MPLS LDP--Local Label Allocation Filtering

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This feature introduces command-line interface (CLI) commands to modify the way in which Multiprotocol Label Switching (MPLS) Label Distribution Protocol (LDP) handles local label allocation. This MPLS LDP feature enhancement enables the configuration of filtering policies for selective local label binding assignments by LDP to improve LDP scalability and convergence.

This document contains information about and instructions on how to configure the MPLS LDP--Local Label Allocation Filtering feature.

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 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 MPLS LDP--Local Label Allocation Filtering

The feature requires the MPLS Forwarding Infrastructure (MFI).

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

Restrictions for MPLS LDP--Local Label Allocation Filtering

The MPLS LDP--Local Label Allocation Filtering feature does not support access lists. This feature supports prefix lists.

Restrictions for the MPLS LDP--Local Label Allocation Filtering feature in Cisco IOS Releases 12.2(33)SRC and 12.2(33)SB:

- LDP local label allocation configuration for prefix list or host routes is supported only in the global routing table.
- LDP and RIB restart handling supported in Cisco IOX software does not apply.
- Wildcard Forwarding Equalence Class (FEC) requests are not supported.
- Remote bindings are retained for LDP table entries that are filtered.

Information About MPLS LDP--Local Label Allocation Filtering

MPLS LDP Local Label Allocation Filtering Overview

LDP allocates a local label for every route learned from the Interior Gateway Protocol (IGP). In the absence of inbound and outbound label filtering, these local labels are advertised to and learned by all peers.

In most Layer 3 Virtual Private Network (VPN) configurations only the label switched paths (LSPs) created to reach the /32 host routes or Border Gateway Protocol (BGP) next hops between the provider edge (PE) routers carry traffic and are relevant to the Layer 3 VPNs. LSPs between the PE routers that are not members of a VPN use more memory and create additional processing in LDP across the core.
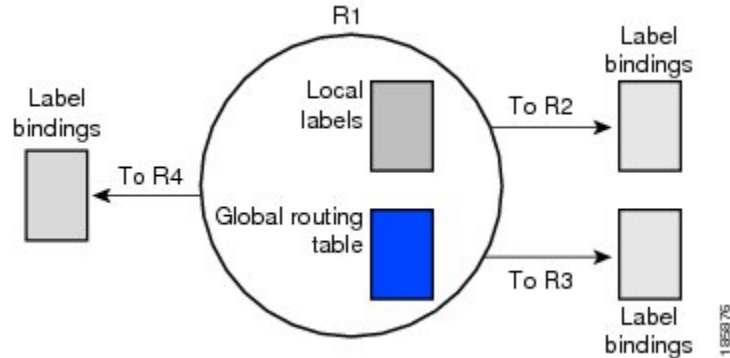
With the load increases in the service provider domain in the last decade (1997-2007), scalability has become more important in the service provider networks. Controlling the local label allocation could off-load LDP processing of non-VPN LSPs in the service provider network core devices.

The MPLS LDP Local Label Allocation Filtering feature introduces the **mpls ldp label** and **allocate** commands that allow you to configure LDP to selectively allocate local labels for a subset of the prefixes learned from the IGP. You can select that LDP allocate local labels for prefixes configured in a prefix list in the global table or for host routes in the global table.

Local label allocation filtering reduces the number of local labels allocated and therefore the number of messages exchanged with peers. This improves LDP scalability and convergence. The two figures below show how controlling local label allocation can reduce local label space size and greatly reduce the number
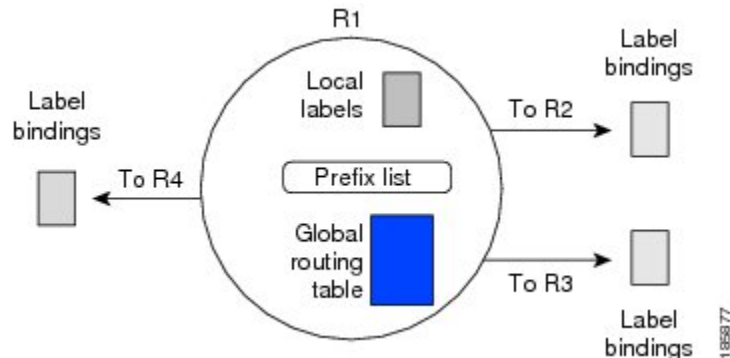
of advertisements to peers. The figure below shows default LDP label allocation behavior. LDP allocates a local label for every route and advertises a label binding for every route learned from the IGP.

