Multiprotocol Label Switching Load Balancing

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The Cisco ME 3800 and ME 3600 switches support IPv4 and IPv6 load balancing at the LER and LSR. Effective with Cisco IOS Release 15.3(3)S, the following features are supported:

- Layer 2 VPN load balancing at LER and LSR
- Layer 3 VPN load balancing at LER and LSR
- Load balancing over port channel at LER and LSR

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 for MPLS Load Balancing, page 22.

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

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- Configuration Examples for MPLS Load Balancing, page 3
Prerequisites for MPLS Load Balancing

- MPLS should be enabled on the Cisco ME3600/ME3800 switches.
- For MPLS load balancing over port channel, the port channel should be configured and MPLS should be enabled on the port channel interface.

Restrictions for MPLS Load Balancing

- The `show mpls forwarding-table counters` command does not display the switched packets for all interfaces. It displays the number of packets only for that label. To view switched packets on each interface, use the `show interface interface-name counter` command.
- Only four load balancing paths are supported.

Layer 2 VPN Load Balancing

- To get an evenly-distributed load balancing experience over virtual circuits (VC), it is recommended to have more number of VCs.

Layer 3 VPN Load Balancing

- Load balancing is supported only on homogeneous paths, that is, all MPLS adjacencies or all IP adjacencies.

Information About MPLS Load Balancing

Load balancing is a technique to distribute traffic evenly across various links to obtain optimal resource utilization.

MPLS load balancing occurs at the LER and LSR.

How to Configure MPLS Load Balancing

<table>
<thead>
<tr>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ensure that MPLS is configured.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>No other specific command needs to be enabled for MPLS Load Balancing to work.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Step 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Understand MPLS VPN. For more information, see the &quot;Understanding MPLS VPNs&quot; section in the Configuring MPLS, MPLS VPN, MPLS OAM, and EoMPLS document.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Step 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Configure MPLS VPN. For more information, see the &quot;Configuring MPLS VPNs&quot; section in the Configuring MPLS, MPLS VPN, MPLS OAM, and EoMPLS document.</td>
</tr>
</tbody>
</table>
Step 3 Enable MPLS. For more information, see the "Enabling MPLS" section in the Configuring MPLS, MPLS VPN, MPLS OAM, and EoMPLS document.

Step 4 Define VPN. For more information, see the "Defining VPNs" section in the Configuring MPLS, MPLS VPN, MPLS OAM, and EoMPLS document.

Step 5 Configure BGP Routing Sessions. For more information, see the "Configuring BGP Routing Sessions" section in the Configuring MPLS, MPLS VPN, MPLS OAM, and EoMPLS document.

Step 6 Configure the Provider-Edge-to-Provider-Edge Routing Sessions. For more information, see the "Configuring the Provider-Edge-to-Provider-Edge Routing Sessions" section in the Configuring MPLS, MPLS VPN, MPLS OAM, and EoMPLS document.

Where to Go Next?

Configure MPLS Load Balancing. For more information, see Configuration Examples for MPLS Load Balancing, page 3.

Configuration Examples for MPLS Load Balancing

Consider the following topology:

![Topology for MPLS Load Balancing](image)

where,

- CE—customer edge router that is located at the customer premises. The CE provides an Ethernet interface between the customer's LAN and the provider's core network.
• PE—provider edge router is a router that is located at the edge of a service provider’s network. A PE router is any component capable of a broad range of routing protocol, such as:
  – Border Gateway Protocol (BGP)
  – Open Shortest Path First (OSPF)
  – Multi-Protocol Label Switching (MPLS)
• P—provider router located in the core of the service provider’s network.

