



OSPF Sham-Link MIB Support

Last Updated: November 1, 2011

This feature introduces MIB support for the OSPF Sham-Link feature through the addition of new tables and trap MIB objects to the Cisco OSPF MIB (CISCO-OSPF-MIB) and the Cisco OSPF Trap MIB (CISCO-OSPF-TRAP-MIB). New commands have been added to enable Simple Network Management Protocol (SNMP) notifications for the Open Shortest Path First (OSPF) sham-link trap objects. Notifications are provided for errors, state changes, and retransmissions across a sham-link interface.

Finding Feature Information in This Module

Your Cisco IOS software release may not support all of the features documented in this module. To reach links to specific feature documentation in this module and to see a list of the releases in which each feature is supported, use the [Feature Information for OSPF Sham-Link MIB Support, page 13](#).

Finding Support Information for Platforms and Cisco IOS and Catalyst OS Software Images

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

- [Finding Feature Information, page 1](#)
- [Prerequisites for OSPF Sham-Link MIB Support, page 2](#)
- [Restrictions for OSPF Sham-Link MIB Support, page 2](#)
- [Information About OSPF Sham-Link MIB Support, page 2](#)
- [How to Configure OSPF Sham-Link MIB Support, page 4](#)
- [Configuration Examples for OSPF Sham-Link MIB Support, page 10](#)
- [Where to Go Next, page 12](#)
- [Additional References, page 12](#)
- [Command Reference, page 13](#)
- [Feature Information for OSPF Sham-Link MIB Support, page 13](#)

Finding Feature Information

Your software release may not support all the features documented in this module. For the latest feature information and caveats, see the release notes for your platform and software release. To find information



Americas Headquarters:
Cisco Systems, Inc., 170 West Tasman Drive, San Jose, CA 95134-1706 USA

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 at the end of this document.

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 Sham-Link MIB Support

- It is presumed that you already have configured an Open Shortest Path First (OSPF) sham-link.
- SNMP must be enabled on the router before notifications (traps) can be configured or before SNMP GET operations can be performed.

Restrictions for OSPF Sham-Link MIB Support

All enhancements that are introduced by this feature are provided only by the Cisco private MIBs CISCO-OSPF-MIB and CISCO-OSPF-TRAP-MIB.

Information About OSPF Sham-Link MIB Support

- [OSPF Sham-Links in PE-PE Router Connections, page 2](#)
- [Cisco OSPF MIB and Cisco OSPF Trap MIB Enhancements, page 2](#)

OSPF Sham-Links in PE-PE Router Connections

In a Multiprotocol Label Switching (MPLS) Virtual Private Network (VPN) configuration, a virtual connection called a sham-link can be configured to interconnect between two VPN sites that want to be in the same OSPF area. The sham-link is configured on top of the MPLS VPN tunnel that connects two provider edge (PE) routers. The OSPF packets are propagated over the sham-link. For more information on configuring sham-links, refer the OSPF Sham-Link Support for MPLS VPN feature at the following URL:

http://www.cisco.com/en/US/docs/ios/iproute_ospf/configuration/guide/iro_sham_link.html

Cisco OSPF MIB and Cisco OSPF Trap MIB Enhancements

The OSPF Sham-Link MIB Support feature introduces MIB support for OSPF sham-links through the addition of new tables and trap MIB objects to the Cisco OSPF MIB (CISCO-OSPF-MIB) and the Cisco OSPF Trap MIB (CISCO-OSPF-TRAP-MIB) for Cisco IOS Releases 12.0(30)S, 12.3(14)T, 12.2(33)SRA, 12.2(31)SB2, and 12.2(33)SXH. New CLI has been added to enable SNMP notifications for the OSPF sham-link trap objects. Notifications are provided for errors, state changes, and retransmissions across a sham-link interface. The following sections describe the enhancements:

