

mpls-vpn assessment part 2

Network Implementation and equipment configuration

DO NOT COPY



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Table of Contents

Lab 1: Mpls Fundamentals (detailed)	7
1.8: Show interfaces.....	7
1.9: Show interface terse.....	¡Error! Marcador no definido.
1.13: Show ospf neighbor.....	¡Error! Marcador no definido.
1.14: ping.....	¡Error! Marcador no definido.
1.15.....	¡Error! Marcador no definido.
1.16.....	¡Error! Marcador no definido.
1.17: run show bgp summary.....	¡Error! Marcador no definido.
Part 2: Configuring Customer Edge Router and Network Interfaces.....	8
2.2: show.....	8
2.4: ping.....	8
2.6: show bgp summary.....	8
2.9: show.....	9
2.13: show.....	9
2.14 show.....	10
PART 3: Configuring a Static LSP Through the Core.....	11
3.3: run show route table mpls.0.....	11
3.4: show mpls interface.....	11
3.7: show mpls static-lsp ingress.....	11
3.8: show route.....	12
3.9: show mpls.....	12
3.10 ping.....	12
3.11 ping.....	13
LAB 2: Label Distribution Protocols.....	13
Part 1: Configuring customer edge router and network interfaces.....	13
1.1: show ospf neighbor.....	13
1.2: ping.....	13
1.3: show bgp summary.....	14
1.5: show route advertising-protocol.....	14
1.9: show route receive-protocol.....	14
1.10: show route receive-protocol.....	15
Part 2: configuring RSVP.....	15

2.3:show mpls interface.....	15
2.5	16
2.6: show mpls lsp.....	16
2.7: show mpls lsp ingress extensive	17
2.8 show route 192.168.11.2	17
2.9: ping	18
PART 3:Configuring a explicit route object (ero)	18
3.1: show	18
3.2: show	19
3.3: show mpls lsp ingress	19
3.4 show mpls lsp ingress detail	20
Part 4: configuring LDP.....	20
4.3: show ldp interface	20
4.4: show ldp session	20
4.5: show route	21
4.6 ping and show	21
Part 5: Changing the default route preference.....	22
5.2: show	22
5.3	23
5.4	23
LAB 3: CSPF (Detailed).....	24
PART 1: Creating the baseline network	24
1.2: show ospf neighbor.....	24
1.3: show bgp neighbor 192.168.1.2	24
1.7: show mpls interface —show rsvp interface	25
Part 2: Enabling the TED	25
2.1: show ospf database	25
2.2: show ted database.....	26
2.3: show ospf database	26
2.4: show ted database esxtensive 192.168.1.1	28
Part 3: Configuring RSVP-Signaled LSPs	29
3.4: show rsvp session	29
Part 4: Adding administrative groups to core-facing interfaces	32
4.4: show mpls interface.....	32
4.5: show ted database 192.168.1.1 extensive	32

Part 5: Configuring LSPs to take Gold, Silver, and Bronze paths using CSPF	33
5.3:	33
Lab 6: VPN Baseline Configuration (Detailed).....	36
Part 1: Creating the baseline SP network and enabling PE for Layer 3 VPN Signaling	36
1.8: show	36
1.9: show ospf neighbor.....	36
1.10: show bgp neighbor 192.168.1.2	37
Part 2: Configuring the CE Router Properties	38
2.9: show route table ce1-1.inet.....	38
Lab 7: Layer 3 VPN with Static and BGP Routing (detailed).....	39
Part 1: Loading and Verifying the VPN Baseline Configuration	39
1.2: show	39
1.3: show routing-instances ce1-1	39
Part 2: Establishing an RSVP Signaled LSP between PE routers.....	40
2.1: show	40
2.2: show mpls lsp – show route table inet 3	40
Part 3: Configuring the PE to CE Interface	41
3.2: Ping 10.0.10.2 count 3	41
Part 4: Configuring a Layer 3 VPN Instance	41
4.5: show	41
4.6: show route table vpn-1. inet 0.....	42
Part 5: Configuring Static Routing between the PE and CE Routers.....	42
5.3: show route advertising-protocol bgp 192.168.1.2	42
5.4: show route receive-protocol bgp 192.168.1.2	43
5.5: show route table vpn-1. inet.0.....	44
Part 6: Configuring BGP Routing between the PE and CE Routers	45
6.3: show route table vpn-1. inet.0.....	45
6.4: show	45
6.5: show	45
6.6: show route receive-protocol bgp 10.0.10.2	46
Lab 8: Route Reflection and Internet Access (Detailed)	52
Part 1: Loading and Verifying the VPN baseline configuration.....	52
1.2:show	52
1.3: show	53
Part 2: Configuring your PE router to peer with the Route Reflector	53

2.1: show.....	53
2.2: show bgp summary.....	53
Part 3: Establishing LDP signaled LSPs between PE routers and router reflector	54
3.2: show.....	54
3.3: show route table inet.3.....	55
Part 4: Configuring another CE router using a virtual router	56
4.7: show route table ce1-3	56
Part 5: Configuring the PE to CE interfaces.....	57
5.2: ping	57
Part 6: Configuring two layer 3 VPN instances	57
6.1: show	57
6.2: show	58
6.3: show routes	58
Part 7: Configuring bgp routing between the PE and CE Routers.....	59
7.1: show.....	59
7.2: show.....	59
7.3: show routes	60
7.4: show.....	64
7.5: show.....	64
7.6: shows	65
Part 8: Implementing route target filtering.....	66
8.2: show route table bgp.13vpn.0.....	66
8.4: show route table bgp.13vpn.0.....	67
8.6: show route table bgp.13vpn.0.....	68
Part 9: Configuring internet access using a non-vrf interface	69
Lab 12: Virtual Private LAN Service.....	69
Part 1: Loading and verifying the VPN baseline configuration	69
1.2: Shows.....	69
1.3: show routing-instances ce1-1	70
Part 2: Adjusting the properties of the virtual router.....	70
2.2: show.....	70
Part 3: Configuring a virtual switch instance	71
3.4: show bridge domain	71
Part 4: Enabling LDP signaling in the core.....	71
4.2: show ldp neighbor	71

