CONTENTS

LDP TTL Propagation

« LDP Session Protection (/workbook/view/service-provider-v4/task/ldp-session-protection-Mjg1Mg%3D%3D) | Basic MPLS Tunnels (/workbook/view/service-provider-v4/task/basic-mpls-tunnels-Mjg1NA%3D%3D) »

Last updated: April 23, 2016

Note:

Initial Configuration & Diagrams: Load the initial configuration files for the section named **Basic L3VPN**, which can be found in CCIE SPv4 Topology Diagrams & Initial Configurations (http://labs.ine.com/workbook/view/service-provider-v4/task/ccie-spv4-topology-diagrams-initial-configs). Refer to the **Base IPv4 Diagram** in order to complete this task.

Task

- Configure MPLS Label Distribution with LDP on all links connecting R2, R3, R4, R5, R6, and XR1.
- R2 and XR1 are preconfigured as PE routers for the MPLS L3VPN customer routers R1 and XR2; at this point R1 and XR2 should have reachability to each other's Loopback0 networks.
- Configure the core of the SP network so that the TTL of packets coming from the customer's network is not copied into the MPLS label.

Configuration **Click to *collapse***

```
R2:
no mpls ip propagate-ttl forwarded
!
router ospf 1
 mpls ldp autoconfig area 0


R3:
router ospf 1
 mpls ldp autoconfig area 0


R4:
router ospf 1
 mpls ldp autoconfig area 0


R5:
router ospf 1
 mpls ldp autoconfig area 0


R6:
router ospf 1
 mpls ldp autoconfig area 0


XR1:
router ospf 1
 mpls ldp auto-config
  !
 !
!
mpls ldp
!
mpls ip-ttl-propagate disable forwarded
```

Verification

Normally when unlabeled IP traffic is received on edge of the MPLS provider network the Time To Live (TTL) of the IP packet is copied into the MPLS header. Since just like in IP routing, the MPLS TTL is decremented on a hop-by-hop basis, the default behavior is that a customer's traceroute packets will see the individual hops in the service provider's core. This can be seen below in the traceroutes of R1 and XR2 before the default behavior is changed.

```
R1#traceroute 20.20.20.20

Type escape sequence to abort.

Tracing the route to 20.20.20.20

VRF info: (vrf in name/id, vrf out name/id)

  1 10.1.2.2 5 msec 1 msec 0 msec

  2 20.2.3.3 [MPLS: Labels 20/16007 Exp 0] 5 msec 4 msec 4 msec

  3 20.3.6.6 [MPLS: Labels 20/16007 Exp 0] 9 msec 21 msec 18 msec

  4 20.6.19.19 20 msec 13 msec 15 msec

  5 10.19.20.20 16 msec *  8 msec


RP/0/3/CPU0:XR2#traceroute 1.1.1.1

Sat May  2 04:53:15.069 UTC


Type escape sequence to abort.

Tracing the route to 1.1.1.1


 1  10.19.20.19 0 msec  0 msec  0 msec

 2  20.5.19.5 [MPLS: Labels 16/43 Exp 0] 29 msec  9 msec  0 msec

 3  20.4.5.4 [MPLS: Labels 16/43 Exp 0] 0 msec  0 msec  0 msec

 4  10.1.2.2 [MPLS: Label 43 Exp 0] 0 msec  0 msec  0 msec

 5  10.1.2.1 0 msec  *  9 msec
```

Even though the customer routers R1 and XR2 do not have routes for the provider routers R3 or R6, nor do R3 and R6 have routes to either R1 or XR2, these hops can still appear in the traceroute path due to exceptions of how traceroute is treated in MPLS differently than regular IP Routing. For more information on this refer to the INE Blog article MPLS Ping and Traceroute (http://blog.ine.com/2008/11/24/mpls-ping-and-traceroute/) and to the Cisco Design Technote The Traceroute Command in MPLS (http://www.cisco.com/en/US/tech/tk436/tk428/technologies_tech_note09186a008020a42a.shtml).

The key point of this example is that when the default behavior of copying the IP TTL into the MPLS TTL is disabled with the IOS command **no mpls ip propagate-ttl** and the IOS XR command **mpls ip-ttl-propagate**, the customer routers are no longer able to see the detailed hops inside the service provider network. Instead of copying the TTL from the IP header into the label, the edge router doing label imposition uses a TTL of 255 on the labels. Below is the output of the traceroutes after TTL propagation has been disabled. Note that this command is only required on the PE routers doing label imposition. It is not necessary to enable this command on P routers.

```
R1#traceroute 20.20.20.20

Type escape sequence to abort.

Tracing the route to 20.20.20.20

VRF info: (vrf in name/id, vrf out name/id)

  1 10.1.2.2 3 msec 1 msec 1 msec

  2 20.6.19.19 8 msec 7 msec 5 msec

  3 10.19.20.20 8 msec *  8 msec


RP/0/3/CPU0:XR2#traceroute 1.1.1.1

Sat May  2 04:56:23.376 UTC


Type escape sequence to abort.

Tracing the route to 1.1.1.1


 1  10.19.20.19 9 msec  0 msec  0 msec

 2  10.1.2.2 [MPLS: Label 43 Exp 0] 0 msec  0 msec  0 msec

 3  10.1.2.1 0 msec  *  0 msec
```

From the above output of the customer routers they simply see the PE routers and the other customer routers in the traceroute hops. The **forwarded** option of the IOS and IOS XR command allows locally generated IP packets to still have the IP TTL copied to the MPLS TTL, which means that traceroutes originated from inside the SP network will still see the details of the path. This is useful for when the service provider network is trying to troubleshoot or verify its own internal topology. As seen below R2's traceroute output still shows the hops in the MPLS Label Switch Path of R3 and R6 on the way to XR1's Loopback0 network.

```
R2#traceroute 19.19.19.19

Type escape sequence to abort.

Tracing the route to 19.19.19.19

VRF info: (vrf in name/id, vrf out name/id)

  1 20.2.3.3 [MPLS: Label 20 Exp 0] 12 msec

    20.2.4.4 [MPLS: Label 20 Exp 0] 6 msec

    20.2.3.3 [MPLS: Label 20 Exp 0] 6 msec

  2 20.4.6.6 [MPLS: Label 20 Exp 0] 2 msec

    20.3.6.6 [MPLS: Label 20 Exp 0] 8 msec

    20.4.6.6 [MPLS: Label 20 Exp 0] 15 msec

  3 20.6.19.19 21 msec *  7 msec
```

« LDP Session Protection (/workbook/view/service-provider-v4/task/ldp-session-protection-Mjg1Mg%3D%3D) | Basic MPLS Tunnels (/workbook/view/service-provider-v4/task/basic-mpls-tunnels-Mjg1NA%3D%3D) »