- [OSPF Sham-Link Configuration Support, page 3](#)
- [OSPF Sham-Link Neighbor Support, page 3](#)
- [OSPF Sham-Link Interface Transition State Change Support, page 3](#)
- [OSPF Sham-Link Neighbor Transition State Change Support, page 4](#)
- [Sham-Link Errors, page 4](#)

OSPF Sham-Link Configuration Support

The `cospfShamLinksTable` table object stores information about the sham-links that have been configured for the OSPF area. Beginning with Cisco IOS Releases 12.0(30)S, 12.3(14)T, 12.2(33)SRA, 12.2(31)SB2, and 12.2(33)SXH, the `cospfShamLinksTable` replaces the `cospfShamLinkTable`. The `cospfShamLinksTable` allows access to the following MIB objects:

- `cospfShamLinksAreaId`
- `cospfShamLinksLocalIpAddrType`
- `cospfShamLinksLocalIpAddr`
- `cospfShamLinksRemoteIpAddrType`
- `cospfShamLinksRemoteIpAddr`
- `cospfShamLinksRetransInterval`
- `cospfShamLinksHelloInterval`
- `cospfShamLinksRtrDeadInterval`
- `cospfShamLinksState`
- `cospfShamLinksEvents`
- `cospfShamLinksMetric`

OSPF Sham-Link Neighbor Support

The `cospfShamLinkNbrTable` table object describes all OSPF sham-link neighbor entries. The `cospfShamLinkNbrTable` allows access to the following MIB objects:

- `cospfShamLinkNbrArea`
- `cospfShamLinkNbrIpAddrType`
- `cospfShamLinkNbrIpAddr`
- `cospfShamLinkNbrRtrId`
- `cospfShamLinkNbrOptions`
- `cospfShamLinkNbrState`
- `cospfShamLinkNbrEvents`
- `cospfShamLinkNbrLsRetransQLen`
- `cospfShamLinkNbrHelloSuppressed`

OSPF Sham-Link Interface Transition State Change Support

The `cospfShamLinksStateChange` trap object is used to notify the network manager of a transition state change for the OSPF sham-link interface. The `cospfShamLinksStateChange` trap object replaces the original `cospfShamLinkStateChange` trap object for Cisco IOS Releases 12.0(30)S, 12.3(14)T, 12.2(33)SRA, and 12.2(31)SB2. The `cospfShamLinksStateChange` trap objects contains the following MIB objects:

- `ospfRouterId`
- `cospfShamLinksAreaId`
- `cospfShamLinksLocalIpAddrType`
- `cospfShamLinksLocalIpAddr`
- `cospfShamLinksRemoteIpAddrType`
- `cospfShamLinksRemoteIpAddr`
- `cospfShamLinksState`

OSPF Sham-Link Neighbor Transition State Change Support

The `cospfShamLinkNbrStateChange` trap object is used to notify the network manager of a transition state change for the OSPF sham-link neighbors. The `cospfShamLinkNbrStateChange` trap object contains the following MIB objects:

- `ospfRouterId`
- `cospfShamLinkNbrArea`
- `cospfShamLinksLocalIpAddrType`
- `cospfShamLinksLocalIpAddr`
- `cospfShamLinkNbrIpAddrType`
- `cospfShamLinkNbrIpAddr`
- `cospfShamLinkNbrRtrId`
- `cospfShamLinkNbrState`

Sham-Link Errors

Trap notifications are provided for OSPF sham-link configuration, authentication, and bad packet errors. These errors include the following trap objects:

- `cospfShamLinkConfigError`
- `cospfShamLinkAuthFailure`
- `cospfShamLinkRxBadPacket`

**Note**

The `cospfShamLinkAuthFailure` trap will not be generated because Cisco IOS Releases 12.0(30)S, 12.3(14)T, 12.2(33)SRA, and 12.2(31)SB2 do not yet support authentication over sham-links. The `cospfShamLinkRxBadPacket` trap will not be generated because it also is not supported by Cisco IOS Releases 12.0(30)S, 12.3(14)T, 12.2(33)SRA, and 12.2(31)SB2. However, the information can be retrieved from the existing OSPF bad packet traps.