4.3: show ldp database	72
Part 5: Configuring an LDP VPLS instance	73
5.5: show vpls connections	73
5.7: show vpls connections extensive.....	74
5.8: Ping.....	75
5.9: show vpls statistics.....	75
5.10: show vpls mac-table	76
Part 6: Using MSTP to prevent a layer 2 loop in a vpls	76
6.3: show vpls connections extensive.....	76
6.4: ping	77
6.8: show spanning-tree interface routing-instance.....	78
6.9: ping	79
Part 8: Configuring the virtual switch instance.....	79
8.3: show bridge domain	79
Part 9: Configuring a BGP VPLS with redundant links between CE and PE Routers.....	80
9.7: ping	80
9.9: show vpls connections extensive.....	82
9.10: show route table vpn-11 extensive	83
9.11: ping	84
9.12: show vpls mac-table	84
9.14: show vpls connections extensive.....	85
9.15: ping	86
9.16: show vpls mac-table	86

Lab 1: Mpls Fundamentals (detailed)

Part 1: Configuring network interfaces and baseline protocols

1.8: Show interfaces

10.10.42.37 - PuTTY

```
    }
  }
}

[edit interfaces]
lab@dani# show
ge-0/0/0 {
  vlan-tagging;
  unit 210 {
    vlan-id 210;
    family inet {
      address 172.22.210.1/24;
    }
  }
}
ge-0/0/1 {
  vlan-tagging;
  unit 211 {
    vlan-id 211;
    family inet {
      address 172.22.211.1/24;
    }
  }
}
}
fxp0 {
  unit 0 {
    family inet {
      dhcp {
        vendor-id Juniper-vmx-VM5B631D44E9;
      }
    }
  }
}
lo0 {
  unit 0 {
    family inet {
      address 192.168.1.1/32;
    }
  }
}
}
```

Part 2: Configuring Customer Edge Router and Network Interfaces

2.2: show

10.10.42.37 - PuTTY

```
[edit routing-instances cel-1]
lab@dani# show
instance-type virtual-router;
interface ge-0/0/8.0; ## 'ge-0/0/8.0' is not defined
interface lo0.1; ## 'lo0.1' is not defined
```

2.4: ping

10.10.42.37 - PuTTY

```
lab@dani> ping 10.0.10.1 routing-instance cel-1
PING 10.0.10.1 (10.0.10.1): 56 data bytes
64 bytes from 10.0.10.1: icmp_seq=0 ttl=64 time=315.884 ms
64 bytes from 10.0.10.1: icmp_seq=1 ttl=64 time=2.893 ms
64 bytes from 10.0.10.1: icmp_seq=2 ttl=64 time=2.043 ms
64 bytes from 10.0.10.1: icmp_seq=3 ttl=64 time=4.232 ms
64 bytes from 10.0.10.1: icmp_seq=4 ttl=64 time=1.499 ms
64 bytes from 10.0.10.1: icmp_seq=5 ttl=64 time=3.246 ms
^C
--- 10.0.10.1 ping statistics ---
6 packets transmitted, 6 packets received, 0% packet loss
round-trip min/avg/max/stddev = 1.499/54.966/315.884/116.689 ms
lab@dani>
```

2.6: show bgp summary

10.10.42.37 - PuTTY

```
lab@dani> show bgp summary
Groups: 3 Peers: 3 Down peers: 0
Table          Tot Paths  Act Paths Suppressed  History Damp State  Pending
inet.0
Peer          AS      InPkt   OutPkt   OutQ   Flaps Last Up/Dwn State|#Active/Received/Accepted/Damped...
10.0.10.1     65512    5       4       0     0    0    1:20 Establ
  cel-1.inet.0: 0/0/0/0
10.0.10.2     65101    5       4       0     0    0    1:20 Establ
  inet.0: 0/0/0/0
192.168.1.2   65512    3       2       0     7    0    42 Establ
  inet.0: 0/0/0/0
lab@dani>
```


2.9: show

```
10.10.42.37 - PuTTY
[edit routing-instances cel-1]
lab@dani# commit and-quit
commit complete
Exiting configuration mode

lab@dani> show route advertising-protocol bgp 10.0.10.1

cel-1.inet.0: 4 destinations, 4 routes (4 active, 0 holddown, 0 hidden)
  Prefix                Nexthop          MED    Lclpref   AS path
* 192.168.11.1/32      Self              0      0         I

lab@dani> show route advertising-protocol bgp 192.168.1.1

lab@dani> show route advertising-protocol bgp 192.168.1.2

inet.0: 29 destinations, 29 routes (29 active, 0 holddown, 0 hidden)
  Prefix                Nexthop          MED    Lclpref   AS path
* 192.168.11.1/32      10.0.10.2        0      100       65101 I
```

2.13: show

```
10.10.42.37 - PuTTY
lab@dani> show route receive-protocol bgp 192.168.1.2

inet.0: 30 destinations, 30 routes (30 active, 0 holddown, 0 hidden)
  Prefix                Nexthop          MED    Lclpref   AS path
* 192.168.11.2/32      192.168.1.2      0      100       65102 I

inet.3: 6 destinations, 6 routes (6 active, 0 holddown, 0 hidden)

cel-1.inet.0: 4 destinations, 4 routes (4 active, 0 holddown, 0 hidden)

mpls.0: 14 destinations, 14 routes (14 active, 0 holddown, 0 hidden)

inet6.0: 1 destinations, 1 routes (1 active, 0 holddown, 0 hidden)

cel-1.inet6.0: 1 destinations, 1 routes (1 active, 0 holddown, 0 hidden)
```

2.14 show

```
10.10.42.37 - PuTTY
lab@dani> show route receive-protocol bgp 10.0.10.1

inet.0: 30 destinations, 30 routes (30 active, 0 holddown, 0 hidden)

inet.3: 6 destinations, 6 routes (6 active, 0 holddown, 0 hidden)

cel-1.inet.0: 4 destinations, 4 routes (4 active, 0 holddown, 0 hidden)
  Prefix          Nexthop          MED      Lclpref    AS path
* 192.168.11.2/32 10.0.10.1                65512 65102 I

mpls.0: 14 destinations, 14 routes (14 active, 0 holddown, 0 hidden)

inet6.0: 1 destinations, 1 routes (1 active, 0 holddown, 0 hidden)

cel-1.inet6.0: 1 destinations, 1 routes (1 active, 0 holddown, 0 hidden)
```

```
lab@dani> show route table cel-1.inet.0

cel-1.inet.0: 3 destinations, 3 routes (3 active, 0 holddown, 0 hidden)
+ = Active Route, - = Last Active, * = Both

10.0.10.0/24      *[Direct/0] ld 18:48:55
                  > via ge-0/0/8.0
10.0.10.2/32     *[Local/0] ld 18:48:55
                  Local via ge-0/0/8.0
192.168.11.1/32  *[Direct/0] ld 18:48:55
                  > via lo0.1
```

```
10.10.42.37 - PuTTY
lab@dani> show route table cel-1.inet.0

cel-1.inet.0: 4 destinations, 4 routes (4 active, 0 holddown, 0 hidden)
+ = Active Route, - = Last Active, * = Both

10.0.10.0/24      *[Direct/0] 00:17:39
                  > via ge-0/0/8.0
10.0.10.2/32     *[Local/0] 00:17:39
                  Local via ge-0/0/8.0
192.168.11.1/32  *[Direct/0] 00:17:39
                  > via lo0.1
192.168.11.2/32  *[BGP/170] 00:00:27, localpref 100
                  AS path: 65512 65102 I, validation-state: unverified
                  > to 10.0.10.1 via ge-0/0/8.0
```