Figure 1   *Default LDP Local Label Allocation Behavior*

The figure below shows LDP behavior with local label allocation control configured. The size of the local label space and the number of label binding advertisements are reduced with local label allocation filtering through the use of a prefix list. The decrease in the number of local labels and label binding advertisement messages reduces the amount of memory use and improves convergence time for LDP. The MPLS LDP Local Label Allocation Filtering feature also allows for more efficient use of the label space.

Figure 2   *LDP Behavior with Local Label Allocation Controls*

The figure above shows that router R1 learns a number of routes from its IGP neighbors on routers R2, R3, and R4. A prefix list defined on router R1 specifies the prefixes for which LDP allocates a local label.

Note   In general, the number of Label Information Base (LIB) entries remains the same regardless of the kind of label filtering. This is because the remote label bindings for the prefixes that are filtered are kept in the LIB. Memory use is reduced because local label filtering decreases the number of local labels allocated and the number of label bindings advertised to and stored by the peers of an LSR.

Prefix Lists for MPLS LDP Local Label Allocation Filtering Benefits and Description

The MPLS LDP--Local Label Allocation Filtering feature allows you to configure LDP to allocate local labels for a subset of the learned prefixes. LDP accepts the prefix and allocates a local label if the prefix is permitted by a prefix list. If the prefix list is not defined, LDP accepts all prefixes and allocates local labels based on its default mode of operation.

The benefits of using prefix lists for LDP local label allocation filtering are as follows:

- Prefix lists provide more flexibility for specifying a subset of prefixes and masks.
- Prefix lists use a tree-based matching technique. This technique is more efficient than evaluating prefixes or host routes sequentially.
- Prefix lists are easy to modify.

You configure a prefix list for the MPLS LDP--Local Label Allocation Filtering feature with the **ip prefix-list** command. The format of the command is as follows: **ip prefix-list** {*list-name* / *list-number*}[**seq** *number*] {**deny** *network* / *length* | **permit** *network* / *length*} [**ge** *ge-length*] [**le** *le-length*]

Local Label Allocation Changes Introduced in Cisco IOS Release 12.2(33)SRC and LDP Actions

The MPLS LDP--Local Label Allocation Filtering enhancement modifies the LDP's local label allocation handling. The feature supports local label allocation filtering through the specification of a prefix list or host routes.

With the introduction of this feature, LDP needs to determine whether a prefix filter is already configured to control the local label allocation on the local node. If a prefix list exists, the local label allocation is confined to the list of prefixes permitted by the configured prefix list.

LDP also needs to respond to local label allocation configuration changes and to configuration changes that affect the prefix list that LDP is using. Any of the following configuration changes can trigger LDP actions:

- Creating a local label allocation configuration
- Deleting or changing a local label allocation configuration
- Creating a new prefix list for a local label allocation configuration
- Deleting or changing a prefix list for a local label allocation configuration

LDP responds to local label allocation configuration changes by updating the LIB and the forwarding table in the global routing table. To update the LIB after a local label filter configuration change without a session reset, LDP keeps all remote bindings.

If you create a local label allocation configuration without defining a prefix list, no LDP action is required. The local label allocation configuration has no effect because the prefix list is created and permits all prefixes.

If you create or change a prefix list and prefixes that were previously allowed are rejected, LDP goes through a label withdraw and release procedure before the local labels for these prefixes are deallocated.

If you delete a prefix, LDP goes through the label withdraw and release procedure for the LIB local label. If the associated prefix is one for which no LIB entry should be allocated, LDP bypasses this procedure.

The LDP default behavior is to allocate local labels for all non-BGP prefixes. This default behavior does not change with the introduction of this feature and the **mpls ldp label** and **allocate** commands.

Note   The local label allocation filtering has no impact on inbound label filtering because both provide LDP filtering independently. The LDP Inbound Label Binding Filtering feature controls label bindings that a label switch router (LSR) accepts from its peer LSRs through the use of access control lists (ACLs). The MPLS LDP--Local Label Allocation Filtering feature controls the allocation of local labels through the use of prefix lists or host routes.

LDP Local Label Filtering and BGP Routes

The LDP default behavior is to allocate local labels for all non-BGP prefixes.

LDP does not apply the configured local label filter to redistributed BGP routes in the global table for which BGP allocates local label, but LDP does the advertisements (Inter-AS Option C). LDP neither forwards these entries nor releases the local labels allocated by BGP.