How to Configure OSPF Sham-Link MIB Support

- [Configuring the Router to Send SNMP Notifications, page 4](#)
- [Enabling OSPF Sham-Link Error Traps, page 6](#)
- [Enabling OSPF Sham-Link Retransmissions Traps, page 7](#)
- [Enabling OSPF Sham-Link State Change Traps, page 8](#)
- [Verifying OSPF Sham-Link MIB Traps on the Router, page 10](#)

Configuring the Router to Send SNMP Notifications

Perform this task to enable the router to send SNMP notifications (traps or informs) defined in the OSPF MIBs. SNMP notifications can be configured on the router and GET operations can be performed from an external management station only after MIB support is enabled.

- [OSPF Configuration Error Notifications, page 5](#)

OSPF Configuration Error Notifications

To enable the sending of OSPF configuration errors notifications, enable the following traps:

- cospfShamLinkConfigError
- cospfShamLinkAuthFailure
- cospfShamLinkRxBadPacket

SUMMARY STEPS

1. enable
2. show running-config
3. configure terminal
4. 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]
5. snmp-server enable traps ospf
6. end

DETAILED STEPS

Command or Action	Purpose
<p>Step 1 enable</p> <p>Example:</p> <pre>Router> enable</pre>	<p>Enables privileged EXEC mode.</p> <ul style="list-style-type: none"> • Enter your password if prompted.
<p>Step 2 show running-config</p> <p>Example:</p> <pre>Router# show running-config</pre>	<p>Displays the running configuration to determine if an SNMP agent is already running.</p> <ul style="list-style-type: none"> • If no SNMP information is displayed, continue with the next step. If any SNMP information is displayed, you can modify the information or change it as needed.
<p>Step 3 configure terminal</p> <p>Example:</p> <pre>Router# configure terminal</pre>	<p>Enters global configuration mode.</p>

Command or Action	Purpose
<p>Step 4 <code>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]</code></p> <p>Example:</p> <pre>Router(config)# snmp-server host 172.20.2.162 version 2c public ospf</pre>	<p>Specifies a recipient (target host) for SNMP notification operations.</p> <ul style="list-style-type: none"> If no <i>notification-type</i> 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.)
<p>Step 5 <code>snmp-server enable traps ospf</code></p> <p>Example:</p> <pre>Router(config)# snmp-server enable traps ospf</pre>	<p>Enables all SNMP notifications defined in the OSPF MIBs.</p> <p>Note This step is required only if you wish to enable all OSPF traps, including the traps for OSPF sham-links. When you enter the no snmp-server enable traps ospf command, all OSPF traps, including the OSPF sham-link trap, will be disabled.</p>
<p>Step 6 <code>end</code></p> <p>Example:</p> <pre>Router(config)# end</pre>	<p>Ends your configuration session and exits global configuration mode.</p>

Enabling OSPF Sham-Link Error Traps

Notifications are sent when OSPF sham-link configuration errors are detected. To enable the sending of sham-link configuration error notifications, enable the following `cospfShamLinkConfigError` trap.

SUMMARY STEPS

1. `enable`
2. `configure terminal`
3. `snmp-server enable traps ospf cisco-specific errors config-error`
4. `snmp-server enable traps ospf cisco-specific errors shamlink [authentication [bad-packet [config] | [config [bad-packet]]]`
5. `end`

DETAILED STEPS

Command or Action	Purpose
<p>Step 1 <code>enable</code></p> <p>Example:</p> <pre>Router> enable</pre>	<p>Enables privileged EXEC mode.</p> <ul style="list-style-type: none"> Enter your password if prompted.

