log?	Active log file management (size/cnt)?	Configuration source
TTMF814-CIENA_en_US_UTF-8.log	Primary EMS Adapter log **Note:** To see contents of this file in TMF814 log, adjust --loglevel.	Yes	No	Yes	Yes	SM_BACKUP_FILE_LIMIT The *EMC Smarts System Administration Guide* provides more information on managing log files.
CienaAdapter.log.<*mmddyyyy*>	TMF814 EMS Adapter generates this log.	No (diagnostic only)	Yes	No	Yes	adapterConnections.xml: • **Path:** **If** ems.logToFilePath = "$otm.basedir$/smarts/local/logs/CienaAdapter.log" • **Duration:** (default 14 days) ems.logFileDuration= 14"
Ciena-EMS_<*current_date_time*>_audit.txt	TMF814 EMS Adapter generates this log. Tracks event handling of each event at very low level.	No (diagnostic only)	Yes	No	Yes (ApacheLogFor J)	adapterConnections.xml: • **Enable: ems.trackEventsAndAudit ="true"** • **Path**: ems.emsTracerFile • **Size**: ems.maxFileSize • **Backup count**: ems. maxBackupIndexForFile
Ciena-EMS_<*current_date_time*>_event.bin	TMF814 EMS Adapter generates this log. Captures in binary format for off-site simulator use a very detailed trace of interaction with EMS.	No (diagnostic only)	Yes	No	No	adapterConnections.xml: • **Enable: ems.trackEventsAndAudit ="true"** ems.saveForSimulator ="true"

Table 17 Ciena EMS Adapter logs (continued)

Log file	Description	Used in production ?	Java-generated ?	Standard sm_server log?	Active log file management (size/cnt)?	Configuration source
Ciena-EMS_‹*current_date_time*›_event.txt	TMF814 EMS Adapter generates this log. Human-readable subset of bin file.	No (diagnostic only)	Yes	No	Yes (ApacheLogFor J)	adapterConnections.xml: • **Enable**: **ems.trackEventsAndAudit ="true"** • **Path**: ems.emsTracerFile • **Size**: ems.maxFileSize • **Backup count**: ems.maxBackupIndexForFile
Ciena-EMS_‹*current_date_time*›_topo.bin	TMF814 EMS Adapter generates this log. Captures in binary format for off-site simulator use a very detailed trace of interaction with EMS.	No (diagnostic only)	Yes	No	No	adapterConnections.xml: • **Enable**: **ems.trackEventsAndAudit ="true"** ems.saveForSimulator ="true"
Ciena-EMS_‹*current_date_time*›_topo.txt	TMF814 EMS Adapter generates this log. Human-readable subset of bin file.	No (diagnostic only)	Yes	No	No	adapterConnections.xml: • **Enable**: **ems.trackEventsAndAudit ="true" ems.saveForSimulator ="true"** • **Path**: ems.emsTracerFile • **Size**: ems.maxFileSize • **Backup count**: ems.maxBackupIndexForFile

Cisco EMS Adapter logs

Table 18 on page 38 describes the Cisco EMS Adapter log files.

Table 18 Cisco EMS Adapter logs

Log file	Description	Used in production ?	Java-generated ?	Standard sm_server log?	Active log file management (size/cnt)?	Configuration source
TMF814-CISCO_en_US_UTF-8.log	Primary EMS Adapter log **Note:** To see contents of this file in TMF814 log, adjust --loglevel.	Yes	No	Yes	Yes	SM_BACKUP_FILE_LIMIT The *EMC Smarts System Administration Guide* provides more information on managing log files.
CiscoAdapter.log.‹*mmddyyyy*›	IC-CISCO-CTM EMS Adapter generates this log.	No (diagnostic only)	Yes	No	Yes	adapterConnections.xml: • **Enable**: if ems.logToFilePath = "$otm.basedir$/smarts/local/logs/CiscoAdapter.log" • **Duration:** (default 14 days) ems.logFileDuration=14"
Cisco-EMS_‹*current_date_time*›_audit.txt	IC-CISCO-CTM EMS Adapter generates this log. Tracks event handling of each event at very low level.	No (diagnostic only)	Yes	No	Yes (ApacheLogFor J)	adapterConnections.xml: • **Enable**: **ems.trackEventsAndAudit ="true"** • **Path**: ems.emsTracerFile • **Size**: ems.maxFileSize • **Backup count**: ems.maxBackupIndexForFile
Cisco-EMS_‹*current_date_time*›_event.bin	IC-CISCO-CTM EMS Adapter generates this log. Captures in binary format for off-site simulator use a very detailed trace of interaction with EMS.	No (diagnostic only)	Yes	No	No	adapterConnections.xml: • **Enable**: **ems.trackEventsAndAudit ="true"** ems.saveForSimulator ="true"