How to Configure MPLS LDP--Local Label Allocation Filtering

Creating a Prefix List for MPLS LDP Local Label Allocation Filtering

Perform the following task to create a prefix list for LDP local label allocation filtering. A prefix list allows LDP to selectively allocate local labels for a subset of the routes learned from the IGP. The decrease in the number of local labels in the LDP LIB and the number of label mapping advertisements reduces the amount of memory use and improves convergence time for LDP.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **ip prefix-list** {*list-name*| *list-number*} [**seq** *number*] {**deny** *network* / *length*| **permit** *network* / *length*} [**ge** *ge-length*] [**le** *le-length*]
4. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. - Enter your password if prompted.

	Command or Action	Purpose
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**ip prefix-list** {*list-name*| *list-number*} [**seq** *number*] {**deny** *network* / *length*| **permit** *network* / *length*} [**ge** *ge-length*] [**le** *le-length*] **Example:** `Router(config)# ip prefix-list list1 permit 192.168.0.0/16 le 20`	Creates a prefix list or adds a prefix-list entry. • The *list-name* argument configures a name to identify the prefix list. • The *list-number* argument configures a number to identify the prefix list. • The **seq** *number* keyword and argument apply a sequence number to a prefix-list entry. The range of sequence numbers that can be entered is from 1 to 4294967294. If a sequence number is not entered when this command is configured, a default sequence numbering is applied to the prefix list. The number 5 is applied to the first prefix entry, and subsequent unnumbered entries are incremented by 5. • The **deny** keyword denies access for a matching condition. • The **permit** keyword permits access for a matching condition. • The *network* / *length* arguments and keyword configure the network address, and the length of the network mask in bits. The network number can be any valid IP address or prefix. The bit mask can be a number from 0 to 32. • The **ge** *ge-length* keyword and argument specify the lesser value of a range (the "from" portion of the range description) by applying the *ge-length* argument to the range specified. The *ge-length* argument represents the minimum prefix length to be matched. The **ge** keyword represents the greater than or equal to operator. • The **le** *le-length* keyword and argument specify the greater value of a range (the "to" portion of the range description) by applying the *le-length* argument to the range specified. The *le-length* argument represents the maximum prefix length to be matched. The **le** keyword represents the less than or equal to operator.
Step 4	**end** **Example:** `Router(config)# end`	Exits to privileged EXEC mode.

Configuring MPLS LDP Local Label Allocation Filtering

Perform the following task to configure LDP local allocation filtering. Configuring filtering policies for selective local label binding assignments by LDP improves LDP scalability and convergence. You can configure either a prefix list or host routes as a filter for local label allocation. A maximum of one local label allocation filter is supported for the global table.

✎

Note   The **host-routes** keyword for the **allocate** command makes it convenient for you to specify a commonly used set of prefixes.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **mpls ldp label**
4. **allocate global prefix-list** {*list-name* | *list-number*}
5. **allocate global host-routes**
6. **no allocate global** {**prefix-list** {*list-name* | *list-number*} | **host-routes**}
7. **no mpls ldp label**
8. **exit**
9. **exit**

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	**mpls ldp label** **Example:** `Router(config)# mpls ldp label`	Enters MPLS LDP label configuration mode to specify how MPLS LDP handles local label allocation.
Step 4	**allocate global prefix-list** {*list-name*	*list-number*} **Example:** `Router(config-ldp-lbl)# allocate global prefix-list list1`	Configures local label allocation filters for learned routes for MPLS LDP. • The **global** keyword specifies the global routing. • The **prefix-list**keyword specifies a prefix list to be used as a filter for MPLS LDP local label allocation. • The *list-name* argument indicates a name that identifies the prefix list. • The *list-number* argument indicates a number that identifies the prefix list.

	Command or Action	Purpose
Step 5	**allocate global host-routes** **Example:** `Router(config-ldp-lbl)# allocate global host-routes`	Configures local label allocation filters for learned routes for MPLS LDP. • The **global** keyword specifies the global routing. • The **host-routes** keyword specifies that local label allocation be done for host routes only.
Step 6	**no allocate global** {**prefix-list** {*list-name* | *list-number*} | **host-routes**} **Example:** `Router(config-ldp-lbl)# no allocate global host-routes`	Removes the specific MPLS LDP local label allocation filter without resetting the LDP session. • The **global** keyword specifies the global routing. • The **prefix-list**keyword specifies a prefix list to be used as a filter for MPLS LDP local label allocation. • The *list-name* argument indicates a name that identifies the prefix list. • The *list-number* argument indicates a number that identifies the prefix list. • The **host-routes** keyword specifies that host routes be used as a filter for MPLS LDP local label allocation.
Step 7	**no mpls ldp label** **Example:** `Router(config-ldp-lbl)# no mpls ldp label`	Removes all local label allocation filters configured under the MPLS LDP label configuration mode and restores LDP default behavior for local label allocation without a session reset.
Step 8	**exit** **Example:** `Router(config-ldp-lbl)# exit`	Exits from MPLS LDP label configuration mode.
Step 9	**exit** **Example:** `Router(config)# exit`	Exits to privileged EXEC mode.