Command or Action	Purpose
<p>Step 2 <code>configure terminal</code></p> <p>Example:</p> <pre>Router# configure terminal</pre>	Enters global configuration mode.
<p>Step 3 <code>snmp-server enable traps ospf cisco-specific errors config-error</code></p> <p>Example:</p> <pre>Router(config)# snmp-server enable traps ospf cisco-specific errors config-error</pre>	<p>Enables error traps for OSPF nonvirtual interface mismatch errors.</p> <p>Note You must enter the <code>snmp-server enable traps ospf cisco-specific errors config-error</code> command before you enter the <code>snmp-server enable traps ospf cisco-specific errors shamlink</code> command, in order for both traps to be generated at the same place and maintain consistency with a similar case for configuration errors across virtual links. If you try to enable the <code>cospfShamLinkConfigError</code> trap before configuring the <code>cospfospfConfigError</code> trap you will receive an error message stating you must first configure the <code>cospfConfigError</code> trap.</p>
<p>Step 4 <code>snmp-server enable traps ospf cisco-specific errors shamlink [authentication [bad-packet [config] [config [bad-packet]]]</code></p> <p>Example:</p> <pre>Router(config)# snmp-server enable traps ospf cisco-specific errors shamlink</pre>	<p>Enables error traps for OSPF sham-link errors.</p> <ul style="list-style-type: none"> The authentication keyword enables SNMP notifications only for authentication failures on OSPF sham-link interfaces. The bad-packet keyword enables SNMP notifications only for packet parsing failures on OSPF sham-link interfaces. The config keyword enables SNMP notifications only for configuration mismatch errors on OSPF sham-link interfaces.
<p>Step 5 <code>end</code></p> <p>Example:</p> <pre>Router(config)# end</pre>	Ends your configuration session and exits global configuration mode.

Enabling OSPF Sham-Link Retransmissions Traps

Notifications are sent when OSPF packets retransmissions across a sham-link are detected. To enable the sending of sham-link packet retransmission notifications, enable the following `cospfShamLinkTxRetransmit` trap.

SUMMARY STEPS

1. `enable`
2. `configure terminal`
3. `snmp-server enable traps ospf cisco-specific retransmit [packets [shamlink | virt-packets] | shamlink [packets | virt-packets] | virt-packets [shamlink]]`
4. `end`

DETAILED STEPS

Command or Action	Purpose
Step 1 enable Example: <pre>Router> enable</pre>	Enables privileged EXEC mode. <ul style="list-style-type: none"> Enter your password if prompted.
Step 2 configure terminal Example: <pre>Router# configure terminal</pre>	Enters global configuration mode.
Step 3 snmp-server enable traps ospf cisco-specific retransmit [packets [shamlink virt-packets] shamlink [packets virt-packets] virt-packets [shamlink]] Example: <pre>Router(config)# snmp-server enable traps ospf cisco-specific retransmit shamlink</pre>	Enables error traps for OSPF sham-link retransmission errors.
Step 4 end Example: <pre>Router(config)# end</pre>	Ends your configuration session and exits global configuration mode.

Enabling OSPF Sham-Link State Change Traps

Notifications are sent when sham-link interface and neighbor state changes are detected. To enable the sending of sham-link state changes notifications, you can enable the following `cospfShamLinksStateChange` trap, which replaces the original `cospfShamLinkStateChange` trap, as well as the `cospfShamLinkNbrStateChange` trap, which is new for Cisco IOS Releases 12.0(30)S, 12.3(14)T, 12.2(33)SRA, and 12.2(31)SB2:

- `cospfShamLinksStateChange`
- `cospfShamLinkNbrStateChange`

**Note**

The replaced `cospfShamLinkChange` trap can still be enabled, but not when you want to enable the new `cospfShamLinksStateChange` trap.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **snmp-server enable traps ospf cisco-specific state-change [nssa-trans-change | shamlink [interface | interface-old | neighbor]]**
4. **end**