Layer 2 VPN Configuration Example

This example depicts configuration for 129 virtual circuits. See Figure 1 for the following configuration:

At PE1:

```
interface loopback0
no shut
ip address 1.1.1.1 255.255.255.255
mpls ip
mpls label protocol ldp
mpls ldp advertise-labels
interface gig0/4
no switchport
no shut
no keepalive
ip address 5.5.5.1 255.255.0.0
mpls ip
mpls label protocol ldp
mpls ldp advertise-labels
router ospf 10
network 5.5.5.1 0.0.0.0 area 0
network 1.1.1.1 0.0.0.0 area 0
```

• Configure the service instance from 2 to 129

Note There are multiple MPLS links in the core. The packets are load balanced across the core links based on the L2VPN labels.

```
interface g0/1
no shut
switchport
switchport trunk allowed vlan none
switchport mode trunk
service instance 2 ethernet
  encapsulation dot1q 2
  rewrite ingress tag pop 1 symmetric
  xconnect 2.2.2.2 2 encapsulation mpls
!
!
service instance 129 ethernet
  encapsulation dot1q 129
  rewrite ingress tag pop 1 symmetric
  xconnect 2.2.2.2 129 encapsulation mpls
```

At P1:

```
interface loopback0
no shut
```
ip address 4.4.4.4 255.255.255.255

mpls ip
mpls label protocol ldp
mpls ldp advertise-labels
interface g0/4
no switchport
no shut
no keepalive
ip address 5.5.5.2 255.255.0.0
mpls ip
mpls label protocol ldp
mpls ldp advertise-labels

interface port-channel1
no switchport
no keepalive
ip address 90.0.0.1 255.255.0.0
mpls ip
mpls label protocol ldp

router ospf 10
network 4.4.4.4 0.0.0.0 area 0
network 90.0.0.1 0.0.0.0 area 0
network 5.5.5.2 0.0.0.0 area 0

interface gig0/8
no switchport
no shut
no keepalive
no ip address
channel-group 1 mode active

interface gig0/9
no switchport
no shut
no keepalive
no ip address
channel-group 1 mode active

interface gig0/13
no switchport
no shut
no keepalive
no ip address
channel-group 1 mode active

interface gig0/14
no switchport
no shut
no keepalive
no ip address
channel-group 1 mode active

At P2:

interface loopback0
no shut
ip address 3.3.3.3 255.255.255.255
interface port-channel1
no switchport
no keepalive
ip address 90.0.0.2 255.255.0.0
mpls ip
mpls label protocol ldp

interface port-channel2
no switchport
no keepalive
ip address 100.0.0.2 255.255.0.0
mpls ip
mpls label protocol ldp

router ospf 10
network 90.0.0.2 0.0.0.0 area 0
network 100.0.0.2 0.0.0.0 area 0
network 3.3.3.3 0.0.0.0 area 0

interface gig0/8
no switchport
no shut
no keepalive
no ip address
channel-group 1 mode active

interface gig0/9
no switchport
no shut
no keepalive
no ip address
channel-group 1 mode active

interface gig0/13
no switchport
no shut
no keepalive
no ip address
channel-group 1 mode active

interface gig0/14
no switchport
no shut
no keepalive
no ip address
channel-group 1 mode active

interface gig0/4
no switchport
no shut
no keepalive
no ip address
channel-group 2 mode active

interface gig0/5
no switchport
no shut
no keepalive
no ip address
channel-group 2 mode active

interface gig0/11
no switchport
no shut
no keepalive
no ip address
channel-group 2 mode active

interface gig0/15
no switchport
no shut
no keepalive
no ip address
channel-group 2 mode active

At PE2:

interface loopback0
no shut
ip address 2.2.2.2 255.255.255.255

interface port-channel2
no switchport
no keepalive
ip address 100.0.0.1 255.255.0.0
mpls ip
mpls label protocol ldp

router ospf 10
network 100.0.0.1 0.0.0.0 area 0
network 2.2.2.2 0.0.0.0 area 0

interface gig0/4
no switchport
no shut
no keepalive
no ip address
channel-group 2 mode active

interface gig0/5
no switchport
no shut
no keepalive
no ip address
channel-group 2 mode active

interface gig0/11
no switchport
no shut
no keepalive
no ip address
channel-group 2 mode active

interface gig0/15
no switchport
no shut
no keepalive
no ip address
channel-group 2 mode active

- Configure the service instance from 2 to 129

interface gig0/24
no shut
switchport
How to Configure MPLS Load Balancing

```
switchport trunk allowed vlan none
switchport mode trunk
service instance 2 ethernet
  encapsulation dot1q 2
  rewrite ingress tag pop 1 symmetric
  xconnect 1.1.1.1 2 encapsulation mpls

!  !
service instance 129 ethernet
  encapsulation dot1q 129
  rewrite ingress tag pop 1 symmetric
  xconnect 1.1.1.1 129 encapsulation mpls
```

This configuration enables load balancing in g0/4, g0/5, g0/11, g0/15 in P2 and PE2.