Part 3: Configuring a Static LSP Through the Core

3.3: run show route table mpls.0

```
10.10.42.37 - PuTTY
lab@dani# run show route table mpls.0

mpls.0: 6 destinations, 6 routes (6 active, 0 holddown, 0 hidden)
+ = Active Route, - = Last Active, * = Both

0          *[MPLS/0] ld 18:13:49, metric 1
           to table inet.0
0(S=0)    *[MPLS/0] ld 18:13:49, metric 1
           to table mpls.0
1          *[MPLS/0] ld 18:13:49, metric 1
           Receive
2          *[MPLS/0] ld 18:13:49, metric 1
           to table inet6.0
2(S=0)    *[MPLS/0] ld 18:13:49, metric 1
           to table mpls.0
13        *[MPLS/0] ld 18:13:49, metric 1
           Receive
```

3.4: show mpls interface

```
10.10.42.37 - PuTTY
lab@dani> show mpls interface
Interface      State      Administrative groups (x: extended)
ge-0/0/4.0     Dn        <none>
ge-0/0/0.210   Up        <none>
ge-0/0/1.211   Up        <none>
```

3.7: show mpls static-lsp ingress

```
10.10.42.37 - PuTTY
lab@dani> show mpls static-lsp ingress
Ingress LSPs:
LSPname          To          State
my-static-lsp    192.168.1.2  Up
Total 1, displayed 1, Up 1, Down 0
```

3.8: show route

```
10.10.42.37 - PuTTY
lab@dani> show route 192.168.11.2

inet.0: 29 destinations, 29 routes (29 active, 0 holddown, 0 hidden)
+ = Active Route, - = Last Active, * = Both

192.168.11.2/32    *[BGP/170] 00:15:59, localpref 100, from 192.168.1.2
                  AS path: 65102 I, validation-state: unverified
                  > to 172.22.210.2 via ge-0/0/0.210, Push 1000101

cel-1.inet.0: 4 destinations, 4 routes (4 active, 0 holddown, 0 hidden)
+ = Active Route, - = Last Active, * = Both

192.168.11.2/32    *[BGP/170] 00:15:59, localpref 100
                  AS path: 65512 65102 I, validation-state: unverified
                  > to 10.0.10.1 via ge-0/0/8.0
```

3.9: show mpls

```
10.10.42.37 - PuTTY
lab@dani> show mpls static-lsp statistics ingress
Ingress LSPs:
LSPname           To           State        Packets
Bytes
my-static-lsp     192.168.1.2  Up           0
0
Total 1, displayed 1, Up 1, Down 0
```

3.10 ping

```
10.10.42.37 - PuTTY
lab@dani> ping 192.168.11.2 source 192.168.11.1 count 10 rapid routing-instance cel-1
PING 192.168.11.2 (192.168.11.2): 56 data bytes
!!!!!!!!!!!!
--- 192.168.11.2 ping statistics ---
10 packets transmitted, 10 packets received, 0% packet loss
round-trip min/avg/max/stddev = 4.105/12.158/39.799/10.965 ms
```

3.11 ping

```
10.10.42.37 - PuTTY
lab@dani> show mpls static-lsp statistics ingress
Ingress LSPs:
LSPname          To          State    Packets    Bytes
my-static-lsp    192.168.1.2 Up        20         1680
Total 1, displayed 1, Up 1, Down 0
```

Lab 2: Label Distribution Protocols

Part 1: Configuring customer edge router and network interfaces

1.1: show ospf neighbor

```
10.10.42.37 - PuTTY
lab@dani> show ospf neighbor
Address          Interface    State    ID          Pri  Dead
172.22.210.2    ge-0/0/0.210 Full     192.168.5.1 128  36
172.22.211.2    ge-0/0/1.211 Full     192.168.5.4 128  39
```

1.2: ping

```
10.10.42.37 - PuTTY
ttl          IP time-to-live value (IPv6 hop-limit value) (1..255 hops)
verbose      Display detailed output
wait         Maximum wait time after sending final packet (seconds)
|            Pipe through a command
lab@dani> ping 10.0.10.1 routing-instance cel-1
PING 10.0.10.1 (10.0.10.1): 56 data bytes
64 bytes from 10.0.10.1: icmp_seq=0 ttl=64 time=375.108 ms
64 bytes from 10.0.10.1: icmp_seq=1 ttl=64 time=149.124 ms
64 bytes from 10.0.10.1: icmp_seq=2 ttl=64 time=112.430 ms
64 bytes from 10.0.10.1: icmp_seq=3 ttl=64 time=3.820 ms
64 bytes from 10.0.10.1: icmp_seq=4 ttl=64 time=33.551 ms
64 bytes from 10.0.10.1: icmp_seq=5 ttl=64 time=2.700 ms
64 bytes from 10.0.10.1: icmp_seq=6 ttl=64 time=3.366 ms
64 bytes from 10.0.10.1: icmp_seq=7 ttl=64 time=1.859 ms
64 bytes from 10.0.10.1: icmp_seq=8 ttl=64 time=80.740 ms
64 bytes from 10.0.10.1: icmp_seq=9 ttl=64 time=124.882 ms
^C64 bytes from 10.0.10.1: icmp_seq=10 ttl=64 time=408.176 ms
^R
64 bytes from 10.0.10.1: icmp_seq=11 ttl=64 time=324.538 ms
^C
--- 10.0.10.1 ping statistics ---
12 packets transmitted, 12 packets received, 0% packet loss
round-trip min/avg/max/stddev = 1.859/135.025/408.176/144.918 ms
```

