OSPF MIB Support of RFC 1850 and Latest Extensions

The OSPF MIB Support of RFC 1850 and Latest Extensions feature introduces the capability for Simple Network Management Protocol (SNMP) monitoring on the Open Shortest Path First (OSPF) routing protocol. Users have an improved ability to constantly monitor the changing state of an OSPF network by use of MIB objects to gather information relating to protocol parameters and trap notification objects that can signal the occurrence of significant network events such as transition state changes. The protocol information collected by the OSPF MIB objects and trap objects can be used to derive statistics that will help monitor and improve overall network performance.

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Finding Feature Information

Your software release may not support all the features documented in this module. For the latest caveats and feature information, see Bug Search Tool and the release notes for your platform and software release. To find information about the features documented in this module, and to see a list of the releases in which each feature is supported, see the feature information table.

Use Cisco Feature Navigator to find information about platform support and Cisco software image support. To access Cisco Feature Navigator, go to www.cisco.com/go/cfn. An account on Cisco.com is not required.

Prerequisites for OSPF MIB Support of RFC 1850 and Latest Extensions

- OSPF must be configured on the router.

- Simple Network Management Protocol (SNMP) must be enabled on the router before notifications (traps) can be configured or before SNMP GET operations can be performed.

Information About OSPF MIB Support of RFC 1850 and Latest Extensions

The following sections contain information about MIB objects standardized as part of RFC 1850 and defined in OSPF-MIB and OSPF-TRAP-MIB. In addition, extensions to RFC 1850 objects are described as defined in the two Cisco private MIBs, CISCO-OSPF-MIB and CISCO-OSPF-TRAP-MIB.

OSPF MIB Changes to Support RFC 1850

OSPF MIB

This section describes the new MIB objects that are provided by RFC 1850 definitions. These OSPF MIB definitions provide additional capacity that is not provided by the standard OSPF MIB that supported the previous RFC 1253. To see a complete set of OSPF MIB objects, see the OSPF-MIB file.

The table below shows the new OSPF-MIB objects that are provided by RFC 1850 definitions. The objects are listed in the order in which they appear within the OSPF-MIB file, per the tables that describe them.

Table 1: New OSPF-MIB Objects

OSPF-MIB Table	New MIB Objects
OspfAreaEntry table	• OspfAreaSummary • OspfAreaStatus
OspfStubAreaEntry	• OspfStubMetricType
OspfAreaRangeEntry	• OspfAreaRangeEffect
OspfHostEntry	• OspfHostAreaID
OspfIfEntry	• OspfIfStatus • OspfIfMulticastForwarding • OspfIfDemand • OspfIfAuthType
OspfVirtIfEntry	• OspfVirtIfAuthType
OspfNbrEntry	• OspfNbmaNbrPermanence • OspfNbrHelloSuppressed

OSPF-MIB Table	New MIB Objects
OspfVirtNbrEntry	• OspfVirtNbrHelloSuppressed
OspfExtLsdbEntry	• OspfExtLsdbType • OspfExtLsdbLsid • OspfExtLsdbRouterId • OspfExtLsdbSequence • OspfExtLsdbAge • OspfExtLsdbChecksum • OspfExtLsdbAdvertisement
OspfAreaAggregateEntry	• OspfAreaAggregateAreaID • OspfAreaAggregateLsdbType • OspfAreaAggregateNet • OspfAreaAggregateMask • OspfAreaAggregateStatusospfSetTrap • OspfAreaAggregateEffect

OSPF TRAP MIB

This section describes scalar objects and MIB objects that are provided to support RFC 1850.

The following scalar objects are added to OSPF-TRAP-MIB and are listed in the order in which they appear in the OSPF-TRAP-MIB file:

- OspfExtLsdbLimit
- OspfMulticastExtensions
- OspfExitOverflowInterval
- OspfDemandExtensions

The ospfSetTrap control MIB object contains the OSPF trap MIB objects that enable and disable OSPF traps in the IOS CLI. These OSPF trap MIB objects are provided by the RFC 1850 standard OSPF MIB. To learn how to enable and disable the OSPF traps, see the How to Enable OSPF MIB Support of RFC 1850 and Latest Extensions, on page 7.