DETAILED STEPS

Command or Action	Purpose
<p>Step 1 enable</p> <p>Example:</p> <pre>Router> enable</pre>	<p>Enables privileged EXEC mode.</p> <ul style="list-style-type: none"> • Enter your password if prompted.
<p>Step 2 configure terminal</p> <p>Example:</p> <pre>Router# configure terminal</pre>	<p>Enters global configuration mode.</p>
<p>Step 3 snmp-server enable traps ospf cisco-specific state-change [nssa-trans-change shamlink [interface interface-old neighbor]]</p> <p>Example:</p> <pre>Router(config)# snmp-server enable traps ospf cisco- specific state-change</pre>	<p>Enables all Cisco-specific OSPF state change traps including the cospfShamLinksStateChange and cospfShamLinkNbrStateChange traps that are new for Cisco IOS Releases 12.0(30)S, 12.3(14)T, 12.2(33)SRA, and 12.2(31)SB2.</p> <ul style="list-style-type: none"> • The neighbor keyword enables the OSPF sham-link neighbor state change traps. • The interface keyword enables the OSPF sham-link interface state change traps. • The interface-old keyword enables the original OSPF sham-link interface state change trap that is replaced by the cospfShamLinksStateChange and cospfShamLinkNbrStateChange traps for Cisco IOS Releases 12.0(30)S and 12.3(14)T. <p>Note You cannot enter both the interface and interface-old keywords because you cannot enable both the new and replaced sham-link interface transition state change traps. You can configure only one of the two traps, but not both.</p>
<p>Step 4 end</p> <p>Example:</p> <pre>Router(config)# end</pre>	<p>Ends your configuration session and exits global configuration mode.</p>

Verifying OSPF Sham-Link MIB Traps on the Router

This task verifies that you have enabled OSPF sham-link MIB support.

SUMMARY STEPS

1. **enable**
2. **show running-config | include traps**

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> • Enter your password if prompted.
Step 2	show running-config include traps Example: Router# show running-config include traps	Displays the contents of the currently running configuration file and includes information about enabled traps. <ul style="list-style-type: none"> • Verifies if the trap is enabled.

Configuration Examples for OSPF Sham-Link MIB Support

- [Enabling and Verifying OSPF Sham-Link Error Traps Example, page 10](#)
- [Enabling and Verifying OSPF State Change Traps Example, page 11](#)
- [Enabling and Verifying OSPF Sham-Link Retransmissions Traps Example, page 11](#)

Enabling and Verifying OSPF Sham-Link Error Traps Example

The following example enables all Cisco-specific OSPF sham-link error traps. Note that the first attempt to enter the **snmp-server enable traps ospf cisco-specific errors shamlink** command results in an error message that the **snmp-server enable traps ospf cisco-specific errors config-error** command must be entered first:

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

% Sham-link config error trap not enabled.
% Configure "cisco-specific errors config-error" first.
% This requirement allows both traps to be sent.
Router(config)# snmp-server enable traps ospf cisco-specific errors config-error
Router(config)# snmp-server enable traps ospf cisco-specific errors shamlink
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 cisco-specific errors config-error
snmp-server enable traps ospf cisco-specific errors shamlink
```

At the time of disabling the traps, if the **no snmp-server enable traps ospf cisco-specific errors config-error** command is entered before the **snmp-server enable traps ospf cisco-specific errors shamlink** command, a message will be displayed to indicate that the sham-link configuration errors traps have also been disabled:

```
Router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)# no snmp-server enable traps ospf cisco-specific errors config-error
! This command also disables the previously-enabled shamlink configuration error traps.

Router(config)# end
```

Enabling and Verifying OSPF State Change Traps Example

The following example enables all Cisco-specific OSPF state change traps including the `cospfShamLinksStateChange` and `cospfShamLinkNbrStateChange` traps that are new for Cisco IOS Releases 12.0(30)S, 12.3(14)T, 12.2(33)SRA, and 12.2(31)SB2:

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

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 cisco-specific state-change shamlink interface
snmp-server enable traps ospf cisco-specific state-change shamlink neighbor
```

Note that the **snmp-server enable traps ospf cisco-specific state-change shamlink** command enables the sham-link interface state change for the `cospfShamLinksStateChange` trap that is new for Cisco IOS Releases 12.0(30)S, 12.3(14)T, 12.2(33)SRA, and 12.2(31)SB2.