1.3: show bgp summary

```
10.10.42.37 - PuTTY
unknown command.
lab@dani> show bgp summary
Groups: 3 Peers: 3 Down peers: 0
Table          Tot Paths  Act Paths Suppressed    History Damp State   Pending
inet.0
Peer           1          1          0          0          0          0
AS            InPkt     OutPkt     OutQ     Flaps Last Up/Dwn State|#Active
/Received/Accepted/Damped...
10.0.10.1      65512     6198      5808      0      0 1d 19:47:26 Establ
cel-1.inet.0: 1/1/1/0
10.0.10.2      65101     5808      6196      0      0 1d 19:47:26 Establ
inet.0: 0/0/0/0
192.168.1.2    65512      8         5         0     196 2:08 Establ
inet.0: 1/1/1/0
```

1.5: show route advertising-protocol

```
10.10.42.37 - PuTTY
lab@dani> show route advertising-protocol bgp 10.0.10.1
cel-1.inet.0: 4 destinations, 4 routes (4 active, 0 holddown, 0 hidden)
Prefix          Nexthop          MED    Lclpref    AS path
* 192.168.11.1/32  Self              0      100        I

lab@dani> show route advertising-protocol bgp 192.168.1.1
lab@dani> show route advertising-protocol bgp 192.168.1.2
inet.0: 29 destinations, 29 routes (29 active, 0 holddown, 0 hidden)
Prefix          Nexthop          MED    Lclpref    AS path
* 192.168.11.1/32  10.0.10.2        0      100        65101 I

lab@dani>
```

1.9: show route receive-protocol

```
10.10.42.37 - PuTTY
lab@dani> show route receive-protocol bgp 192.168.1.2
inet.0: 29 destinations, 29 routes (29 active, 0 holddown, 0 hidden)
Prefix          Nexthop          MED    Lclpref    AS path
* 192.168.11.2/32  192.168.1.2      0      100        65102 I

cel-1.inet.0: 4 destinations, 4 routes (4 active, 0 holddown, 0 hidden)

mpls.0: 6 destinations, 6 routes (6 active, 0 holddown, 0 hidden)

inet6.0: 1 destinations, 1 routes (1 active, 0 holddown, 0 hidden)

cel-1.inet6.0: 1 destinations, 1 routes (1 active, 0 holddown, 0 hidden)
```

1.10: show route receive-protocol

10.10.42.37 - PuTTY

```
lab@dani> show route receive-protocol bgp 10.0.10.1

inet.0: 29 destinations, 29 routes (29 active, 0 holddown, 0 hidden)

cel-1.inet.0: 4 destinations, 4 routes (4 active, 0 holddown, 0 hidden)
  Prefix          Nexthop          MED      Lclpref    AS path
* 192.168.11.2/32  10.0.10.1
mpls.0: 6 destinations, 6 routes (6 active, 0 holddown, 0 hidden)

inet6.0: 1 destinations, 1 routes (1 active, 0 holddown, 0 hidden)

cel-1.inet6.0: 1 destinations, 1 routes (1 active, 0 holddown, 0 hidden)

lab@dani>
```

10.10.42.37 - PuTTY

```
lab@dani> show route table cel-1.inet.0

cel-1.inet.0: 4 destinations, 4 routes (4 active, 0 holddown, 0 hidden)
+ = Active Route, - = Last Active, * = Both

10.0.10.0/24      *[Direct/0] 4d 00:48:22
                  > via ge-0/0/8.0
10.0.10.2/32      *[Local/0] 4d 00:48:22
                  Local via ge-0/0/8.0
192.168.11.1/32   *[Direct/0] 00:48:08
                  > via lo0.1
192.168.11.2/32   *[BGP/170] 00:29:40, localpref 100
                  AS path: 65512 65102 I, validation-state: unverified
                  > to 10.0.10.1 via ge-0/0/8.0
```

Part 2: configuring RSVP

2.3: show mpls interface

10.10.42.37 - PuTTY

```
lab@dani#
[edit protocols mpls]
lab@dani# run show mpls interface
Interface          State          Administrative groups (x: extended)
ge-0/0/0.210       Up             <none>
ge-0/0/1.211       Up             <none>
ge-0/0/4.0         Dn             <none>
```

2.5: show

10.10.42.37 - PuTTY

```
lab@dani#  
  
[edit]  
lab@dani# edit protocols mpls  
  
[edit protocols mpls]  
lab@dani# set no-cspf  
  
[edit protocols mpls]  
lab@dani# set label-si  
^  
syntax error.  
lab@dani# set label-switched-path ?  
Possible completions:  
  <path_name>      Name of path  
[edit protocols mpls]  
lab@dani# set label-switched-path pel-to-pe2-1 to 192.168.1.2  
  
[edit protocols mpls]  
lab@dani# show  
no-cspf;  
label-switched-path pel-to-pe2-1 {  
  to 192.168.1.2;  
}  
interface all;  
interface fxp0.0 {  
  disable;  
}  
  
[edit protocols mpls]  
lab@dani# commit and-quit  
commit complete  
Exiting configuration mode
```

2.6: show mpls lsp

10.10.42.37 - PuTTY

```
lab@dani> show mpls lsp  
Ingress LSP: 1 sessions  
To          From          State Rt P    ActivePath      LSPname  
192.168.1.2  192.168.1.1  Up    0 *           pel-to-pe2-1  
Total 1 displayed, Up 1, Down 0  
  
Egress LSP: 1 sessions  
To          From          State  Rt Style Labelin Labelout LSPname  
192.168.1.1  192.168.1.2  Up     0  1 FF      3      - pe2-to-pel-1  
Total 1 displayed, Up 1, Down 0  
  
Transit LSP: 0 sessions  
Total 0 displayed, Up 0, Down 0
```


