MPLS Scalability Enhancements for the ATM LSR

Feature History

Release	Modification
12.0(14)ST	This feature was introduced.
12.0(22)S	This feature was integrated to Cisco IOS Release 12.0(22)S.

This document describes how to prevent label-switched paths (LSPs) from being created in an MPLS network. This document includes the following sections:

- Feature Overview
- Supported Platforms
- Supported Standards, MIBs, and RFCs
- Configuration Tasks
- Configuration Tasks
- Verifying the Configuration
- Command Reference

Feature Overview

Some LSPs are often unnecessary between some label-switched edge routers (LERs) in an MPLS network. Every time a new destination is created, LSPs are created from all LERs in the MPLS network to the new destination. You can use the **mpls ldp request-tags for** command with an access list at an LER to restrict the destinations for which a downstream-on-demand request is issued. You specify the destination IP addresses that you want to enable/disable from creating LSPs.

Benefits

This command allows you to permit/deny creation of some LSPs, while preventing the creation of others. Using this command reduces the number of LSPs in an MPLS network, which reduces the VC usage in the network.

Restrictions

This section details some of the restrictions of this feature.

- Do not use the **mpls disable headend-vc** command.

  When using access lists to prevent the creation of LSPs, do not disable the router from acting as an edge router with the **mpls disable headend-vc** command, which prevents all LSPs from being established.

- Cisco 12000 routers need special LVC configuration for efficient use of VCs.

  A Cisco 12000 router (GSR) ATM interface used for MPLS cannot use the entire virtual path identifier (VPI) range configured on the subinterface. Attempts to create label switched controlled virtual circuits (LVCs) within the configured range may be rejected by the line card drivers. This can occur when you use the GSR ATM OC-3 or OC-12 interfaces running MPLS.

  The following paragraphs show the commands for efficiently using LVC space. For a configuration example, see "Efficiently Using LVC space for Cisco 12000 Series Routers".

  - For the Quad OC-3 or Quad OC-12

    On the main interface, use 512 VCs per VPI. Enter the following command:

    ```
    atm vc-per-vp 512
    ```

    On the MPLS subinterface, match the hardware limit of 7 VPIs and set the control-vc to within that range by entering the following commands:

    ```
    mpls atm control-vc 2 32
    mpls atm vpi 2-8
    ```

  - For the Single-Port OC-12

    On the main interface, use 1024 VCs per VPI . Enter the following command:

    ```
    atm vc-per-vp 1024
    ```

    On the MPLS subinterface, match the hardware limit of 15 VPIs and set the control-vc to fall within that range by entering the following commands:

    ```
    mpls atm control-vc 2 32
    mpls atm vpi 2-16
    ```

    You must configure the control-vc of the LDP neighbor so that it uses the same VPI and VCI.

Related Documents

For more information about standard and extended access lists, see the following documents:

- *Cisco IOS IP Configuration Guide, Release 12.2,* Configuring IP Services
- *Cisco IOS Security Configuration Guide, Release 12.2,* Access Control Lists: Overview and Guidelines

Supported Platforms

This feature is supported on the following platforms:

- Cisco 7200 series

- Cisco 7500 series
- Cisco 12000 series (engine 0)

Determining Platform Support Through Cisco Feature Navigator

Cisco IOS software is packaged in feature sets that are supported on specific platforms. To get updated information regarding platform support for this feature, access Cisco Feature Navigator. Cisco Feature Navigator dynamically updates the list of supported platforms as new platform support is added for the feature.

Cisco Feature Navigator is a web-based tool that enables you to quickly determine which Cisco IOS software images support a specific set of features and which features are supported in a specific Cisco IOS image. You can search by feature or release. Under the release section, you can compare releases side by side to display both the features unique to each software release and the features in common.

To access Cisco Feature Navigator, you must have an account on Cisco.com. If you have forgotten or lost your account information, send a blank e-mail to cco-locksmith@cisco.com. An automatic check will verify that your e-mail address is registered with Cisco.com. If the check is successful, account details with a new random password will be e-mailed to you. Qualified users can establish an account on Cisco.com by following the directions found at this URL:

http://www.cisco.com/register

Cisco Feature Navigator is updated regularly when major Cisco IOS software releases and technology releases occur. For the most current information, go to the Cisco Feature Navigator home page at the following URL:

http://www.cisco.com/go/fn

Availability of Cisco IOS Software Images

Platform support for particular Cisco IOS software releases is dependent on the availability of the software images for those platforms. Software images for some platforms may be deferred, delayed, or changed without prior notice. For updated information about platform support and availability of software images for each Cisco IOS software release, refer to the online release notes or, if supported, Cisco Feature Navigator.