Layer 3 VPN Configuration Example

This example depicts configuration for 129 VPN Routing and Forwarding (VRF) instances. See Figure 1 for this configuration:

At PE1:

```
ip routing
ip cef
interface loopback0
no shut
ip address 1.1.1.1 255.255.255.255

• Configure EFP from 2 to 129
  interface g0/1
  no shut
  switchport
  switchport trunk allowed vlan none
  switchport mode trunk
  service instance 2 ethernet
  encapsulation dot1q 2
  rewrite ingress tag pop 1 symmetric
  bridge-domain 2
  !  
  service instance 129 ethernet
  encapsulation dot1q 129
  rewrite ingress tag pop 1 symmetric
  bridge-domain 129

• Configure VRF from 2 to 129
  ip vrf vrf2
    rd 2:2
    route-target export 2:2
    route-target import 2:2
    
    !
  ip vrf vrf129
    rd 129:129
    route-target export 129:129
    route-target import 129:129

• Add address-family from 2 to 129
  router bgp 10
  bgp router-id 1.1.1.1
```
bgp log-neighbor-changes
bgp deterministic-med
no bgp default ipv4-unicast
neighbor 2.2.2.2 remote-as 10
neighbor 2.2.2.2 update-source Loopback0
!
address-family ipv4
redistribute connected
exit-address-family
!
address-family vpnv4
neighbor 2.2.2.2 activate
neighbor 2.2.2.2 s-community both
exit-address-family
!
address-family ipv4 vrf vrf2
redistribute connected
exit-address-family
!
address-family ipv4 vrf vrf3
redistribute connected
exit-address-family
!
address-family ipv4 vrf vrf129
redistribute connected
exit-address-family
!

- **Configure VLAN from 2 to 129**

  interface Vlan2
  ip vrf forwarding vrf2
  ip address 172.16.0.1 255.255.255.240
  !
  interface Vlan3
  ip vrf forwarding vrf3
  ip address 172.16.0.17 255.255.255.240
  !
  interface Vlan129
  ip vrf forwarding vrf129
  ip address 172.16.7.241 255.255.255.240

  At P1:

  ip routing
  ip cef
  interface loopback0
  no shut
  ip address 4.4.4.4 255.255.255.255

  interface port-channel1
  no switchport
  no keepalive
  ip address 90.0.0.1 255.255.0.0
  mpls ip
  mpls label protocol ldp

  interface gig0/8
  no switchport
  no shut
  no keepalive
  no ip address
  channel-group 1 mode active
interface gig0/9
no switchport
no shut
no keepalive
no ip address
channel-group 1 mode active

interface gig0/13
no switchport
no shut
no keepalive
no ip address
channel-group 1 mode active

interface gig0/14
no switchport
no shut
no keepalive
no ip address
channel-group 1 mode active

At P2:

    ip routing
    ip cef
    interface loopback0
    no shut
    ip address 3.3.3.3 255.255.255.255

    interface port-channel1
    no switchport
    no keepalive
    ip address 90.0.0.2 255.255.0.0
    mpls ip
    mpls label protocol ldp

    interface port-channel2
    no switchport
    no keepalive
    ip address 100.0.0.2 255.255.0.0
    mpls ip
    mpls label protocol ldp

    interface gig0/8
    no switchport
    no shut
    no keepalive
    no ip address
    channel-group 1 mode active

    interface gig0/9
    no switchport
    no shut
    no keepalive
    no ip address
    channel-group 1 mode active

    interface gig0/13
    no switchport
    no shut

    interface gig0/14
    no switchport
    no shut
    no keepalive
    no ip address
    channel-group 1 mode active

    interface gig0/14
    no switchport
    no shut
    no keepalive
    no ip address
    channel-group 1 mode active
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no keepalive
no ip address
channel-group 1 mode active

interface gig0/14
no switchport
no shut
no keepalive
no ip address
channel-group 1 mode active

interface gig0/4
no switchport
no shut
no keepalive
no ip address
channel-group 2 mode active

interface gig0/5
no switchport
no shut
no keepalive
no ip address
channel-group 2 mode active

interface gig0/11
no switchport
no shut
no keepalive
no ip address
channel-group 2 mode active

interface gig0/15
no switchport
no shut
no keepalive
no ip address
channel-group 2 mode active

