MPLS LDP Local Label Allocation Filtering

The MPLS LDP Local Label Allocation Filtering feature introduces 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.

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Prerequisites for MPLS LDP Local Label Allocation Filtering

The MPLS LDP Local Label Allocation Filtering feature requires the MPLS Forwarding Infrastructure (MFI).

Restrictions for MPLS LDP Local Label Allocation Filtering

- This feature does not support access lists; it supports prefix lists.
- Label Distribution Protocol (LDP) local label allocation configuration for prefix list or host routes is supported only in the global routing table.
- LDP and Routing Information Base (RIB) restart handling 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

The Label Distribution Protocol (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.

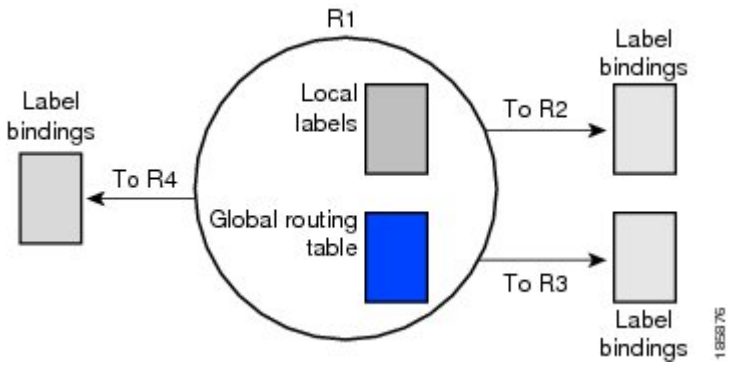
In most Layer 3 Virtual Private Network (VPN) configurations only the label switched paths (LSPs) created to reach the /32 host routes or Border Gateway Protocol (BGP) next hops between the provider edge (PE) devices carry traffic and are relevant to the Layer 3 VPNs. LSPs between the PE devices that 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.

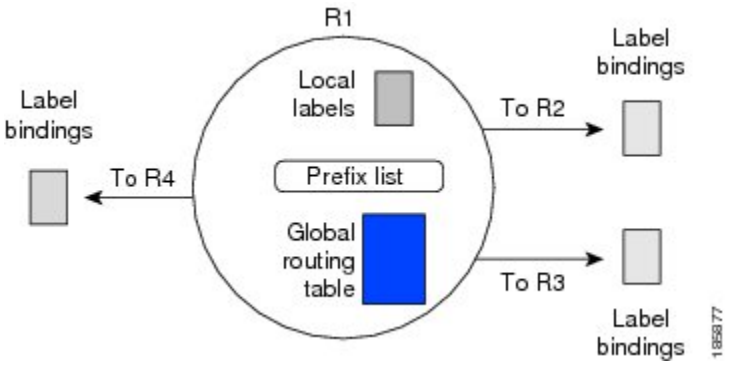
Local label allocation filtering reduces the number of local labels allocated and therefore the number of messages exchanged with peers. This improves LDP scalability and convergence. The two figures below show how controlling local label allocation can reduce local label space size and greatly reduce the number of advertisements to peers. The first 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 device R1 learns a number of routes from its IGP neighbors on devices R2, R3, and R4. A prefix list defined on device 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 a label switch router (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 the Label Distribution Protocol (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.

Local Label Allocation Changes and LDP Actions

The MPLS LDP Local Label Allocation Filtering enhancement modifies the Label Distribution Protocol's (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 Label Information Database (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 Label Distribution Protocol (LDP) default behavior is to allocate local labels for all non-Border Gateway Protocol (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 the Label Distribution Protocol (LDP) local label allocation filtering. A prefix list allows LDP to selectively allocate local labels for a subset of the routes learned from the Interior Gateway Protocol {IGP). The decrease in the number of local labels in the LDP Label Information Base (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

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Device# 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:** `Device(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 is 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

	Command or Action	Purpose
		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:** `Device(config)# end`	Returns to privileged EXEC mode.

Configuring MPLS LDP Local Label Allocation Filtering

Perform the following task to configure the Label Distribution Protocol (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.

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

Note A maximum of one local label allocation filter is supported for the global table.

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. **end**

DETAILED STEPS

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**mpls ldp label** **Example:** `Device(config)# mpls ldp label`	Enters MPLS LDP label configuration mode to specify how LDP handles local label allocation.
Step 4	**allocate global prefix-list** {*list-name* | *list-number*} **Example:** `Device(config-ldp-lbl)# allocate global prefix-list list1`	Configures local label allocation filters for learned routes for 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.
Step 5	**allocate global host-routes** **Example:** `Device(config-ldp-lbl)# allocate global host-routes`	Configures local label allocation filters for learned routes for LDP. • The **global** keyword specifies the global routing.

	Command or Action	Purpose
		• 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:** `Device(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:** `Device(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	**end** **Example:** `Device(config-ldp-lbl)# end`	Returns to privileged EXEC mode.

Verifying 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

Procedure

Step 1 **enable**

Enables privileged EXEC mode. Enter your password if prompted.

Example:

```
Device> enable
Device#
```

Step 2 **show mpls ldp bindings detail**

Verifies that local label allocation filtering is configured as you expect.