The table below shows the OSPF trap MIB objects, listed in the order in which they appear within the OSPF-TRAP-MIB file.

Table 2: New OSPF-TRAP-MIB Objects

OSPF Control MIB Object	Trap MIB Objects
ospfSetTrap	• ospfIfStateChange • ospfVirtIfStateChange • ospfNbrStateChange • ospfVirtNbrState • ospfIfConfigError • ospfVirtIfConfigError • ospfIfAuthFailure • ospfVirtIfAuthFailure • ospfIfRxBadPacket • ospfVirtIfRxBadPacket • ospfTxRetransmit • ospfVirtIfTxRetransmit • ospfOriginateLsa • ospfMaxAgeLsa

CISCO OSPF MIB

This section describes scalar and Cisco-specific OSPF MIB objects that are provided as extensions to support the RFC 1850 OSPF MIB definitions, to provide capability that the standard MIB cannot provide.

The following scalar objects are added to OSPF-OSPF-MIB:

- cospfRFC1583Compatibility
- cospfOpaqueLsaSupport
- cospfOpaqueASLsaCount
- cospfOpaqueASLsaCksumSum

For each of the following table entries, the new Cisco-specific MIB objects that are provided as extensions to support the RFC 1850 OSPF MIB definitions are listed. To see the complete set of objects for the Cisco-specific OSPF MIB, refer to the CISCO-OSPF-MIB file.

The table below shows the new CISCO-OSPF-MIB objects that are provided by RFC 1850 definitions. The objects are listed in the order in which they appear within the CISCO-OSPF-MIB file, per the tables that describe them.

Table 3: New CISCO-OSPF-MIB Objects

CISCO-OSPF-MIB Table	New MIB Objects
cospfAreaEntry	• cospfOpaqueAreaLsaCount • cospfOpaqueAreaLsaCksumSum • cospfAreaNssaTranslatorRole • cospfAreaNssaTranslatorState • cospfAreaNssaTranslatorEvents
cospfLsdbEntry	• cospfLsdbType • cospfLsdbSequence • cospfLsdbAge • cospfLsdbChecksum • cospfLsdbAdvertisement
cospfIfEntry	• cospfIfLsaCount • cospfIfLsaCksumSum
cospfVirtIfEntry	• cospfVirtIfLsaCount • cospfVirtIfLsaCksumSum
cospfLocalLsdbEntry	• cospfLocalLsdbIpAddress • cospfLocalLsdbAddressLessIf • cospfLocalLsdbType • cospfLocalLsdbLsid • cospfLocalLsdbRouterId • cospfLocalLsdbSequence • cospfLocalLsdbAge • cospfLocalLsdbChecksum • cospfLocalLsdbAdvertisement

CISCO-OSPF-MIB Table	New MIB Objects
cospfVirtLocalLsdbEntry	• cospfVirtLocalLsdbTransitArea • cospfVirtLocalLsdbNeighbor • cospfVirtLocalLsdbType • cospfVirtLocalLsdbLsid • cospfVirtLocalLsdbRouterId • cospfVirtLocalLsdbSequence • cospfVirtLocalLsdbAge • cospfVirtLocalLsdbChecksum • cospfVirtLocalLsdbAdvertisement

CISCO OSPF TRAP MIB

The cospfSetTrap MIB object represents trap events in CISCO-OSPF-TRAP-MIB. This is a bit map, where the first bit represents the first trap. The following MIB objects are TRAP events that have been added to support RFC 1850. To see a complete set of Cisco OSPF Trap MIB objects, see the CISCO-OSPF-TRAP-MIB file.