Supported Standards, MIBs, and RFCs

Standards

The MPLS LSC supports no new or modified standards.

MIBs

The MPLS LSC supports no new or modified MIBs.

To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL:

http://tools.cisco.com/ITDIT/MIBS/servlet/index

If Cisco MIB Locator does not support the MIB information that you need, you can also obtain a list of supported MIBs and download MIBs from the Cisco MIBs page at the following URL:

http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml

To access Cisco MIB Locator, you must have an account on Cisco.com. If you have forgotten or lost your account information, send a blank e-mail to cco-locksmith@cisco.com. An automatic check will verify that your e-mail address is registered with Cisco.com. If the check is successful, account details with a new random password will be e-mailed to you. Qualified users can establish an account on Cisco.com by following the directions found at this URL:

http://www.cisco.com/register

RFCs

The MPLS LSC supports no new or modified RFCs.

Configuration Tasks

The following sections explain how to configure the network to prevent the creation of LSPs from specified IP addresses:
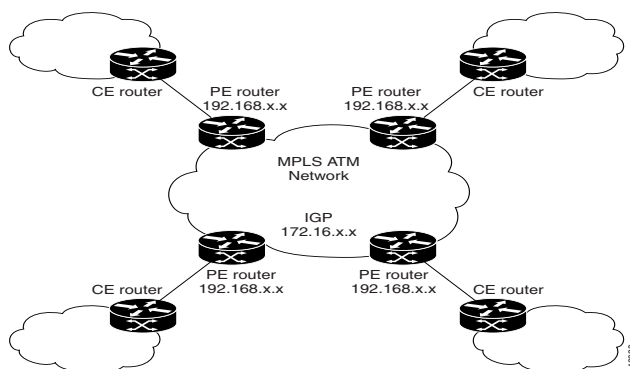
- Sample MPLS ATM Network
- Configuring the MPLS ATM Network
- Configuring the PE Routers

Sample MPLS ATM Network

Figure 1 is an MPLS ATM network that consists of the following elements:

- The PE routers in the virtual private network require LSPs to communicate with each other.

- All the PE routers are in network 1 (198.x.x.x).

- All the IGP IP addresses are in network 2 (192.x.x.x).

- If numbered interfaces are required (for network management or other purposes), they are placed in network 2 (192.x.x.x).

Figure 1   Sample MPLS ATM Network

The following configuration tasks use **mpls ldp request-tags for** commands to accomplish the following:

- Allow the PE routers in network 1 to create LSPs and communicate with each other, but prevent creation of LSPs from the PE routers to the MPLS ATM network,

- Prevent LSPs from being created in the MPLS ATM network (network 2) and prevent from the MPLS ATM network to the PE routers.

Performing these tasks reduces the number of LSPs in the MPLS ATM network, which reduces the VC usage in the network.

Configuring the MPLS ATM Network

In the configuration file of the routers in the MPLS ATM network, enter the following commands:

	Command	Purpose
Step 1	`mpls ldp request-tags for acl_1`	Initiates the request to prevent the creation of LSPs and specifies the access list name (acl_1).
Step 2	`ip access-list standard acl_1`	Creates a standard IP access list.
Step 3	`deny   192.0.0.0 0.255.255.255`	Denies access to all routers with an IP address of 192.x.x.x. This prevents LSPs from being created in the MPLS ATM network.

	Command	Purpose
Step 4	`deny   198.0.0.0 0.255.255.255`	Denies access to all routers with an IP address of 198.x.x.x. This prevents LSPs from being created between the MPLS ATM network and the PE routers.
Step 5	`permit any`	Permits all other IP addresses.

Configuring the PE Routers

In the configuration file of the PE routers, enter the following commands:

	Command	Purpose
Step 1	`mpls ldp request-tags for acl_2`	Initiates the request to prevent the creation of LSPs and specifies the access list name (acl_2).
Step 2	`ip access-list standard acl_2`	Creates a standard IP access list.
Step 3	`deny   192.0.0.0 0.255.255.255`	Denies access to all routers with an IP address of 192.x.x.x. This prevents LSPs from being created between the PE routers and MPLS ATM network.
Step 4	`permit any`	Permits all other IP addresses.