2.7: show mpls lsp ingress extensive

```
10.10.42.37 - PuTTY
lab@dani> show mpls lsp ingress extensive
Ingress LSP: 1 sessions

192.168.1.2
  From: 192.168.1.1, State: Up, ActiveRoute: 0, LSPname: pel-to-pe2-1
  ActivePath: (primary)
  LSPtype: Static Configured, Penultimate hop popping
  LoadBalance: Random
  Encoding type: Packet, Switching type: Packet, GPID: IPv4
  LSP Self-ping Status : Enabled
  *Primary State: Up
    Priorities: 7 0
    SmartOptimizeTimer: 180
    Flap Count: 0
    MBB Count: 0
    Received RRO (ProtectionFlag 1=Available 2=InUse 4=B/W 8=Node 10=SoftPreempt 20=Node-ID):
      172.22.211.2 (Label=443472) 172.22.203.2 (Label=412080) 172.22.204.2 (Label=429328) 172.
22.213.1 (Label=3)
  7 Jun 7 14:01:32.488 Self-ping ended successfully
  6 Jun 7 14:01:31.556 Selected as active path
  5 Jun 7 14:01:31.554 Up
  4 Jun 7 14:01:31.554 Self-ping started
  3 Jun 7 14:01:31.554 Self-ping enqueued
  2 Jun 7 14:01:31.554 Record Route: 172.22.211.2 (Label=443472) 172.22.203.2 (Label=412080)
172.22.204.2 (Label=429328) 172.22.213.1 (Label=3)
  1 Jun 7 14:01:31.236 Originate Call
  Created: Mon Jun 7 14:01:31 2021
Total 1 displayed, Up 1, Down 0
```

2.8 show route 192.168.11.2

```
10.10.42.37 - PuTTY
lab@dani> show route 192.168.11.2

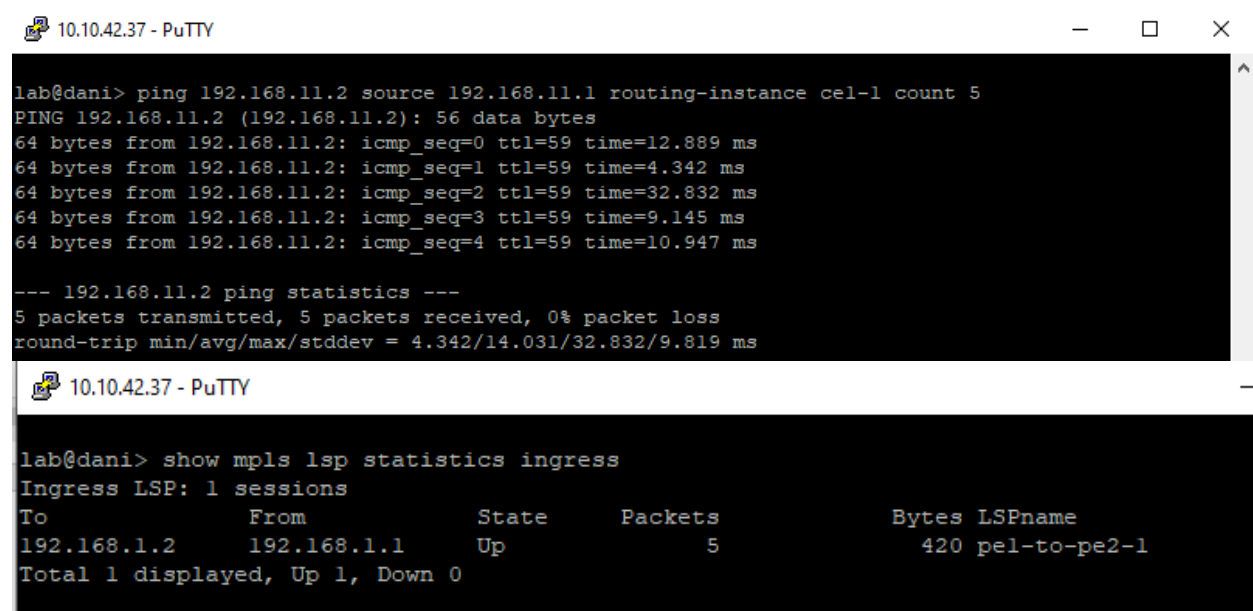
inet.0: 29 destinations, 29 routes (29 active, 0 holddown, 0 hidden)
+ = Active Route, - = Last Active, * = Both

192.168.11.2/32    *[BGP/170] 00:37:03, localpref 100, from 192.168.1.2
                  AS path: 65102 I, validation-state: unverified
                  > to 172.22.210.2 via ge-0/0/0.210
                  to 172.22.211.2 via ge-0/0/1.211

cel-1.inet.0: 4 destinations, 4 routes (4 active, 0 holddown, 0 hidden)
+ = Active Route, - = Last Active, * = Both

192.168.11.2/32    *[BGP/170] 00:37:03, localpref 100
                  AS path: 65512 65102 I, validation-state: unverified
                  > to 10.0.10.1 via ge-0/0/8.0
```

2.9: ping



The image shows two screenshots of a PuTTY terminal window. The first screenshot shows a ping command being executed from a device named 'lab@dani' to the IP address 192.168.11.2. The command is 'ping 192.168.11.2 source 192.168.11.1 routing-instance cel-1 count 5'. The output shows five successful ping attempts with varying response times. The second screenshot shows the command 'show mpls lsp statistics ingress' being executed, displaying a table of ingress LSP statistics.