At PE2:

    ip routing
    ip cef
    interface loopback0
    no shut
    ip address 2.2.2.2 255.255.255.255

• Configure EFP from 2 to 129

    interface gig0/24
    no shut
    switchport
    switchport trunk allowed vlan none
    switchport mode trunk
    service instance 2 ethernet
    encapsulation dot1q 2
    rewrite ingress tag pop 1 symmetric
    bridge-domain 2

    !
    service instance 129 ethernet
    encapsulation dot1q 129
    rewrite ingress tag pop 1 symmetric
    bridge-domain 129
• Configure VRF from 2 to 129

```plaintext
ip vrf vrf2
  rd 2:2
  route-target export 2:2
  route-target import 2:2

!

ip vrf vrf129
  rd 129:129
  route-target export 129:129
  route-target import 129:129
```

• Configure vlan from 2 to 129

```plaintext
interface Vlan2
  ip vrf forwarding vrf2
  ip address 172.26.0.1 255.255.255.240

interface Vlan3
  ip vrf forwarding vrf3
  ip address 172.26.0.17 255.255.255.240

interface Vlan129
  ip vrf forwarding vrf129
  ip address 172.26.7.241 255.255.255.240
```

• Add address family 2 to 129

```plaintext
router bgp 10
  bgp router-id 2.2.2.2
  bgp log-neighbor-changes
  bgp deterministic-med
  no bgp default ipv4-unicast
  neighbor 1.1.1.1 remote-as 10
  neighbor 1.1.1.1 update-source Loopback0

  address-family ipv4
    redistribute connected
    exit-address-family

  address-family vpnv4
    neighbor 1.1.1.1 activate
    neighbor 1.1.1.1 s-community both
    exit-address-family

  address-family ipv4 vrf vrf2
    redistribute connected
    exit-address-family

  address-family ipv4 vrf vrf3
    redistribute connected
    exit-address-family

  address-family ipv4 vrf vrf129
    redistribute connected
    exit-address-family

  interface port-channel2
    no switchport
    no keepalive
    ip address 100.0.0.1 255.255.0.0
  mpls ip
```
mpls label protocol ldp

interface gig0/4
no switchport
no shut
no keepalive
no ip address
channel-group 2 mode active

interface gig0/5
no switchport
no shut
no keepalive
no ip address
channel-group 2 mode active

interface gig0/11
no switchport
no shut
no keepalive
no ip address
channel-group 2 mode active

interface gig0/15
no switchport
no shut
no keepalive
no ip address
channel-group 2 mode active

This configuration enables load balancing on g0/4, g0/5, g0/11, g0/15 in P2 and PE2.

Load Balancing Over Port Channel: Configuration Example

To configure load balancing over port channel, use the following command:

```
```

<table>
<thead>
<tr>
<th>Syntax</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>dst-ip destination-ip-address</strong></td>
<td>Loads distribution on the destination IP address. Option to exclude VLAN in the distribution is provided using the <strong>excludevlan</strong> keyword along with this method.</td>
</tr>
<tr>
<td><strong>dst-mac destination-mac-address</strong></td>
<td>Loads distribution on the destination MAC address.</td>
</tr>
<tr>
<td><strong>src-dst-ip source-XOR-destination-ip-address</strong></td>
<td>Loads distribution on the source transfer or XOR-destination IP address. Option to exclude VLAN in the distribution is provided using the <strong>excludevlan</strong> keyword along with this method.</td>
</tr>
<tr>
<td><strong>src-dst-mac source-XOR-destination-mac-address</strong></td>
<td>Loads distribution on the source XOR-destination MAC address.</td>
</tr>
</tbody>
</table>
Multiprotocol Label Switching Load Balancing

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Note

Refer to Figure 1 for this configuration.