Verifying the Configuration

Use the following commands to verify the configuration:

`show mpls atm-ldp bindings`	Displays the current headend, tailend, and transit dynamic tag bindings for the destinations.
`show ip route`	Displays IP routing table entries.
`show mpls forwarding-table`	Displays the contents of the label forwarding information base (LFIB).

Configuration Examples

This section contains the following configuration examples:

- Disabling the Creation of LSPs
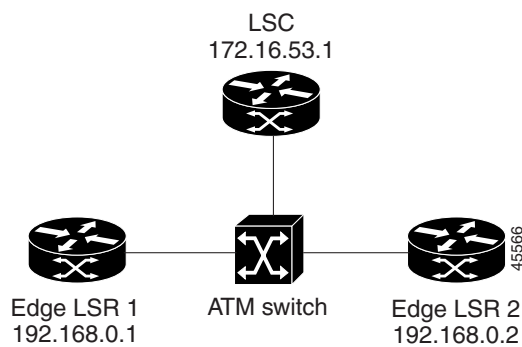- Efficiently Using LVC space for Cisco 12000 Series Routers

Disabling the Creation of LSPs

The following examples of the **mpls ldp request-tags for** command use Figure 2 as a basis. The examples show different ways to disable the creation of LSPs from the LSC to the edge GSR, and from the edge GSRs to the LSC.

Note In this example, the LSCs are running 12.1(5)T software. Cisco IOS Release 12.0(14ST) does not support LSCs.

Figure 2   Sample Configuration

Using a Numbered Access List

The following examples use a numbered access list to restrict creation of LSPs.

Note With LSCs, you disable the LSC from acting as an edge router with the **mpls disable headend-vc** command, which prevents all LSPs from being established. The following examples use the **mpls ldp request-tags for** command on the LSC. However, it is recommended that you use the **mpls disable headend-vc** command.

Preventing LSPs from the LSC to the Edge LSRs

The following example prevents LSPs from being established from the LSC to all 198.x.x.x destinations. However, transit LSPs are allowed between 198.x.x.x destinations. Add the following commands to the LSC configuration:

```
mpls ldp request-tags for 1
access-list 1 deny 198.0.0.0 0.255.255.255
access-list 1 permit any
```

Preventing LSPs from the Edge LSRs to the LSC

The following example prevents headend LVCs from being established from edge LSR 1 and edge GSR 2 to the LSC (192.x.x.x). However, transit LSPs are allowed between 198.x.x.x destinations. Add the following commands to the edge GSR 1 and 2 configurations:

```
mpls ldp request-tags for 1
access-list 1 deny 192.0.0.0 0.255.255.255
access-list 1 permit any
```

Using a Named Access List

The following examples use a named access list to perform the same tasks as the previous examples.

```
mpls ldp request-tags for nolervcs
ip access-list standard nolervcs
deny   198.0.0.0 0.255.255.255
permit any
```

```
mpls ldp request-tags for nolervcs
ip access-list standard nolervcs
deny 192.0.0.0 0.255.255.255
permit any
```

Specifying Exact Match IP Addresses with an Access List

The following examples use exact IP addresses to perform the same tasks as the previous examples.
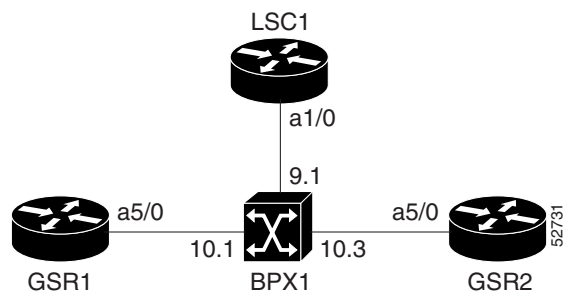
```
mpls ldp request-tags for 1
access-list 1 deny 198.5.0.1 0.0.0.0
access-list 1 deny 198.5.0.2 0.0.0.0
access-list 1 permit any

mpls ldp request-tags for 1
access-list 1 deny 192.6.53.1 0.0.0.0
access-list 1 permit any
```

Efficiently Using LVC space for Cisco 12000 Series Routers

The following configuration shows how to set up the ATM interfaces so that LVC space is optimized on a Cisco 12000 series router.