Table 18 Cisco EMS Adapter logs

Log file	Description	Used in production ?	Java-generated ?	Standard sm_server log?	Active log file management (size/cnt)?	Configuration source
Cisco-EMS_‹*current_date_time*›_event.txt	IC-CISCO-CTM EMS Adapter generates this log. Human-readable subset of bin file.	No (diagnostic only)	Yes	No	Yes (ApacheLogFor J)	adapterConnections.xml: • **Enable**: **ems.trackEventsAndAudit ="true"** • **Path**: ems.emsTracerFile • **Size**: ems.maxFileSize • **Backup count**: ems.maxBackupIndexForFile
Cisco-EMS_‹*current_date_time*›_topo.bin	IC-CISCO-CTM EMS Adapter generates this log. Captures in binary format for off-site simulator use a very detailed trace of interaction with EMS.	No (diagnostic only)	Yes	No	No	adapterConnections.xml: • **Enable**: **ems.trackEventsAndAudit ="true"** ems.saveForSimulator ="true"
Cisco-EMS_‹*current_date_time*›_topo.txt	IC-CISCO-CTM EMS Adapter generates this log. Human-readable subset of bin file.	No (diagnostic only)	Yes	No	No	adapterConnections.xml: • **Enable**: **ems.trackEventsAndAudit ="true" ems.saveForSimulator ="true"** • **Path**: ems.emsTracerFile • **Size**: ems.maxFileSize • **Backup count**: ems.maxBackupIndexForFile

APPENDIX A
Understanding the sm_edit Utility

As part of the EMC Smarts deployment and configuration process, you need to modify certain files. User modifiable files include configuration files, rule set files, templates, and seed files that contain encrypted passwords. Original versions of these files are installed into appropriate subdirectories under the BASEDIR/smarts/ directory.

The original versions of files should not be altered. If a file must be modified, a new version should be created and then stored as a local copy of the file in BASEDIR/smarts/local or one of its subdirectories.

When EMC Smarts software requires one of these files, it is designed to first search for a modified file in BASEDIR/smarts/local or one of its subdirectories. If a modified version of a file is not found in the local area, EMC Smarts software then searches corresponding BASEDIR/smarts directories for the original version of the file.

To ease file editing and storage, EMC Corporation provides the sm_edit utility with every EMC Smarts product suite. When invoked, sm_edit opens the specified file in a text editor. This utility ensures that modified files are always saved to the appropriate local area and that non-local copies of all files remain unchanged. If an appropriate subdirectory does not exist for the file you are modifying, sm_edit creates the appropriate subdirectory before saving the modified file to that location. For files with header information set for encryption, sm_edit encrypts certain fields in the file. In addition, sm_edit preserves the file permissions of modified files, which helps ensure that important configuration files are not altered by unauthorized users.

Example

Modify ics.conf

To use sm_edit from the command line, specify the file name and include the subdirectory under /local where the file resides. For example, to edit the ics.conf, enter:

```
# BASEDIR/smarts/bin> sm_edit conf/ics/ics.conf
```

In this example, sm_edit searches in the BASEDIR/smarts/local/conf/ics directory for the ics.conf file. If it finds the ics.conf file, it opens the file in a text editor. If sm_edit does not find the ics.conf file in the BASEDIR/smarts/local/conf/ics directory, it creates a local copy of the ics.conf file and writes it to the BASEDIR/smarts/local/conf/ics directory.

The *EMC Smarts System Administration Guide* provides additional information about the sm_edit utility, including how to configure the utility to use a specific editor.

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