To enable the original `cospfShamLinkStateChange` trap, you must first disable the `cospfShamLinksStateChange` trap. An attempt to enter the **snmp-server enable traps ospf cisco-specific state-change shamlink interface-old** command results in the following error message:

```
Router(config)# snmp-server enable traps ospf cisco-specific state-change shamlink
interface-old
% Cannot enable both sham-link state-change interface traps.
% Deprecated sham link interface trap not enabled.
Router(config)# no snmp-server enable traps ospf cisco-specific state-change shamlink
interface
Router(config)# snmp-server enable traps ospf cisco-specific state-change shamlink
interface-old
```

Enabling and Verifying OSPF Sham-Link Retransmissions Traps Example

The following example enables all OSPF sham-link retransmissions traps:

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

Where to Go Next

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

Additional References

The following sections provide references related to the OSPF Sham-Link MIB Support feature.

Related Documents

Related Topic	Document Title
Configuring OSPF sham-links	OSPF Sham-Link Support for MPLS VPN
SNMP configuration	<i>Cisco IOS Network Management Configuration Guide</i> .
SNMP commands	<i>Cisco IOS Network Management Command Reference</i> .

Standards

Standard	Title
None	--

MIBs

MIB	MIBs Link
<ul style="list-style-type: none"> CISCO-OSPF-MIB CISCO-OSPF-TRAP-MIB 	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
None	--

Technical Assistance

Description	Link
The Cisco Support website provides extensive online resources, including documentation and tools for troubleshooting and resolving technical issues with Cisco products and technologies. Access to most tools on the Cisco Support website requires a Cisco.com user ID and password. If you have a valid service contract but do not have a user ID or password, you can register on Cisco.com.	http://www.cisco.com/techsupport

Command Reference

The following commands are introduced or modified in the feature or features documented in this module. For information about these commands, see the Cisco IOS IP Routing: OSPF Command Reference. For information about all Cisco IOS commands, go to the Command Lookup Tool at <http://tools.cisco.com/Support/CLILookup> or to the *Cisco IOS Master Commands List*.

- **snmp-server enable traps ospf cisco-specific errors config-error**
- **snmp-server enable traps ospf cisco-specific errors shamlink**
- **snmp-server enable traps ospf cisco-specific retransmit**
- **snmp-server enable traps ospf cisco-specific state-change**

Feature Information for OSPF Sham-Link MIB Support

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 1 **Feature Information for OSPF Sham-Link MIB Support**

Feature Name	Releases	Feature Information
OSPF Sham-Link MIB Support	12.0(30)S 12.3(14)T 12.2(33)SRA 12.2(31)SB2 12.2(33)SXH	This feature introduces MIB support for the OSPF Sham-Link feature through the addition of new tables and trap MIB objects to the Cisco OSPF MIB (CISCO-OSPF-MIB) and the Cisco OSPF Trap MIB (CISCO-OSPF-TRAP-MIB). New commands have been added to enable Simple Network Management Protocol (SNMP) notifications for the Open Shortest Path First (OSPF) sham-link trap objects. Notifications are provided for errors, state changes, and retransmissions across a sham-link interface..

Cisco and the Cisco logo are trademarks or registered trademarks of Cisco and/or its affiliates in the U.S. and other countries. To view a list of Cisco trademarks, go to this URL: www.cisco.com/go/trademarks. Third-party trademarks mentioned are the property of their respective owners. The use of the word partner does not imply a partnership relationship between Cisco and any other company. (1110R)

Any Internet Protocol (IP) addresses and phone numbers used in this document are not intended to be actual addresses and phone numbers. Any examples, command display output, network topology diagrams, and other figures included in the document are shown for illustrative purposes only. Any use of actual IP addresses or phone numbers in illustrative content is unintentional and coincidental.

© 2011 Cisco Systems, Inc. All rights reserved.