Figure 3   Cisco 12000 Series Router Configuration Example

LSC1 Configuration

```
ip routing
ip cef
    mpls ip
!
int loopback0
    ip address 12.12.12.12.255.255.255.255
!
int atm1/0
        tag-control-protocol vsi slaves 18
!
interface XTagATM101
    ip unnumbered Loopback0
    extended-port ATM2/0 vsi 0x000A0100
    mpls atm control-vc 2 32
    mpls atm vpi 2-8
    mpls ip
!
interface XTagATM103
```

```
ip unnumbered Loopback0
extended-port ATM2/0 vsi 0x000A0300
mpls atm control-vc 2 32
mpls atm vpi 2-8
mpls ip
```

BPX1 Configuration

Port 9.1

```
uptrk 9.1
cnfrscr 9.1 256 248207 N y 1 e 512 5000 2 15 26000 100000
addshelf 9.1 V
```

Port 10.1

```
uptrk 10.1
cnfrscr 10.1 256 248207 N y 1 e 512 5000 2 15 26000 100000
```

Port 10.3

```
uptrk 10.3
cnfrscr 10.3 256 248207 N y 1 e 512 5000 2 15 26000 100000
```

Routing Protocol Configuration

```
router ospf 100
network 12.0.0.0.0.255.255.255.255 area 100
```

GSR1 Configuration

```
ip routing
ip cef
    mpls ip
!
int loopback0
    ip address 10.10.10.10.255.255.255.255
    int atm5/0
    atm vc-per-vp 512
!
interface ATM5/0.1 tag-switching
    ip unnumbered Loopback0
    no ip directed-broadcast
    no atm enable-ilmi-trap
    mpls atm control-vc 2 32
    mpls atm vpi 2-8
    mpls ip
!
router ospf 100
    network 10.0.0.0.0.255.255.255.255 area 100
```

GSR2 Configuration

```
ip routing
ip cef
    mpls ip
!
int loopback0
    ip address 11.11.11.11.255.255.255.255
```

```
!
int atm5/0
    atm vc-per-vp 512
    interface ATM5/0.1 tag-switching
    ip unnumbered Loopback0
    no ip directed-broadcast
    no atm enable-ilmi-trap
    mpls atm control-vc 2 32
    mpls atm vpi 2-8
    mpls ip
!
router ospf 100
    router (config-router)# network 11.0.0.0.0.255.255.255.255 area 100
```

Command Reference

This section describes the CLI commands that you can use to disable the creation of LSPs:

- **mpls ldp request-tags for**

All other commands used with this feature are documented in the Cisco IOS command reference publications.

Command Conventions

boldface font	Commands and keywords are in **boldface** type.
italic font	Arguments for which you supply values are in *italics*. In a context that does not allow *italics*, arguments are enclosed in **angle brackets < >**.
[ ]	Elements in square **brackets** are optional.
{ x | y | z }	Alternative keywords are grouped in **braces** and separated by vertical bars.
[x | y | z]	Optional keywords are grouped in **brackets** and separated by vertical bars.

mpls ldp request-tags for

To restrict the creation of LVCs through the use of access lists on the label edge router, use the **mpls ldp request-tags for** global configuration command. Use the **no** form of this command to disable this feature.

mpls ldp request-tags for *access list*

no mpls ldp request-tags for *access list*

Syntax Description

access list	A named or numbered standard IP access list.

Defaults   No default behavior or values

Command Modes   Global configuration

Command History

Release	Modification
12.1(5)T	This command was introduced as **tag-switching request-tags for**.
12.0(14)ST	This command was changed to reflect MPLS terminology.
12.0(22)S	This command was integrated into Cisco IOS Release 12.0(22)S.

Usage Guidelines   The command includes the following usage guidelines:

- You can specify either an access list number or name.
- When creating an access list, the end of the access list contains an implicit deny statement for everything if it did not find a match before reaching the end.
- If you omit the mask from an IP host address access list specification, 0.0.0.0 is assumed to be the mask.

Examples   In the following example, headend LVCs are prevented from being established from the core router to all 198.x.x.x destinations. The following commands are added to the core router configuration:

```
mpls ldp request-tags for 1
access-list 1 deny 198.0.0.0 0.255.255.255
access-list 1 permit any
```

Related Commands

Command	Description
access list	Creates access lists.