Fault Management of ONS 15454 Using Simple Network Management Protocol

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Introduction

Cisco recommends using Cisco Transport Manager (CTM) as the Element Management System (EMS) to monitor traps from a Cisco ONS 15454, and recommends Cisco Information Center (CIC) as the Network Management System (NMS) to monitor network wide faults and alarms. Use this document with an existing fault management platform, such as Hewlett–Packard OpenView (HPOV) as the primary interface to view faults.

This document explains how an ONS 15454 sends traps, the contents of a trap, and what action should be taken on a fault management platform, such as HPOV, to decipher the traps. Since there are minor differences in name in the various releases of ONS 15454, this document highlights the differences when applicable.

Prerequisites

Requirements

This document assumes that you have a basic understanding of Simple Network Management Protocol (SNMP) traps, and can interpret the contents in a Management Information Base System (MIBS) defining the trap.

Read this document in conjunction with the ONS 15454 User Documentation.

Components Used

This document is not restricted to specific software and hardware versions.

Conventions

Refer to the Cisco Technical Tips Conventions for more information on document conventions.

Description of ONS 15454 Traps

The ONS 15454 uses SNMP traps as one mechanism to inform its upper level management systems of any alarm condition experienced during its operation. The MIBS for ONS 15454 Software Release 2.2 is defined in these three files:

- cerentRegistry.mib
- cerentTC.mib
- cerent454.mib

The names of these files have been changed since Release 4.6 of the ONS 15454 system software to indicate the name of the MIBS modules. The names of these MIBS files are:

- CERENT−GLOBAL−REGISTRY.mib
- CERENT−TC.mib
- CERENT−454−MIB.mib
- CERENT−GENERIC−MIB.mib (for ONS 15327 only)
- CISCO−SMI.mib
- CISCO−VOA−MIB.mib
- CERENT−MSDWDM−MIB.mib
- CISCO−OPTICAL−MONITOR−MIB.mib
- CERENT−FC−MIB.mib

Note: The CERENT−MSDWDM−MIB.mib and CERENT−FC−MIB.mib in the CiscoV2 directory support 64−bit performance monitoring counters. However, the respective SNMPv1 MIB in the CiscoV1 directory does not contain 64−bit performance monitoring counters, but supports the lower and higher word values of the corresponding 64−bit counter. The other MIB files in the CiscoV1 and CiscoV2 directories are identical in content and differ only in format.

Note: Different MIB files are used for the ONS 15454 (or ONS 15454 SDH) and the ONS 15327, respectively. The file CERENT−454−MIB.mib contains the object and trap definitions pertaining to the ONS 15454 (both SONET and SDH platforms). The file CERENT−GENERIC−MIB.mib contains the object and trap definitions pertaining to the ONS 15327. When provisioning the Network Management System for the ONS 15454 or ONS 15454 SDH, use the file CERENT−454−MIB.mib. When provisioning the Network Management System for the ONS 15327, use the file CERENT−GENERIC−MIB.mib.

A unique feature of SNMP is that a particular version of a MIBS is always compatible with all the earlier versions of the same file. For instance, the CERENT−454−MIB.mib file from the Release 3.0 distribution CD is compatible with software version Release 2.2.3, 2.2.1, 2.0, and so on. This is a mandatory property of every SNMP MIBS, and Cisco Optical Transport Business Unit (OTBU) proprietary MIBS files are no exception.

Structure of a Trap from ONS 15454

The traps of the ONS 15454 are defined in the cerent454.mib file. This is the CERENT−454−MIB.mib file in release 3.0. Traps generated by the ONS 15454 contain an object ID that uniquely identifies the alarm. An entity identifier uniquely identifies which entity generated the alarm (slot, port, Synchronous Transport Signal [STS], Virtual Tributary [VT], Bidirectional Line Switched Rings [BLSR], Spanning−Tree Protocol [STP], and so on). The traps give the severity of the alarm (critical, major, minor, event, and so on), and indicate whether the alarm is service affecting or non−service affecting. The traps also contain a date/time stamp that shows the date and time the alarm occurred. The ONS 15454 also generates a trap for each alarm when the alarm condition clears. Each SNMP trap contains ten variable bindings.