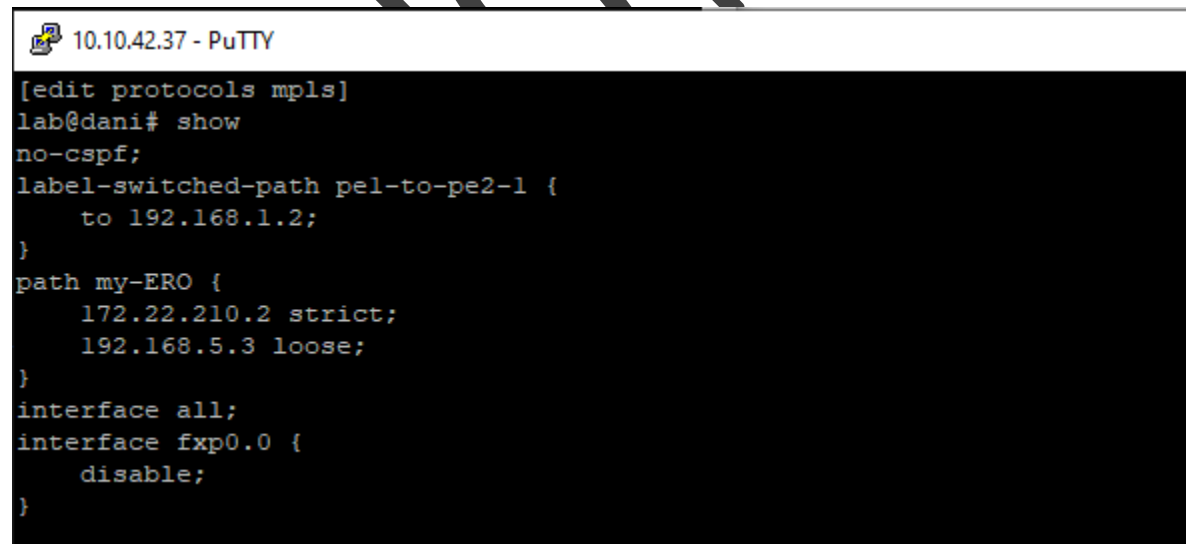
```
lab@dani> ping 192.168.11.2 source 192.168.11.1 routing-instance cel-1 count 5
PING 192.168.11.2 (192.168.11.2): 56 data bytes
64 bytes from 192.168.11.2: icmp_seq=0 ttl=59 time=12.889 ms
64 bytes from 192.168.11.2: icmp_seq=1 ttl=59 time=4.342 ms
64 bytes from 192.168.11.2: icmp_seq=2 ttl=59 time=32.832 ms
64 bytes from 192.168.11.2: icmp_seq=3 ttl=59 time=9.145 ms
64 bytes from 192.168.11.2: icmp_seq=4 ttl=59 time=10.947 ms

--- 192.168.11.2 ping statistics ---
5 packets transmitted, 5 packets received, 0% packet loss
round-trip min/avg/max/stddev = 4.342/14.031/32.832/9.819 ms

lab@dani> show mpls lsp statistics ingress
Ingress LSP: 1 sessions
To          From          State    Packets    Bytes LSPname
192.168.1.2 192.168.1.1   Up       5          420 pel-to-pe2-1
Total 1 displayed, Up 1, Down 0
```

Part 3: Configuring an explicit route object (ero)

3.1: show



The image shows a screenshot of a PuTTY terminal window displaying network configuration commands. The user is in the 'edit protocols mpls' mode and has entered several commands to configure an explicit route object (ERO) and other settings.

```
[edit protocols mpls]
lab@dani# show
no-cspf;
label-switched-path pel-to-pe2-1 {
    to 192.168.1.2;
}
path my-ERO {
    172.22.210.2 strict;
    192.168.5.3 loose;
}
interface all;
interface fxp0.0 {
    disable;
}
```

3.2: show

```
10.10.42.37 - PuTTY
[edit protocols mpls]
lab@dani# show
no-cspf;
label-switched-path pel-to-pe2-1 {
  to 192.168.1.2;
  primary my-ERO;
}
path my-ERO {
  172.22.210.2 strict;
  192.168.5.3 loose;
}
interface all;
interface fxp0.0 {
  disable;
}
```

3.3: show mpls lsp ingress

```
lab@dani> show mpls lsp ingress
Ingress LSP: 1 sessions
To          From          State Rt P    ActivePath    LSPname
192.168.1.2 192.168.1.1  Up    0 *    my-ERO        pel-to-pe2-1
Total 1 displayed, Up 1, Down 0
lab@dani>
```

3.4 show mpls lsp ingress detail

```
10.10.42.37 - PuTTY
Ingress LSP: 1 sessions

192.168.1.2
From: 192.168.1.1, State: Up, ActiveRoute: 0, LSPname: pel-to-pe2-1
ActivePath: my-ERO (primary)
LSPtype: Static Configured, Penultimate hop popping
LoadBalance: Random
Encoding type: Packet, Switching type: Packet, GPID: IPv4
LSP Self-ping Status : Enabled
*Primary my-ERO State: Up
Priorities: 7 0
SmartOptimizeTimer: 180
Flap Count: 17
MBB Count: 0
Received RRO (ProtectionFlag 1=Available 2=InUse 4=B/W 8=Node 10=SoftPreempt
20=Node-ID):
172.22.211.2 (Label=447648) 172.22.203.2 (Label=414896) 172.22.205.1 (Lab
el=439808) 172.22.206.2 (Label=454384) 172.22.212.1 (Label=3)
Total 1 displayed, Up 1, Down 0
```

Part 4: configuring LDP

4.3: show ldp interface

```
10.10.42.37 - PuTTY
lab@dani> show ldp interface
Interface          Address                Label space ID      Nbr   Next
                   Address                ID                   count hello
ge-0/0/0.210       172.22.210.1          192.168.1.1:0       1     3
ge-0/0/1.211       172.22.211.1          192.168.1.1:0       1     1
lo0.0               192.168.1.1           192.168.1.1:0       0     0
```

4.4: show ldp session

```
10.10.42.37 - PuTTY
lab@dani> show ldp session
Address            State      Connection  Hold time  Adv. Mode
192.168.5.1        Operational Open         26         DU
192.168.5.4        Operational Open         26         DU
```

4.5: show route

```
10.10.42.37 - PuTTY
lab@dani> show route 192.168.11.2

inet.0: 30 destinations, 30 routes (30 active, 0 holddown, 0 hidden)
+ = Active Route, - = Last Active, * = Both

192.168.11.2/32    *[BGP/170] 00:04:29, localpref 100, from 192.168.1.2
                 AS path: 65102 I, validation-state: unverified
                 > to 172.22.210.2 via ge-0/0/0.210, Push 484320
                 to 172.22.211.2 via ge-0/0/1.211, Push 447552

cel-1.inet.0: 4 destinations, 4 routes (4 active, 0 holddown, 0 hidden)
+ = Active Route, - = Last Active, * = Both

192.168.11.2/32    *[BGP/170] 00:26:21, localpref 100
                 AS path: 65512 65102 I, validation-state: unverified
                 > to 10.0.10.1 via ge-0/0/8.0
```