The table below shows the trap events described within the cospfSetTrap MIB object in the CISCO-TRAP-MIB:

Table 4: CISCO-OSPF Trap Events

CISCO-OSPF-TRAP-MIB Trap Events	Trap Event Description
cospfIfConfigError	This trap is generated for mismatched MTU parameter errors that occur when nonvirtual OSPF neighbors are forming adjacencies.
cospfVirtIfConfigError	This trap is generated for mismatched MTU parameter errors when virtual OSPF neighbors are forming adjacencies.
cospfTxRetransmit	This trap is generated in the case of opaque LSAs when packets are sent by a nonvirtual interface. An opaque link-state advertisement (LSA) is used in MPLS traffic engineering to distribute attributes such as capacity and topology of links in a network. The scope of this LSA can be confined to the local network (Type 9, Link-Local), OSPF area (Type 20, Area-Local), or autonomous system (Type 11, AS scope). The information in an opaque LSA can be used by an external application across the OSPF network.
cospfVirtIfTxRetransmit	This trap is generated in the case of opaque LSAs when packets are sent by a virtual interface.
cospfOriginateLsa	This trap is generated when a new opaque LSA is originated by the router when a topology change has occurred.

CISCO-OSPF-TRAP-MIB Trap Events	Trap Event Description
cospfMaxAgeLsa	The trap is generated in the case of opaque LSAs.
cospfNssaTranslatorStatusChange	The trap is generated if there is a change in the ability of a router to translate OSPF type-7 LSAs into OSPF type-5 LSAs.

For information about how to enable OSPF MIB traps, see the How to Enable OSPF MIB Support of RFC 1850 and Latest Extensions, on page 7.

Benefits of the OSPF MIB

The OSPF MIBs (OSPF-MIB and OSPF-TRAP-MIB) and Cisco private OSPF MIBs (CISCO-OSPF-MIB and CISCO-OSPF-TRAP-MIB) allow network managers to more effectively monitor the OSPF routing protocol through the addition of new table objects and trap notification objects that previously were not supported by the RFC 1253 OSPF MIB.

New CLI commands have been added to enable SNMP notifications for OSPF MIB support objects, Cisco-specific errors, retransmission and state-change traps. The SNMP notifications are provided for errors and other significant event information for the OSPF network.

How to Enable OSPF MIB Support of RFC 1850 and Latest Extensions

Enabling OSPF MIB Support

Before you begin

Before the OSPF MIB Support of RFC 1850 and Latest Extensions feature can be used, the SNMP server for the router must be configured.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **snmp-server community** *string1* **ro**
4. **snmp-server community** *string2* **rw**
5. **snmp-server host** {*hostname* | *ip-address*} [**vrf** *vrf-name*] [**traps** | **informs**] [**version** {**1** | **2c** | **3** [**auth** | **noauth** | **priv**]}] *community-string* [**udp-port** *port*] [*notification-type*]
6. **snmp-server enable traps ospf**
7. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**snmp-server community** *string1* **ro** **Example:** `Router(config)# snmp-server community public ro`	Enables read access to all objects in the MIB, but does not allow access to the community strings.
Step 4	**snmp-server community** *string2* **rw** **Example:** `Router(config)# snmp-server community private rw`	Enables read and write access to all objects in the MIB, but does not allow access to the community strings.
Step 5	**snmp-server host** {*hostname* | *ip-address*} [**vrf** *vrf-name*] [**traps** | **informs**] [**version** {**1** | **2c** | **3** [**auth** | **noauth** | **priv**]}] *community-string* [**udp-port** *port*] [*notification-type*] **Example:** `Router(config)# snmp-server host 172.20.2.162 version 2c public ospf`	Specifies a recipient (target host) for SNMP notification operations. • If no *notification-type* is specified, all enabled notifications (traps or informs) will be sent to the specified host. • If you want to send only the OSPF notifications to the specified host, you can use the optional **ospf**keyword as one of the *notification-types*. (See the example.) Entering the **ospf** keyword enables the ospfSetTrap trap control MIB object.
Step 6	**snmp-server enable traps ospf** **Example:** `Router(config)# snmp-server enable traps ospf`	Enables all SNMP notifications defined in the OSPF MIBs. **Note** This step is required only if you wish to enable all OSPF traps. When you enter the **no snmp-server enable traps ospf** command, all OSPF traps will be disabled.
Step 7	**end** **Example:** `Router(config)# end`	Ends your configuration session and exits global configuration mode.