Verifying Configuration

Perform the following task to verify the MPLS LDP--Local Label Allocation Filtering configuration.

SUMMARY STEPS

1. **enable**
2. **show mpls ldp bindings detail**
3. **debug mpls ldp binding filter**
4. **exit**

DETAILED STEPS

Step 1   **enable**

Use this command to enable privileged EXEC mode. Enter your password if prompted. For example:

Example:

```
Router> enable
Router#
```

Step 2   **show mpls ldp bindings detail**

Use this command to verify that local label allocation filtering is configured as you expect. For example:

Example:

```
Router# show mpls ldp bindings detail
Advertisement spec:
        Prefix acl = bar
Local label filtering spec: host routes.
  lib entry: 10.1.1.1/32, rev 9
  lib entry: 10.10.7.0/24, rev 10
  lib entry: 10.10.8.0/24, rev 11
  lib entry: 10.10.9.0/24, rev 12
  lib entry: 10.41.41.41/32, rev 17
  lib entry: 10.50.50.50/32, rev 15
  lib entry: 10.60.60.60/32, rev 18
  lib entry: 10.70.70.70/32, rev 16
  lib entry: 10.80.80.80/32, rev 14
```

The output of this command verifies that host routes are configured as the local label allocation filter for the router.

Step 3   **debug mpls ldp binding filter**

Use this command to verify that local label allocation filtering was configured properly and to display how LDP accepts or withdraw labels. For example:

Example:

```
Router# debug mpls ldp binding filter
LDP Local Label Allocation Filtering changes debugging is on
.
.
.
```

Step 4   **exit**

Use this command to exit to user EXEC mode. For example:

Example:

```
Router# exit
Router>
```

Configuration Examples for MPLS LDP--Local Label Allocation Filtering

Creating a Prefix List for MPLS LDP Local Label Allocation Filtering Examples

The following examples show how to configure a prefix list for MPLS LDP local label allocation filtering.

In this example, prefix list List1 permits only 192.168.0.0/16 prefixes. LDP accepts 192.168.0.0/16 prefixes, but would not assign a local label for the following prefixes: 192.168.0.0/24 and 192.168.2.0/24. For example:

```
configure terminal
!
ip prefix-list List1 permit 192.168.0.0/16
end
```

In the following example, prefix list List2 permits a range of prefixes from 192.168.0.0/16 to /20 prefixes. LDP would accept 192.168.0.0/16 prefixes, but would not assign local labels for the following prefixes: 192.168.0.0/24 and 192.168.2.0/24.

```
configure terminal
!
ip prefix-list List2 permit 192.168.0.0/16 le 20
end
```

In the following example, prefix list List3 permits a range of prefixes greater than /18. LDP would accept 192.168.17.0/20 and 192.168.2.0/24 prefixes, but would not assign a local label for 192.168.0.0/16.

```
configure terminal
!
ip prefix-list List3 permit 192.168.0.0/16 ge 18
end
```

Configuring MPLS LDP Local Label Allocation Filtering Examples

The following examples show how to configure MPLS LDP local label allocation filtering.

This examples shows how to allocate a prefix list to be used as a local label allocation filter:

```
configure terminal
!
ip prefix-list List3 permit 192.168.0.0/16 ge 18
!
mpls ldp label
 allocate global prefix-list List3
 exit
exit
```

Prefix list List3, which permits a range of prefixes greater than /18, is configured as the local label allocation filter for the router. LDP would allow 192.168.17.0/20 and 192.168.2.0/24 prefixes, but would withdraw labels for prefixes not in the allowed range.

In the following example, host routes are configured as the local label allocation filter:

```
configure terminal
!
mpls ldp label
 allocate global host-routes
 exit
exit
```

LDP allocates local labels for host routes that are in the global routing table.