4.6 ping and show

```
10.10.42.37 - PuTTY
lab@dani> ping 192.168.11.2 source 192.168.11.1 routing-instance cel-1 count 5
PING 192.168.11.2 (192.168.11.2): 56 data bytes
64 bytes from 192.168.11.2: icmp_seq=0 ttl=59 time=42.651 ms
64 bytes from 192.168.11.2: icmp_seq=1 ttl=59 time=315.169 ms
64 bytes from 192.168.11.2: icmp_seq=2 ttl=59 time=154.352 ms
64 bytes from 192.168.11.2: icmp_seq=3 ttl=59 time=7.971 ms
64 bytes from 192.168.11.2: icmp_seq=4 ttl=59 time=6.915 ms

--- 192.168.11.2 ping statistics ---
5 packets transmitted, 5 packets received, 0% packet loss
round-trip min/avg/max/stddev = 6.915/105.412/315.169/117.922 ms
```

```
10.10.42.37 - PuTTY
lab@dani> show ldp traffic-statistics
INET FEC Statistics:

FEC                Type           Packets      Bytes      Shared
192.168.1.2/32     Transit        0            0          No
                  Ingress       15          1260       No
192.168.5.1/32     Transit        0            0          No
                  Ingress       0            0          No
192.168.5.2/32     Transit        0            0          No
                  Ingress       0            0          No
192.168.5.3/32     Transit        0            0          No
                  Ingress       0            0          No
192.168.5.4/32     Transit        0            0          No
                  Ingress       0            0          No
192.168.5.5/32     Transit        0            0          No
                  Ingress       0            0          No
192.168.5.6/32     Transit        0            0          No
                  Ingress       0            0          No

lab@dani> ping 192.168.11.2 source 192.168.11.1 routing-instance cel-1 count 5
PING 192.168.11.2 (192.168.11.2): 56 data bytes
```

Part 5: Changing the default route preference

5.2: show

```
10.10.42.37 - PuTTY
[edit]
lab@dani# run show route 192.168.11.2

inet.0: 30 destinations, 30 routes (30 active, 0 holddown, 0 hidden)
+ = Active Route, - = Last Active, * = Both

192.168.11.2/32  *[BGP/170] 00:01:25, localpref 100, from 192.168.1.2
                 AS path: 65102 I, validation-state: unverified
                 > to 172.22.210.2 via ge-0/0/0.210, label-switched-path pel-to-pe2-1

cel-1.inet.0: 4 destinations, 4 routes (4 active, 0 holddown, 0 hidden)
+ = Active Route, - = Last Active, * = Both

192.168.11.2/32  *[BGP/170] 00:03:09, localpref 100
                 AS path: 65512 65102 I, validation-state: unverified
                 > to 10.0.10.1 via ge-0/0/8.0
```

5.3

```
10.10.42.37 - PuTTY
lab@dani# run show route table inet.3 192.168.1.2

inet.3: 7 destinations, 8 routes (7 active, 0 holddown, 0 hidden)
+ = Active Route, - = Last Active, * = Both

192.168.1.2/32      *[RSVP/7/1] 00:00:28, metric 4
                   > to 172.22.211.2 via ge-0/0/1.211, label-switched-path pel-
to-pe2-1

                   [LDP/9] 00:00:21, metric 1
                   to 172.22.210.2 via ge-0/0/0.210, Push 484320
                   > to 172.22.211.2 via ge-0/0/1.211, Push 447744
```

5.4

```
[edit]
lab@dani# run show route 192.168.11.2

inet.0: 30 destinations, 30 routes (30 active, 0 holddown, 0 hidden)
+ = Active Route, - = Last Active, * = Both

192.168.11.2/32    *[BGP/170] 00:00:45, localpref 100, from 192.168.1.2
                  AS path: 65102 I, validation-state: unverified
                  > to 172.22.210.2 via ge-0/0/0.210, Push 484320
                  to 172.22.211.2 via ge-0/0/1.211, Push 447744

cel-1.inet.0: 4 destinations, 4 routes (4 active, 0 holddown, 0 hidden)
+ = Active Route, - = Last Active, * = Both

192.168.11.2/32    *[BGP/170] 00:02:11, localpref 100
                  AS path: 65512 65102 I, validation-state: unverified
                  > to 10.0.10.1 via ge-0/0/8.0
```

```
[edit]
lab@dani# run show route table inet.3 192.168.1.2

inet.3: 7 destinations, 7 routes (7 active, 0 holddown, 0 hidden)
+ = Active Route, - = Last Active, * = Both

192.168.1.2/32      *[LDP/6] 00:01:01, metric 1
                   to 172.22.210.2 via ge-0/0/0.210, Push 484320
                   > to 172.22.211.2 via ge-0/0/1.211, Push 447744
```

Lab 3: CSPF (Detailed)

PART 1: Creating the baseline network

1.2: show ospf neighbor

```
10.10.42.37 - PuTTY
lab@dani> show ospf neighbor
Address      Interface      State   ID           Pri  Dead
172.22.210.2 ge-0/0/0.210   Full   192.168.5.1  128  38
172.22.211.2 ge-0/0/1.211   Full   192.168.5.4  128  36
```

1.3: show bgp neighbor 192.168.1.2

```
10.10.42.37 - PuTTY
Output Queue[1]: 0 (inet.0, inet-unicast)
lab@dani> show bgp neighbor 192.168.1.2
Peer: 192.168.1.2+57212 AS 65512 Local: 192.168.1.1+179 AS 65512
  Group: my-int-group          Routing-Instance: master
  Forwarding routing-instance: master
  Type: Internal      State: Established   Flags: <Sync>
  Last State: OpenConfirm  Last Event: RecvKeepAlive
  Last Error: Cease
  Options: <Preference LocalAddress Refresh>
  Local Address: 192.168.1.1 Holdtime: 90 Preference: 170
  Number of flaps: 2
  Last flap event: HoldTime
  Error: 'Hold Timer Expired Error' Sent: 2 Recv: 0
  Error: 'Cease' Sent: 2 Recv: 0
  Peer ID: 192.168.1.2      Local ID: 192.168.1.1      Active Holdtime: 90
  Keepalive Interval: 30    Group index: 0      Peer index: 0      SNMP index: 19
  I/O Session Thread: bgpio-0 State: Enabled
  BFD: disabled, down
  NLRI for restart configured on peer: inet-unicast
  NLRI advertised by peer: inet-unicast
  NLRI for this session: inet-unicast
  Peer supports Refresh capability (2)
  Stale routes from peer are kept for: 300
```

```
10.10.42.37 - PuTTY
lab@dani> show bgp summary
Groups: 3 Peers: 3 Down peers: 0
Table
inet.0
Peer          Tot Paths  Act Paths  Suppressed  History  Damp  State  Pending
Peer          AS        InPkt     OutPkt     OutQ     Flaps  Last  Up/Dwn  State|#Active/Re
ceived/Accepted/Damped...
10.0.10.1     65512     20        15         0         0      5:59  Establ
cel-1.inet.0: 0/0/0/0
10.0.10.2     65101     15        18         0         0      5:59  Establ
inet.0: 0/0/0/0
192.168.1.2   65512     2         2          0         2      54    Establ
inet.0: 0/0/0/0
lab@dani>
```