At PE1:

```plaintext
interface loopback0
no shut
ip address 1.1.1.1 255.255.255.255

mpls ip
mpls label protocol ldp
mpls ldp advertise-labels
interface gig0/4
no switchport
no shut
no keepalive
ip address 5.5.5.1 255.255.0.0
mpls ip
mpls label protocol ldp
mpls ldp advertise-labels

routerr ospf 10
network 5.5.5.1 0.0.0.0 area 0
network 1.1.1.1 0.0.0.0 area 0
```

- Configure the service instance from 2 to 129

```plaintext
interface g0/1
no shut
switchport
switchport trunk allowed vlan none
switchport mode trunk
service instance 2 ethernet
  encapsulation dot1q 2
  rewrite ingress tag pop 1 symmetric
  xconnect 2.2.2.2 2 encapsulation mpls
!
!
service instance 129 ethernet
  encapsulation dot1q 129
  rewrite ingress tag pop 1 symmetric
  xconnect 2.2.2.2 129 encapsulation mpls
```

At P1:

```plaintext
interface loopback0
no shut
ip address 4.4.4.4 255.255.255.255

mpls ip
mpls label protocol ldp
```

---

**Table 1 Syntax Description of the port-channel load balance command (continued)**

<table>
<thead>
<tr>
<th>Syntax</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>src-ip source-ip-address</td>
<td>Loads distribution on the source IP address. Option to exclude VLAN in the distribution is provided using the excludevlan keyword along with this method.</td>
</tr>
<tr>
<td>src-mac source-mac-address</td>
<td>Loads distribution on the source MAC address.</td>
</tr>
</tbody>
</table>
mpls ldp advertise-labels
interface g0/4
no switchport
no shut
no keepalive
ip address 5.5.5.2 255.255.0.0
mpls ip
mpls label protocol ldp
mpls ldp advertise-labels

interface port-channel1
no switchport
no keepalive
ip address 90.0.0.1 255.255.0.0
mpls ip
mpls label protocol ldp

router ospf 10
network 4.4.4.4 0.0.0.0 area 0
network 90.0.0.1 0.0.0.0 area 0
network 5.5.5.2 0.0.0.0 area 0

interface gig0/8
no switchport
no shut
no keepalive
no ip address
channel-group 1 mode active

interface gig0/9
no switchport
no shut
no keepalive
no ip address
channel-group 1 mode active

interface gig0/13
no switchport
no shut
no keepalive
no ip address
channel-group 1 mode active

interface gig0/14
no switchport
no shut
no keepalive
no ip address
channel-group 1 mode active

At P2

interface loopback0
no shut
ip address 3.3.3.3 255.255.255.255

interface port-channel1
no switchport
no keepalive
ip address 90.0.0.2 255.255.0.0
mpls ip
mpls label protocol ldp

interface port-channel2
no switchport
no keepalive
ip address 100.0.0.2 255.255.0.0
mpls ip
mpls label protocol ldp

router ospf 10
network 90.0.0.2 0.0.0.0 area 0
network 100.0.0.2 0.0.0.0 area 0
network 3.3.3.3 0.0.0.0 area 0

interface gig0/8
no switchport
no shut
no keepalive
no ip address
channel-group 1 mode active

interface gig0/9
no switchport
no shut
no keepalive
no ip address
channel-group 1 mode active

interface gig0/13
no switchport
no shut
no keepalive
no ip address
channel-group 1 mode active

interface gig0/14
no switchport
no shut
no keepalive
no ip address
channel-group 1 mode active

interface gig0/4
no switchport
no shut
no keepalive
no ip address
channel-group 2 mode active

interface gig0/5
no switchport
no shut
no keepalive
no ip address
channel-group 2 mode active

interface gig0/11
no switchport
no shut
no keepalive
no ip address
channel-group 2 mode active

interface gig0/15
no switchport
no shut
no keepalive
no ip address
channel-group 2 mode active