In the following example, a specific local label allocation filter is removed:

```
configure terminal
!
mpls ldp label
 no allocate global host-routes
 exit
exit
```

In the following example, all local label allocation filters configured in MPLS LDP label configuration mode are removed and the default LDP local label allocation is restored without a session reset:

```
configure terminal
!
no mpls ldp label
 exit
exit
```
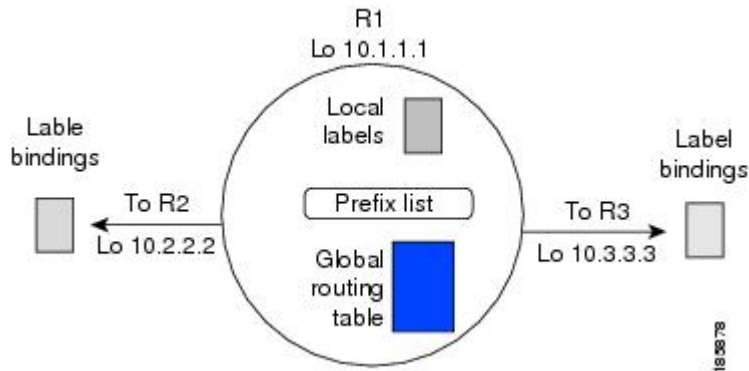
Sample MPLS LDP Local Label Allocation Filtering Configuration Example

The figure below is a sample configuration that is used in this section to show how MPLS LDP local label allocation filtering works:

- Routers R1, R2, and R3 have loopback addresses 10.1.1.1, 10.2.2.2, and 10.3.3.3 defined and advertised by the IGP, respectively.
- 10.1.1.1 is the router ID of Router R1, 10.2.2.2 is the router ID of Router R2, and 10.3.3.3 is the router ID of Router R3.
- A prefix list is defined on Router R1 to specify the local labels for which LDP allocates a local label.

Router RI learns a number of routes from its IGP neighbors on Routers R2 and R3.

Figure 3   LDP Local Label Allocation Filtering Example

You can use LDP CLI commands to verify the following:

- Router R1 has allocated a local label for the correct subset of the prefixes.
- Routers R2 and R3 did not receive any remote bindings for the prefixes for which Router R1 did not assign a local label.

Routing Table on Router R1

You can enter the **show ip route** command to display the current state of the routing table. The following example shows the routing table on Router R1 based on the figure above:

```
R1# show ip route

Codes: C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2
       i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
       ia - IS-IS inter area, * - candidate default, U - per-user static route
       o - ODR, P - periodic downloaded static route
Gateway of last resort is not set
     10.0.0.0/32 is subnetted, 1 subnets
C       10.1.1.1 is directly connected, Loopback0
     10.2.0.0/32 is subnetted, 1 subnets
O       10.2.2.2 [110/11] via 10.10.7.1, 00:00:36, Ethernet1/0
     10.3.0.0/32 is subnetted, 1 subnets
O       10.3.3.3 [110/11] via 10.10.9.1, 00:00:36, Ethernet3/0
     10.0.0.0/24 is subnetted, 3 subnets
C       10.10.7.0 is directly connected, Ethernet1/0
O       10.10.8.0 [110/20] via 10.10.9.1, 00:00:36, Ethernet3/0
                  [110/20] via 10.10.7.1, 00:00:36, Ethernet1/0
C       10.10.9.0 is directly connected, Ethernet3/0
```

Local Label Bindings on Router R1 Router R 2 and Router R3

You can enter the **show mpls ldp bindings**command on Routers R1, R2, and R3 to display the contents of the LIB on each router. In the following examples, the default LDP allocation behavior is in operation; that is, LDP allocates a local label for every route and advertises a label binding for every route learned from the IGP.

LIB on Router R

This example shows the contents of the LIB on Router R1 based on the configuration in the figure above:

```
R1# show mpls ldp bindings
  lib entry: 10.1.1.1/32, rev 7
        local binding:  label: imp-null
        remote binding: lsr: 10.3.3.3:0, label: 16
        remote binding: lsr: 10.2.2.2:0, label: 17
  lib entry: 10.2.2.2/32, rev 13
        local binding:  label: 1000
        remote binding: lsr: 10.3.3.3:0, label: 18
        remote binding: lsr: 10.2.2.2:0, label: imp-null
  lib entry: 10.3.3.3/32, rev 15
        local binding:  label: 1002
        remote binding: lsr: 10.3.3.3:0, label: imp-null
        remote binding: lsr: 10.2.2.2:0, label: 18
  lib entry: 10.10.7.0/24, rev 8
        local binding:  label: imp-null
        remote binding: lsr: 10.3.3.3:0, label: 17
        remote binding: lsr: 10.2.2.2:0, label: imp-null
  lib entry: 10.10.8.0/24, rev 11
        local binding:  label: 1001
        remote binding: lsr: 10.3.3.3:0, label: imp-null
        remote binding: lsr: 10.2.2.2:0, label: imp-null
  lib entry: 10.10.9.0/24, rev 9
        local binding:  label: imp-null
        remote binding: lsr: 10.3.3.3:0, label: imp-null
        remote binding: lsr: 10.2.2.2:0, label: 16
```

The local labels assigned to 10.2.2.2 and 10.3.3.3 on Router R1 are advertised to Routers R2 and R3.