Example:

```
Device# 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 device.

Step 3 **debug mpls ldp binding filter**

Verifies that local label allocation filtering was configured properly and to display how LDP accepts or withdraw labels.

Example:

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

Step 4 **exit**

Returns to user EXEC mode.

Example:

```
Device# exit
Device>
```

Configuration Examples for MPLS LDP Local Label Allocation Filtering

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

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. The Label Distribution Protocol (LDP) accepts 192.168.0.0/16 prefixes, but does 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 accepts 192.168.0.0/16 prefixes, but does 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 accepts 192.168.17.0/20 and 192.168.2.0/24 prefixes, but does 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
```

Examples: Configuring 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 device. The Label Distribution Protocol (LDP) allows 192.168.17.0/20 and 192.168.2.0/24 prefixes, but withdraws 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
```

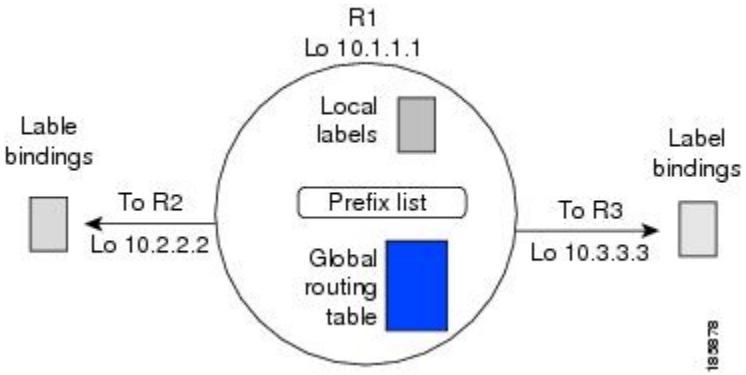
Examples: Sample MPLS LDP Local Label Allocation Filtering Configuration

The figure below is a sample configuration that is used in this section to show how Multiprotocol Label Switching (MPLS) Label Distribution Protocol (LDP) local label allocation filtering works:

- Devices 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 Interior Gateway Protocol (IGP), respectively.
- 10.1.1.1 is the router ID of Device R1, 10.2.2.2 is the router ID of Device R2, and 10.3.3.3 is the router ID of Device R3.
- A prefix list is defined on Device R1 to specify the local labels for which LDP allocates a local label.

Device RI learns a number of routes from its IGP neighbors on Devices R2 and R3.

Figure 3: LDP Local Label Allocation Filtering Example



You can use LDP CLI commands to verify the following:

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

Routing Table on Device 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 Device R1 based on the figure above:

```
Device# 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, FastEthernet1/0/0
     10.3.0.0/32 is subnetted, 1 subnets
O       10.3.3.3 [110/11] via 10.10.9.1, 00:00:36, FastEthernet3/0/0
     10.0.0.0/24 is subnetted, 3 subnets
C       10.10.7.0 is directly connected, FastEthernet1/0/0
O       10.10.8.0 [110/20] via 10.10.9.1, 00:00:36, FastEthernet3/0/0
                  [110/20] via 10.10.7.1, 00:00:36, FastEthernet1/0/0
C       10.10.9.0 is directly connected, FastEthernet3/0/0
```

Local Label Bindings on Devices R1, R2, and R3

You can enter the **show mpls ldp bindings** command on Devices R1, R2, and R3 to display the contents of the Label Information Base (LIB) on each device. In the following examples, the default Label Distribution Protocol (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 Interior Gateway Protocol (IGP).

LIB on Device R1

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

```
Device# 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 Device R1 are advertised to Devices R2 and R3.

LIB on Device R2

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

```
Device# 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 Device R3

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

```
Device # 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 Device 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 Device 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 Devices R1, R2, and R3

After configuring a local label allocation filter on Device R1, you can enter the **show mpls ldp bindings** command again to see the changes in the local label bindings in the Label Information Base (LIB) on each device. 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 Device 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 Device R1:

```
Device# 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 Device R1 are advertised as withdrawn.

LIB on Device R2 After Local Label Allocation Filtering

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

```
Device# 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, Device R1 sends no label advertisement for these prefixes.

LIB on Device R3 After Local Label Allocation Filtering

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

```
Device# 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, Device 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:

```
Device# 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
Cisco IOS commands	Cisco IOS Master Command List, All Releases
MPLS commands	Cisco IOS Multiprotocol Label Switching Command Reference
Configuration tasks for MPLS LDP	"MPLS Label Distribution Protocol" module in the *MPLS Label Distribution Protocol Configuration Guide*
Configuration tasks for inbound label binding filtering for MPLS LDP	"MPLS LDP Inbound Label Binding Filtering" module in the *MPLS Label Distribution Protocol Configuration Guide*

RFCs

RFC	Title
RFC 3037	LDP Applicability
RFC 3815	Definitions of Managed Objects for the Multiprotocol Label Switching (MPLS), Label Distribution Protocol (LDP)
RFC 5036	LDP Specification

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 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.

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

FEC—Forwarding Equivalence 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 devices 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 device to another device 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 devices and the switches in the network where to forward the packets. The forwarding of MPLS packets is based on preestablished IP routing information

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

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.