At PE2:

interface loopback0
no shut
ip address 2.2.2.2 255.255.255.255

interface port-channel2
no switchport
no keepalive
ip address 100.0.0.1 255.255.0.0
mpls ip
mpls label protocol ldp

router ospf 10
network 100.0.0.1 0.0.0.0 area 0
network 2.2.2.2 0.0.0.0 area 0

interface gig0/4
no switchport
no shut
no keepalive
no ip address
channel-group 2 mode active

interface gig0/5
no switchport
no shut
no keepalive
no ip address
channel-group 2 mode active

interface gig0/11
no switchport
no shut
no keepalive
no ip address
channel-group 2 mode active

interface gig0/15
no switchport
no shut
no keepalive
no ip address
channel-group 2 mode active

- Configure the service instance from 2 to 129

interface gig0/24
no shut
switchport
switchport trunk allowed vlan none
switchport mode trunk
service instance 2 ethernet
  encapsulation dot1q 2
  rewrite ingress tag pop 1 symmetric
  xconnect 1.1.1.1 2 encapsulation mpls

service instance 129 ethernet
  encapsulation dot1q 129
  rewrite ingress tag pop 1 symmetric
  xconnect 1.1.1.1 129 encapsulation mpls

Load balancing should be enabled at g0/4, g0/5, g0/11, an dg0/15 in P2 and PE2.

Verifying the MPLS Load Balancing Configuration

The output of the following commands provides details of the MPLS load balancing configuration:

Switch# show 12vpn bridge-domain detail
List of Access PWS:
List of VFIs:
  VFI 1
    PW: neighbor 3.3.3.3, PW ID 200, state is up (established)
    PW class not set, XC ID 0xc0000001
    Encapsulation MPLS, protocol LDP
    PW type Ethernet, control word disabled, interworking none
    MPLS
      Local                          Remote
        ------------------------------ -----------------------------
        Label  16000                        16001
        Group ID  0x0                        0x1
        Interface  1                         1
        MTU      1500                        1500
        Control word disabled                disabled
        PW type      Ethernet                Ethernet
        VCCV CV type 0x2                     0x2
        VCCV CC type 0x6                     0x6

- Enabling load balance hashing:

Switch# show 12vpn xconnect detail
PW: neighbor 3.3.3.3, PW ID 300, state is down (provisioned)
PW class not set, XC ID 0x4000008
Encapsulation MPLS, protocol LDP
PW type Ethernet, control word disabled, interworking none
MPLS
  Local                          Remote
    ------------------------------ -----------------------------
    Label  16001                        unknown
    Group ID  0x200                      0x0
    Interface GigabitEthernet0/0/0/6    unknown
The following are sample outputs for the MPLS load balancing:

Switch# `show ip route 10.255.17.42`

Routing entry for 10.255.17.42/32
Known via "ospf 1", distance 110, metric 101, type intra area
Last update from 192.168.207.170 on GigabitEthernet0/11, 1w3d ago
Routing Descriptor Blocks:
  192.168.207.182, from 10.255.17.42, 1w3d ago, via GigabitEthernet0/14
    Route metric is 101, traffic share count is 1
  192.168.207.178, from 10.255.17.42, 1w3d ago, via GigabitEthernet0/13
    Route metric is 101, traffic share count is 1
  * 192.168.207.174, from 10.255.17.42, 1w3d ago, via GigabitEthernet0/12
    Route metric is 101, traffic share count is 1
  192.168.207.170, from 10.255.17.42, 1w3d ago, via GigabitEthernet0/11
    Route metric is 101, traffic share count is 1

Switch# `show ip cef 10.255.17.42`

10.255.17.42/32
nexthop 192.168.207.170 GigabitEthernet0/11
nexthop 192.168.207.174 GigabitEthernet0/12
nexthop 192.168.207.178 GigabitEthernet0/13
nexthop 192.168.207.182 GigabitEthernet0/14