LIB on Router R2

This example shows the contents of the LIB on Router R2 based on the configuration in the figure above:

```
R2# show mpls ldp bindings
  lib entry: 10.1.1.1/32, rev 11
        local binding:  label: 17
        remote binding: lsr: 10.3.3.3:0, label: 16
        remote binding: lsr: 10.1.1.1:0, label: imp-null
  lib entry: 10.2.2.2/32, rev 7
        local binding:  label: imp-null
        remote binding: lsr: 10.3.3.3:0, label: 18
        remote binding: lsr: 10.1.1.1:0, label: 1000
  lib entry: 10.3.3.3/32, rev 15
        local binding:  label: 18
        remote binding: lsr: 10.3.3.3:0, label: imp-null
        remote binding: lsr: 10.1.1.1:0, label: 1002
  lib entry: 10.10.7.0/24, rev 8
        local binding:  label: imp-null
        remote binding: lsr: 10.3.3.3:0, label: 17
        remote binding: lsr: 10.1.1.1:0, label: imp-null
  lib entry: 10.10.8.0/24, rev 9
        local binding:  label: imp-null
        remote binding: lsr: 10.3.3.3:0, label: imp-null
        remote binding: lsr: 10.1.1.1:0, label: 1001
  lib entry: 10.10.9.0/24, rev 13
        local binding:  label: 16
```

```
                        remote binding: lsr: 10.3.3.3:0, label: imp-null
                        remote binding: lsr: 10.1.1.1:0, label: imp-null
```

LIB on Router R3

This example shows the contents of the LIB on Router R3 based on the configuration in the figure above:

```
R3# show mpls ldp bindings
  lib entry: 10.1.1.1/32, rev 13
        local binding:  label: 16
        remote binding: lsr: 10.2.2.2:0, label: 17
        remote binding: lsr: 10.1.1.1:0, label: imp-null
  lib entry: 10.2.2.2/32, rev 15
        local binding:  label: 18
        remote binding: lsr: 10.2.2.2:0, label: imp-null
        remote binding: lsr: 10.1.1.1:0, label: 1000
  lib entry: 10.3.3.3/32, rev 7
        local binding:  label: imp-null
        remote binding: lsr: 10.2.2.2:0, label: 18
        remote binding: lsr: 10.1.1.1:0, label: 1002
  lib entry: 10.10.7.0/24, rev 11
        local binding:  label: 17
        remote binding: lsr: 10.2.2.2:0, label: imp-null
        remote binding: lsr: 10.1.1.1:0, label: imp-null
  lib entry: 10.10.8.0/24, rev 8
        local binding:  label: imp-null
        remote binding: lsr: 10.2.2.2:0, label: imp-null
        remote binding: lsr: 10.1.1.1:0, label: 1001
  lib entry: 10.10.9.0/24, rev 9
        local binding:  label: imp-null
        remote binding: lsr: 10.2.2.2:0, label: 16
        remote binding: lsr: 10.1.1.1:0, label: imp-null
```

Local Label Allocation Filtering Configuration on Router R1

You enter the **mpls ldp label**command to configure a local label allocation filter. The following examples show how to configure a local label allocation filter by host routes only and by a prefix list.

Local Label Allocation Filter--Host Routes Only Configuration

This example shows the selection of host routes as the only filter.

The following local label allocation filtering is defined on Router R1 under MPLS LDP label configuration mode:

```
configure terminal
!
mpls ldp label
 allocate global host-routes
 exit
exit
```

Local Label Allocation Filter--Prefix List Configuration

The following example shows how to configure a local label allocation filter that allows or denies prefixes based on a prefix list:

```
configure terminal
!
mpls ldp label
 allocate global prefix-list ListA
 exit
end
```

ListA is a prefix list defined as:

```
configure terminal
!
ip prefix-list ListA permit 0.0.0.0/32 ge 32
```

Local Label Allocation Filtering Changes Label Bindings on Router R1 Router R 2 and Router R3

After configuring a local label allocation filter on Router R1, you can enter the **show mpls ldp bindings**command again to see the changes in the local label bindings in the LIB on each router. Changes to the output in the LIB entries are highlighted in bold text.