This table shows the structure of an ONS 15454 trap:

SNMP Trap Variable Bindings for ONS 15454 Number	Name	Description
1	sysUpTime	The first variable binding in the variable binding list of a SNMPv2–Trap–PDU.
2	snmpTrapOID	The second variable binding in the variable binding list of a SNMPv2–Trap–PDU.
3	cerentNodeTime	This variable gives the time that an event occurred.
4	cerent454AlarmState	This variable specifies alarm severity and service–affecting status. Severities are minor, major and critical. Service–affecting statuses are service–affecting and non–service affecting.
5	cerent454AlarmObjectType	This variable provides the entity type that raised the alarm. The NMS should use this value to decide which table to poll for further information about the alarm.
6	cerent454AlarmObjectIndex	Every alarm is raised by an object entry in a specific table. This variable is the index of the objects in each table. If the alarm is interface related, this is the index of the interfaces in the interface table.
7	cerent454AlarmSlotNumber	This variable indicates the slot of the object that raised the alarm. If a slot is not relevant to the alarm, the slot

		number is zero.
8	cerent454AlarmPortNumber	This variable provides the port of the object that raised the alarm. If a port is not relevant to the alarm, the port number is zero.
9	cerent454AlarmLineNumber	This variable provides the object line that raised the alarm. If a line is not relevant to the alarm, the line number is zero.
10	cerent454AlarmObjectName	This variable gives the TL1−style user−visible name which uniquely identifies an object in the system.

SNMP Trap Variable Bindings used in ONS 15327 Number	Name	Description
1	sysUpTime	This table holds all the currently raised alarms. When an alarm is raised, it appears as a new entry in the table. When an alarm is cleared, it is removed from the table and all the subsequent entries move up by one row.
2	snmpTrapID	This variable uniquely identifies each entry in an alarm table. When an alarm in the alarm table clears, the alarm indexes change for each alarm

		located subsequent to the cleared alarm.
3	cerentNodeTime	This variable gives the time that an event occurred.
4	cerentGenericAlarmState	This variable specifies alarm severity and service−affecting status. Severities are minor, major and critical. Service−affecting statuses are service−affecting and non−service affecting.
5	cerentGenericAlarmObjectType	This variable provides the entity type that raised the alarm. The NMS should use this value to decide which table to poll for further information about the alarm.
6	cerentGenericAlarmObjectIndex	Every alarm is raised by an object entry in a specific table. This variable is the index of the objects in each table; if the alarm is interface related, this is the index of the interfaces in the interface table.
7	cerentGenericAlarmSlotNumber	This variable indicates the slot of the object that raised the alarm. If a slot is not relevant to the alarm, the slot

		number is zero.
8	cerentGenericAlarmPortNumber	This variable provides the port of the object that raised the alarm. If a port is not relevant to the alarm, the port number is zero.
9	cerentGenericAlarmLineNumber	This variable provides the object line that raised the alarm. If a line is not relevant to the alarm, the line number is zero.
10	cerentGenericAlarmObjectName	This variable gives the TL1–style user–visible name which uniquely identifies an object in the system.

The IETF standard documents, known as requests for comments (RFCs), contain MIB object definitions with detailed descriptions. These definitions are extracted from the RFCs and made available as MIB files on the CD. RFCs can be obtained from many sources such as the official IETF website ⬈ .

These standard MIB files, included on the CD, must be loaded into your network management system. They are located in the Standard directory.

IETF Standard MIBs Implemented in the ONS 15454 and ONS 15327 SNMP Agent RFC#	Module Name	Title/Comments
	IANAifType–MIB.mib	Internet Assigned Numbers Authority (IANA) ifType
1213 1907	RFC1213–MIB–rfc1213.mib, SNMPV2–MIB–rfc1907.mib	Management Information Base for Network Management of

		TCP/IP−based internets:MIB−II Management Information Base for Version 2 of the Simple Network Management Protocol (SNMPv2)
1253	RFC1253−MIB−rfc1253.mib	OSPF Version 2 Management Information Base
1493	BRIDGE−MIB−rfc1493.mib	Definitions of Managed Objects for Bridges. This defines MIB objects for managing MAC bridges based on the IEEE 802.1D−1990 standard between Local Area Network (LAN) segments.
1757	RMON−MIB−rfc1757.mib	Remote Network Monitoring Management Information Base
2737	ENTITY−MIB−rfc2737.mib	Entity MIB (Version 2)
2233	IF−MIB−rfc2233.mib	The Interfaces Group MIB using SMIv2
2358	EtherLike−MIB−rfc2358.mib	Definitions of Managed Objects for the Ethernet−like Interface Types
2493	PerfHist−TC−MIB−rfc2493.mib	Textual Conventions for MIB Modules Using Performance History Based on 15 Minute Intervals
2495	DS1−MIB−rfc2495.mib	Definitions of Managed Objects