Switch# `show ip cef 10.255.17.42 internal`

10.255.17.42/32, epoch 0, RIB[1], refcount 5, per-destination sharing sources: RIB
feature space:
  LFD: 10.255.17.42/32 1 local label
  local label info: global/243
    contains path extension list
    disposition chain 0x08E9B0B4
    label switch chain 0x08E9B2D8
  IPRM: 0x00038000
ifnmas:
  GigabitEthernet0/11(64): 192.168.207.170
  GigabitEthernet0/12(65): 192.168.207.174
  GigabitEthernet0/13(66): 192.168.207.178
  GigabitEthernet0/14(67): 192.168.207.182
path 08E8B8068, path list 08EAF274, share 1/1, type attached nexthop, for IPv4
  MPLS short path extensions: MOI flags = 0x0 label implicit-null
  nexthop 192.168.207.170 GigabitEthernet0/11, adjacency IP adj out of
  GigabitEthernet0/11, addr 192.168.207.170 0950B0E0
path 08E8B80DC, path list 08EAF274, share 1/1, type attached nexthop, for IPv4
  MPLS short path extensions: MOI flags = 0x0 label implicit-null
  nexthop 192.168.207.174 GigabitEthernet0/12, adjacency IP adj out of
  GigabitEthernet0/12, addr 192.168.207.174 0950B540
path 08E8B9EC4, path list 08EAF274, share 1/1, type attached nexthop, for IPv4
  MPLS short path extensions: MOI flags = 0x0 label implicit-null
  nexthop 192.168.207.178 GigabitEthernet0/13, adjacency IP adj out of
  GigabitEthernet0/13, addr 192.168.207.178 0950AC80
path 08E8B912C, path list 08EAF274, share 0/1, type attached nexthop, for IPv4
  MPLS short path extensions: MOI flags = 0x0 label implicit-null
Multiprotocol Label Switching Load Balancing

How to Configure MPLS Load Balancing

nexthop 192.168.207.182 GigabitEthernet0/14, adjacency IP adj out of
GigabitEthernet0/14, addr 192.168.207.182 0950A3C0
output chain:
loadinfo 08E9AE90, per-session, 4 choices, flags 0003, 5 locks
flags: Per-session, for-rx-IPv4
16 hash buckets
< 0 > IP adj out of GigabitEthernet0/11, addr 192.168.207.170 0950B0E0
< 1 > IP adj out of GigabitEthernet0/12, addr 192.168.207.174 0950B540
< 2 > IP adj out of GigabitEthernet0/13, addr 192.168.207.178 0950AC80
< 3 > IP adj out of GigabitEthernet0/14, addr 192.168.207.182 0950A3C0
< 4 > IP adj out of GigabitEthernet0/11, addr 192.168.207.170 0950B0E0
< 5 > IP adj out of GigabitEthernet0/12, addr 192.168.207.174 0950B540
< 6 > IP adj out of GigabitEthernet0/13, addr 192.168.207.178 0950AC80
< 7 > IP adj out of GigabitEthernet0/14, addr 192.168.207.182 0950A3C0
< 8 > IP adj out of GigabitEthernet0/11, addr 192.168.207.170 0950B0E0
< 9 > IP adj out of GigabitEthernet0/12, addr 192.168.207.174 0950B540
<10 > IP adj out of GigabitEthernet0/13, addr 192.168.207.178 0950AC80
<11 > IP adj out of GigabitEthernet0/14, addr 192.168.207.182 0950A3C0
<12 > IP adj out of GigabitEthernet0/11, addr 192.168.207.170 0950B0E0
<13 > IP adj out of GigabitEthernet0/12, addr 192.168.207.174 0950B540
<14 > IP adj out of GigabitEthernet0/13, addr 192.168.207.178 0950AC80
<15 > IP adj out of GigabitEthernet0/14, addr 192.168.207.182 0950A3C0
Subblocks:
None

Switch# show mpls forwarding-table 10.255.17.42

<table>
<thead>
<tr>
<th>Local Label</th>
<th>Outgoing Prefix</th>
<th>Bytes Label</th>
<th>Outgoing Switched</th>
<th>Next Hop</th>
</tr>
</thead>
<tbody>
<tr>
<td>243</td>
<td>10.255.17.42/32</td>
<td>252677583293010</td>
<td>Gi0/11</td>
<td>192.168.207.170</td>
</tr>
<tr>
<td>Pop Label</td>
<td>Pop Label</td>
<td>0</td>
<td>G10/12</td>
<td>192.168.207.174</td>
</tr>
<tr>
<td>Pop Label</td>
<td>Pop Label</td>
<td>0</td>
<td>G10/13</td>
<td>192.168.207.178</td>
</tr>
<tr>
<td>Pop Label</td>
<td>Pop Label</td>
<td>0</td>
<td>G10/14</td>
<td>192.168.207.182</td>
</tr>
</tbody>
</table>

Note: The show mpls forwarding-table counters command does not display the switched packets for all interfaces. To view switched packets on each interface, use the show interface interface-name counter command.