This sample prefix list is used for the examples in the this section:

```
ip prefix-list ListA permit 0.0.0.0/32 ge 32
```

LIB on Router R1 After Local Label Allocation Filtering

This example shows how the configuration of a local label allocation prefix-list filter changes the contents of the LIB on Router R1:

```
R1# show mpls ldp bindings
  lib entry: 10.1.1.1/32, rev 7
        local binding:  label: imp-null
        remote binding: lsr: 10.3.3.3:0, label: 16
        remote binding: lsr: 10.2.2.2:0, label: 17
  lib entry: 10.2.2.2/32, rev 13
        local binding:  label: 1000
        remote binding: lsr: 10.3.3.3:0, label: 18
        remote binding: lsr: 10.2.2.2:0, label: imp-null
  lib entry: 10.3.3.3/32, rev 15
        local binding:  label: 1002
        remote binding: lsr: 10.3.3.3:0, label: imp-null
        remote binding: lsr: 10.2.2.2:0, label: 18
  lib entry: 10.10.7.0/24, rev 8
        no local binding
        remote binding: lsr: 10.3.3.3:0, label: 17
        remote binding: lsr: 10.2.2.2:0, label: imp-null
  lib entry: 10.10.8.0/24, rev 11
        no local binding
        remote binding: lsr: 10.3.3.3:0, label: imp-null
        remote binding: lsr: 10.2.2.2:0, label: imp-null
  lib entry: 10.10.9.0/24, rev 9
        no local binding
        remote binding: lsr: 10.3.3.3:0, label: imp-null
        remote binding: lsr: 10.2.2.2:0, label: 16
```

Local label bindings for all but 10.2.2.2 and 10.3.3.3 on Router R1 are advertised as withdrawn.

LIB on Router R2 After Local Label Allocation Filtering

This example shows how the configuration of a local label allocation prefix-list filter on Router R1 changes the contents of the LIB on Router R2:

```
R2# show mpls ldp bindings
  lib entry: 10.1.1.1/32, rev 11
        local binding:  label: 17
        remote binding: lsr: 10.3.3.3:0, label: 16
  lib entry: 10.2.2.2/32, rev 7
        local binding:  label: imp-null
        remote binding: lsr: 10.3.3.3:0, label: 18
        remote binding: lsr: 10.1.1.1:0, label: 1000
  lib entry: 10.3.3.3/32, rev 15
```

```
               local binding:  label: 18
               remote binding: lsr: 10.3.3.3:0, label: imp-null
               remote binding: lsr: 10.1.1.1:0, label: 1002
lib entry: 10.10.7.0/24, rev 8
               local binding:  label: imp-null
               remote binding: lsr: 10.3.3.3:0, label: 17
  lib entry: 10.10.8.0/24, rev 9
               local binding:  label: imp-null
               remote binding: lsr: 10.3.3.3:0, label: imp-null
  lib entry: 10.10.9.0/24, rev 13
               local binding:  label: 16
               remote binding: lsr: 10.3.3.3:0, label: imp-null
```

The 10.10.7.0/24, 10.10.8.0/24, and 10.10.9.0/24 prefixes are no longer assigned local labels. Therefore, Router R1 sends no label advertisement for these prefixes.

LIB on Router R3 After Local Label Allocation Filtering

This example shows how the configuration of a local label allocation prefix-list filter on Router R1 changes the contents of the LIB on Router R3:

```
R3# show mpls ldp bindings
  lib entry: 10.1.1.1/32, rev 13
               local binding:  label: 16
               remote binding: lsr: 10.2.2.2:0, label: 17
               remote binding: lsr: 10.1.1.1:0, label: imp-null
  lib entry: 10.2.2.2/32, rev 15
               local binding:  label: 18
               remote binding: lsr: 10.2.2.2:0, label: imp-null
               remote binding: lsr: 10.1.1.1:0, label: 1000
  lib entry: 10.3.3.3/32, rev 7
               local binding:  label: imp-null
               remote binding: lsr: 10.2.2.2:0, label: 18
               remote binding: lsr: 10.1.1.1:0, label: 1002
  lib entry: 10.10.7.0/24, rev 11
               local binding:  label: 17
               remote binding: lsr: 10.2.2.2:0, label: imp-null
  lib entry: 10.10.8.0/24, rev 8
               local binding:  label: imp-null
               remote binding: lsr: 10.2.2.2:0, label: imp-null
  lib entry: 10.10.9.0/24, rev 9
               local binding:  label: imp-null
               remote binding: lsr: 10.2.2.2:0, label: 16
```

The 10.10.7.0/24, 10.10.8.0/24, and 10.10.9.0/24 prefixes are no longer assigned local labels. Again, Router R1 sends no label advertisement for these prefixes.