		for the DS1, E1, DS2 and E2 Interface Types
2496	DS3−MIB−rfc2496.mib	Definitions of Managed Object for the DS3/E3 Interface Type
2558	SONET−MIB−rfc2558.mib	Definitions of Managed Objects for the SONET/SDH Interface Type
2674	P−BRIDGE−MIB−rfc2674.mib Q−BRIDGE− MIB−rfc2674.mib	Definitions of Managed Objects for Bridges with Traffic Classes, Multicast Filtering and Virtual LAN Extensions

The ONS 15454 supports generic and Internet Engineering Task Force (IETF) traps. The Standard category consists of all the IETF and IANA standard MIB files you need for your operations.

This table lists the traps supported in the ONS 15454:

Traps Supported in the ONS 15454 Trap	From RFC# MIB	Description
coldStart	RFC1907−MIB	Agent up, cold start
warmStart	RFC1907−MIB	Agent up, warm start
authenticationFailure	RFC1907−MIB	Community string does not match
newRoot	RFC1493/ BRIDGE−MIB	Sending agent is the new root of the spanning tree
topologyChange	RFC1493/ BRIDGE−MIB	A port in a bridge has changed from Learning to Forwarding or Forwarding to Blocking
entConfigChange	RFC2737/ ENTITY−MIB	The entLastChangeTime value has changed
dsx1LineStatusChange	RFC2495/ DS1−MIB	A dsx1LineStatusChange trap is sent when the value of an instance dsx1LineStatus changes. The trap can be used by an NMS to trigger polls. When the line status change results from a higher−level

		line status change (such as DS−3), no traps for the DS−1 are sent.
dsx3LineStatusChange	RFC2496/ DS3−MIB	A dsx3LineStatusLastChange trap is sent when the value of an instance of dsx3LineStatus changes. This trap can be used by an NMS to trigger polls. When the line status change results in a lower−level line status change (such as DS−1), no traps for the lower−level are sent.
risingAlarm	RFC1757/ RMON−MIB	The SNMP trap that is generated when an alarm entry crosses the rising threshold and the entry generates an event that is configured for sending SNMP traps.
fallingAlarm	RFC1757/ RMON−MIB	The SNMP trap that is generated when an alarm entry crosses the falling threshold and the entry generates an event that is configured for sending SNMP traps.

Determine the Severity of a Trap

The type of trap received cannot alone determine the severity of a trap. You must view the inside contents of the trap to determine the severity of the trap. The alarm/trap severities can be provisioned in the ONS 15454. The Object Identifier (OID) cerent454AlarmState specifies the severity of the alarm and the service affecting status. The possible values for cerent454AlarmState are other (1), crucial (10), administrative (20), diagnostic (30), cleared (40), minorNonServiceAffecting (50), majorNonServiceAffecting (60), criticalNonServiceAffecting (70), minorServiceAffecting (80), majorServiceAffecting (90), criticalServiceAffecting (100). The current implementations for Release 2.2 and Release 3.0 do not have any traps that are of type crucial and diagnostic.

Action to take in HPoV

These steps are written for HP Network Node Manager (NNM) Version 6.1. Consult the user documentation of your version of HP NNM for more information on how to compile an MIB and on changing contents in the trapd.conf file. Use this procedure as a guideline:

1. Compile cerentRegistry.mib, cerentTC.mib, and cerent454.mib in the same order as mentioned here into HPoV.
2. Copy the current trapd.conf as trapd.conf.old. This is an important step. In the event that something missed, you can always revert the file name and return the original setup.

3. In trapd.conf file, replace the string NO FORMAT DEFINED with $N $2 Object:$3 Index:$4 Slot:$5 Port:$6, using any text editor (VI, Emacs, Wordpad, and so on). Ensure this replacement is done only for traps loaded from Cisco OTBU proprietary MIBS files.
4. In trapd.conf file, replace the string LOGONLY with Error Alarms, using any text editor (VI, Emacs, Wordpad, and so on). Ensure this replacement is done only for traps loaded from Cisco OTBU proprietary MIBS files.
5. This makes every trap received from the 15454 appear appropriately on the alarm browser.
6. Save and restart HPoV.

Related Information

- **Optical Technology Support Page**
- **Technical Support & Documentation – Cisco Systems**