What to Do Next

If you did not want to enable all OSPF traps, follow the steps in the following section to selectively enable one or more types of OSPF trap:

Enabling Specific OSPF Traps

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **snmp-server enable traps ospf cisco-specific errors** [**config-error**] [**virt-config-error**]
4. **snmp-server enable traps ospf cisco-specific retransmit** [**packets**] [**virt-packets**]
5. **snmp-server enable traps ospf cisco-specific state-change** [**nssa-trans-change**] [**shamlink-state-change**]
6. **snmp-server enable traps ospf cisco-specific lsa** [**lsa-maxage**] [**lsa-originate**]
7. **snmp-server enable traps ospf errors** [**authentication-failure**] [**bad-packet**] [**config-error**] [**virt-authentication-failure**] [**virt-config-error**]
8. **snmp-server enable traps ospf lsa** [**lsa-maxage**] [**lsa-originate**]
9. **snmp-server enable traps ospf rate-limit** *seconds trap-number*
10. **snmp-server enable traps ospf retransmit** [**packets**] [**virt-packets**]
11. **snmp-server enable traps ospf state-change** [**if-state-change**] [**neighbor-state-change**] [**virtif-state-change**] [**virtneighbor-state-change**]

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**snmp-server enable traps ospf cisco-specific errors** [**config-error**] [**virt-config-error**] **Example:** `Router(config)# snmp-server enable traps ospf cisco-specific errors config-error`	Enables SNMP notifications for Cisco-specific OSPF configuration mismatch errors. • Entering the **snmp-server enable traps ospf cisco-specific errors** command with the optional **virt-config-error** keyword enables only the SNMP notifications for configuration mismatch errors on virtual interfaces.
Step 4	**snmp-server enable traps ospf cisco-specific retransmit** [**packets**] [**virt-packets**]	Enables error traps for Cisco-specific OSPF errors that involve re-sent packets.

	Command or Action	Purpose
	Example: `Router(config)# snmp-server enable traps ospf cisco-specific retransmit packets virt-packets`	• Entering the **snmp-server enable traps ospf cisco-specific retransmit** command with the optional **virt-packets**keyword enables only the SNMP notifications for packets that are re-sent on virtual interfaces.
Step 5	**snmp-server enable traps ospf cisco-specific state-change** [**nssa-trans-change**] [**shamlink-state-change**] **Example:** `Router(config)# snmp-server enable traps ospf cisco-specific state-change`	Enables all error traps for Cisco-specific OSPF transition state changes.
Step 6	**snmp-server enable traps ospf cisco-specific lsa** [**lsa-maxage**] [**lsa-originate**] **Example:** `Router(config)# snmp-server enable traps ospf cisco-specific lsa`	Enables error traps for opaque LSAs.
Step 7	**snmp-server enable traps ospf errors** [**authentication-failure**] [**bad-packet**] [**config-error**] [**virt-authentication-failure**] [**virt-config-error**] **Example:** `Router(config)# snmp-server enable traps ospf errors virt-config-error`	Enables error traps for OSPF configuration errors. • Entering the **snmp-server enable traps ospf errors** command with the optional **virt-config-error**keyword enables only the SNMP notifications for OSPF configuration errors on virtual interfaces.
Step 8	**snmp-server enable traps ospf lsa** [**lsa-maxage**] [**lsa-originate**] **Example:** `Router(config)# snmp-server enable traps ospf lsa`	Enables error traps for OSPF LSA errors.
Step 9	**snmp-server enable traps ospf rate-limit** *seconds trap-number* **Example:** `Router(config)# snmp-server enable traps ospf rate-limit 20 20`	Sets the rate limit for how many SNMP OSPF notifications are sent in each OSPF SNMP notification rate-limit window.
Step 10	**snmp-server enable traps ospf retransmit** [**packets**] [**virt-packets**] **Example:** `Router(config)# snmp-server enable traps ospf retransmit`	Enables SNMP OSPF notifications for re-sent packets.