Command to Display the Local Label Allocation Filter

You can enter the **show mpls ldp detail** command to display the filter used for local label allocation. For example:

```
Router# show mpls ldp bindings detail
Advertisement spec:
        Prefix acl = List1
Local label filtering spec: host routes. ! <--- Local local label filtering spec

  lib entry: 10.1.1.1/32, rev 9
  lib entry: 10.10.7.0/24, rev 10
  lib entry: 10.10.8.0/24, rev 11
  lib entry: 10.10.9.0/24, rev 12
  lib entry: 10.41.41.41/32, rev 17
  lib entry: 10.50.50.50/32, rev 15
  lib entry: 10.60.60.60/32, rev 18
  lib entry: 10.70.70.70/32, rev 16
  lib entry: 10.80.80.80/32, rev 14
```

Additional References

Related Documents

Related Topic	Document Title
Configuration tasks for MPLS LDP	MPLS Label Distribution Protocol Overview
MPLS LDP commands	*Cisco IOS Multiprotocol Label Switching Command Reference*
Configuration tasks for inbound label binding filtering for MPLS LDP	MPLS LDP Inbound Label Binding Filtering

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 3037	LDP Applicability
RFC 3815	Definitions of Managed Objects for the Multiprotocol Label Switching (MPLS), Label Distribution Protocol (LDP)

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.	http://www.cisco.com/techsupport
To receive security and technical information about your products, you can subscribe to various services, such as the Product Alert Tool (accessed from Field Notices), the Cisco Technical Services Newsletter, and Really Simple Syndication (RSS) Feeds.	
Access to most tools on the Cisco Support website requires a Cisco.com user ID and password.	

Feature Information for MPLS LDP--Local Label Allocation Filtering

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 MPLS LDP--Local Label Allocation Filtering*

Feature Name	Releases	Feature Information
MPLS LDP--Local Label Allocation Filtering	12.2(33)SRC 12.2(33)SB	This feature introduces command-line interface (CLI) commands to modify the way in which Multiprotocol Label Switching (MPLS) Label Distribution Protocol (LDP) handles local label allocation. This MPLS LDP feature enhancement enables the configuration of filtering policies for selective local label binding assignments by LDP to improve LDP scalability and convergence. This document contains information about and instructions on how to configure the MPLS LDP--Local Label Allocation Filtering feature. In 12.2(33)SRC, the feature was introduced on a Cisco IOS 12.2SR release. In 12.2(33)SB, the feature was integrated into a Cisco IOS 12.2SB release. The following sections provide information about this feature:
		The following commands were introduced or modified: **allocate**, **debug mpls ldp bindings**, **mpls ldp label**, **show mpls ldp bindings**.

Glossary

BGP --Border Gateway Protocol. An interdomain routing protocol that replaces Exterior Gateway Protocol (EGP). A BGP system exchanges reachability information with other BGP systems. It is defined by RFC 1163.

CE router --customer edge router. A router that is part of a customer network and that interfaces to a provider edge (PE) router. CE routers do not have routes to associated Virtual Private Networks (VPNs) in their routing tables.

FEC --Forwarding Equivalency Class. A set of packets that can be handled equivalently for the purpose of forwarding and thus is suitable for binding to a single label. The set of packets destined for an address prefix is one example of an FEC.

IGP --Interior Gateway Protocol. Internet protocol used to exchange routing information within a single autonomous system. Examples of common Internet IGP protocols include Interior Gateway Routing Protocol (IGRP), Open Shortest Path First (OSPF), Intermediate System-to-Intermediate System (IS-IS), and Routing Information protocol (RIP).

label --A short fixed-length label that tells switching nodes how to forward data (packets or cells).

LDP --Label Distribution Protocol. A standard protocol between Multiprotocol Label Switching (MPLS)-enabled routers that is used for the negotiation of the labels (addresses) used to forward packets.

LIB --Label Information Base. A database used by a label switch router (LSR) to store labels learned from other LSRs, and labels assigned by the local LSR.

LSP --label switched path. A sequence of hops in which a packet travels from one router to another router by means of label switching mechanisms. A label switched path can be established dynamically, based on normal routing mechanisms, or through configuration.

LSR --label switch router. A device that forwards Multiprotocol Label Switching (MPLS) packets based on the value of a fixed-length label encapsulated in each packet.

MPLS --Multiprotocol Label Switching. A switching method that forwards IP traffic using a label. This label instructs the routers and the switches in the network where to forward the packets. The forwarding of MPLS packets is based on preestablished IP routing information

PE router --provider edge router. A router that is part of a service provider's network connected to a customer edge (CE) router. All Virtual Private Network (VPN) processing occurs in the PE router.

VPN --Virtual Private Network. A secure IP-based network that shares resources on one or more physical networks. A VPN contains geographically dispersed sites that can communicate securely over a shared backbone.