Switch# show mpls ldp neighbor

Peer LDP Ident: 10.255.17.42:0; Local LDP Ident 10.255.17.32:0
TCP connection: 10.255.17.42.18853 - 10.255.17.32.646
State: Oper; Msgs sent/rcvd: 186413/186396; Downstream
Up time: 15w6d
LDP discovery sources:
GigabitEthernet0/12, Src IP addr: 192.168.207.174
GigabitEthernet0/11, Src IP addr: 192.168.207.170
GigabitEthernet0/13, Src IP addr: 192.168.207.178
GigabitEthernet0/14, Src IP addr: 192.168.207.182
Addresses bound to peer LDP Ident:
192.168.207.182

Peer LDP Ident: 10.255.10.3:0; Local LDP Ident 10.255.17.32:0
TCP connection: 10.255.10.3.646 - 10.255.17.32.11542
State: Oper; Msgs sent/rcvd: 18328/18297; Downstream
Up time: 1w3d
LDP discovery sources:
Targeted Hello 10.255.17.32 -> 10.255.10.3, active, passive
Addresses bound to peer LDP Ident:
10.255.10.3 172.31.10.3 192.168.190.61 192.168.190.57
10.11.11.1 10.255.4.1 192.168.190.65 192.168.190.70
Peer LDP Ident: 10.255.10.97:0; Local LDP Ident 10.255.17.32:0
TCP connection: 10.255.10.97.646 - 10.255.17.32.16411
State: Oper; Msgs sent/rcvd: 18318/18329; Downstream
Up time: 1w3d
LDP discovery sources:
    GigabitEthernet0/22, Src IP addr: 192.168.207.130
Addresses bound to peer LDP Ident:
    10.255.10.97    172.31.10.97    192.168.191.149 192.168.191.193
    192.168.191.138 192.168.207.130 192.168.191.130

Additional References

Related Documents

<table>
<thead>
<tr>
<th>Related Topic</th>
<th>Document Title</th>
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</table>

Standards

<table>
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<th>Standard</th>
<th>Title</th>
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</thead>
<tbody>
<tr>
<td>—</td>
<td>There are no new standards.</td>
</tr>
</tbody>
</table>

MIBs

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<tr>
<th>MIB</th>
<th>MIBs Link</th>
</tr>
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<tr>
<td>—</td>
<td>To locate and download MIBs for selected platforms, Cisco software releases, and feature sets, use Cisco MIB Locator found at the following URL: <a href="http://www.cisco.com/go/mibs">http://www.cisco.com/go/mibs</a></td>
</tr>
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</table>

RFCs

<table>
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<tr>
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</thead>
<tbody>
<tr>
<td>—</td>
<td>There are no new RFC.</td>
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</tbody>
</table>
Technical Assistance

<table>
<thead>
<tr>
<th>Description</th>
<th>Link</th>
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<tbody>
<tr>
<td>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.</td>
<td><a href="http://www.cisco.com/cisco/web/support/index.html">http://www.cisco.com/cisco/web/support/index.html</a></td>
</tr>
</tbody>
</table>

**Feature Information for MPLS Load Balancing**

Use Cisco Feature Navigator to find information about platform support and software image support. Cisco Feature Navigator enables you to determine which software images support a specific software release, feature set, or platform. To access Cisco Feature Navigator, go to [http://www.cisco.com/go/cfn](http://www.cisco.com/go/cfn). An account on Cisco.com is not required.

*Note*

Table 2 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.

**Table 2** Feature Information for MPLS Load Balancing

<table>
<thead>
<tr>
<th>Feature Name</th>
<th>Releases</th>
<th>Feature Information</th>
</tr>
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<tbody>
<tr>
<td>MPLS Load Balancing</td>
<td>15.3(3)S</td>
<td>This feature was introduced.</td>
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</tbody>
</table>