	Command or Action	Purpose
Step 11	**snmp-server enable traps ospf state-change** [**if-state-change**] [**neighbor-state-change**] [**virtif-state-change**] [**virtneighbor-state-change**] **Example:** `Router(config)# snmp-server enable traps ospf state-change`	Enables SNMP OSPF notifications for OSPF transition state changes.

Verifying OSPF MIB Traps on the Router

SUMMARY STEPS

1. **enable**
2. **show running-config** [*options*]

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**show running-config** [*options*] **Example:** `Router# show running-config | include traps`	Displays the contents of the currently running configuration file and includes information about enabled traps. • Verifies which traps are enabled.

Configuration Examples for OSPF MIB Support of RFC 1850 and Latest Extensions

Example Enabling and Verifying OSPF MIB Support Traps

The following example enables all OSPF traps.

```
Router# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)# snmp-server enable traps ospf
Router(config)# end
```

The **show running-config** command is entered to verify that the traps are enabled:

```
Router# show running-config | include traps
snmp-server enable traps ospf
```

Where to Go Next

For more information about SNMP and SNMP operations, see the "Configuring SNMP Support" chapter of the Cisco IOS XE Network Management Configuration Guide, *Release 2* .

Additional References

The following sections provide references related to the Area Command in Interface Mode for OSPFv2 feature.

Related Documents

Related Topic	Document Title
OSPF commands	*Cisco IOS IP Routing: OSPF Command Reference*
OSPF configuration tasks	"Configuring OSPF" module

Standards

Standard	Title
No new or modified standards are supported by this feature, and support for existing standards has not been modified by this feature.	--

MIBs

MIB	MIBs Link
No new or modified MIBs are supported by this feature, and support for existing MIBs has not been modified by this feature.	To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL: http://www.cisco.com/go/mibs

RFCs

RFC	Title
RFC 2328	*OSPF Version 2*

Technical Assistance

Description	Link
The Cisco Support and Documentation website provides online resources to download documentation, software, and tools. Use these resources to install and configure the software and to troubleshoot and resolve technical issues with Cisco products and technologies. Access to most tools on the Cisco Support and Documentation website requires a Cisco.com user ID and password.	http://www.cisco.com/cisco/web/support/index.html

Feature Information for OSPF MIB Support of RFC 1850 and Latest Extensions

The following table provides release information about the feature or features described in this module. This table lists only the software release that introduced support for a given feature in a given software release train. Unless noted otherwise, subsequent releases of that software release train also support that feature.

Use Cisco Feature Navigator to find information about platform support and Cisco software image support. To access Cisco Feature Navigator, go to www.cisco.com/go/cfn. An account on Cisco.com is not required.

Table 5: Feature Information for OSPF MIB Support of RFC 1850 and Latest Extensions

Feature Name	Releases	Feature Information
OSPF MIB Support of RFC 1850 and Latest Extensions	Cisco IOS XE Release 2.1	The OSPF MIB Support of RFC 1850 and Latest Extensions feature introduces the capability for Simple Network Management Protocol (SNMP) monitoring on the Open Shortest Path First (OSPF) routing protocol. Users have an improved ability to constantly monitor the changing state of an OSPF network by use of MIB objects to gather information relating to protocol parameters and trap notification objects that can signal the occurrence of significant network events such as transition state changes. The protocol information collected by the OSPF MIB objects and trap objects can be used to derive statistics that will help monitor and improve overall network performance. The following commands are introduced or modified in the feature documented in this module: • **snmp-server enable traps ospf** • **snmp-server enable traps ospf cisco-specific errors** • **snmp-server enable traps ospf cisco-specific lsa** • **snmp-server enable traps ospf cisco-specific retransmit** • **snmp-server enable traps ospf cisco-specific state-change** • **snmp-server enable traps ospf errors** • **snmp-server enable traps ospf lsa** • **snmp-server enable traps ospf rate-limit** • **snmp-server enable traps ospf retransmit** • **snmp-server enable traps ospf state-change**