1.7: show mpls interface – show rsvp interface

```
10.10.42.37 - PuTTY
lab@dani> show mpls interface
Interface      State      Administrative groups (x: extended)
ge-0/0/0.210   Up         <none>
ge-0/0/1.211   Up         <none>

lab@dani> show rsvp interface
RSVP interface: 2 active

Interface      State      Active  Subscr-  Static   Available  Reserved  Highwater
                resv      iption  BW        BW         BW          mark
ge-0/0/0.210   Up         0       100%    1000Mbps  1000Mbps   0bps      0bps
ge-0/0/1.211   Up         0       100%    1000Mbps  1000Mbps   0bps      0bps
```

Part 2: Enabling the TED

2.1: show ospf database

```
10.10.42.37 - PuTTY
lab@dani> show ospf database

OSPF database, Area 0.0.0.0
Type      ID          Adv Rtr      Seq          Age  Opt  Cksum  Len
Router    *192.168.1.1  192.168.1.1  0x80000070  2651 0x22 0x778b 60
Router    192.168.1.2  192.168.1.2  0x8000006f  1364 0x22 0x14e4 60
Router    192.168.5.1  192.168.5.1  0x800004cd   839 0x22 0x6119 72
Router    192.168.5.2  192.168.5.2  0x80000521  1208 0x22 0x2005 72
Router    192.168.5.3  192.168.5.3  0x80000490  1392 0x22 0x1d7b 72
Router    192.168.5.4  192.168.5.4  0x800004a3  1434 0x22 0xa8eb 72
Router    192.168.5.5  192.168.5.5  0x800004eb  1126 0x22 0x7ad6 72
Router    192.168.5.6  192.168.5.6  0x800004ba  1127 0x22 0x8adb 72
Network   172.22.201.2  192.168.5.2  0x800003bd   207 0x22 0x9ffb 32
Network   172.22.202.2  192.168.5.4  0x800001e4   577 0x22 0x541d 32
Network   172.22.203.2  192.168.5.5  0x8000025f   677 0x22 0x7f70 32
Network   172.22.204.2  192.168.5.6  0x80000373  1127 0x22 0x5b7b 32
Network   172.22.205.2  192.168.5.5  0x8000011d  2820 0x22 0xd45e 32
Network   172.22.206.2  192.168.5.3  0x80000155  1113 0x22 0x51ac 32
Network   172.22.207.2  192.168.5.6  0x8000000c   255 0x22 0xf54a 32
Network   172.22.210.2  192.168.5.1  0x80000043  2839 0x22 0x214 32
Network   172.22.211.2  192.168.5.4  0x8000005f  2291 0x22 0xca28 32
Network   172.22.212.2  192.168.5.3  0x80000001  1392 0x22 0x86ca 32
Network   172.22.213.2  192.168.5.6  0x80000001  1384 0x22 0x87c2 32
OpaqArea 1.0.0.1      192.168.5.1  0x80000358  2339 0x22 0x1f4 28
OpaqArea 1.0.0.1      192.168.5.2  0x80000361  2708 0x22 0xf2f7 28
OpaqArea 1.0.0.1      192.168.5.3  0x80000352   235 0x22 0x15e2 28
OpaqArea 1.0.0.1      192.168.5.4  0x80000355   149 0x22 0x13df 28
OpaqArea 1.0.0.1      192.168.5.5  0x80000357  1963 0x22 0x13db 28
OpaqArea 1.0.0.1      192.168.5.6  0x8000034f  1004 0x22 0x27cd 28
OpaqArea 1.0.0.3      192.168.5.1  0x80000379   339 0x22 0x6f69 124
OpaqArea 1.0.0.3      192.168.5.2  0x80000116  1708 0x22 0xa888 124
OpaqArea 1.0.0.3      192.168.5.3  0x8000000a   660 0x22 0xa39b 124
OpaqArea 1.0.0.3      192.168.5.4  0x8000005d  2720 0x22 0x5f88 124
OpaqArea 1.0.0.3      192.168.5.5  0x8000034e  1126 0x22 0x44b5 124
OpaqArea 1.0.0.3      192.168.5.6  0x80000001  1384 0x22 0x70cd 124
OpaqArea 1.0.0.4      192.168.5.1  0x800001d2  1839 0x22 0x4141 124
OpaqArea 1.0.0.4      192.168.5.2  0x80000395   708 0x22 0x4574 124
OpaqArea 1.0.0.4      192.168.5.3  0x80000001  1392 0x22 0x6ec9 124
OpaqArea 1.0.0.4      192.168.5.4  0x80000375  1006 0x22 0x4199 124
OpaqArea 1.0.0.4      192.168.5.5  0x80000277   248 0x22 0xe4e4 124
OpaqArea 1.0.0.4      192.168.5.6  0x80000353  1127 0x22 0x48a9 124
OpaqArea 1.0.0.3      192.168.5.1  0x80000379   358 0x22 0x6f69 124
```

2.2: show ted database

```
10.10.42.37 - PuTTY
lab@dani> show ted database
TED database: 0 ISIS nodes 0 INET nodes
```

2.3: show ospf database

```
10.10.42.37 - PuTTY
lab@dani# edit protocols ospf

[edit protocols ospf]
lab@dani# set traffic-engineering

[edit protocols ospf]
lab@dani# commit and-quit
commit complete
Exiting configuration mode

lab@dani> show ospf database

    OSPF database, Area 0.0.0.0
  Type      ID                Adv Rtr           Seq             Age   Opt  Cksum  Len
Router  *192.168.1.1      192.168.1.1      0x80000070      2991 0x22 0x778b  60
Router   192.168.1.2      192.168.1.2      0x8000006f      1704 0x22 0x14e4  60
Router   192.168.5.1      192.168.5.1      0x800004cd      1179 0x22 0x6119  72
Router   192.168.5.2      192.168.5.2      0x80000521      1548 0x22 0x2005  72
Router   192.168.5.3      192.168.5.3      0x80000490      1732 0x22 0x1d7b  72
Router   192.168.5.4      192.168.5.4      0x800004a3      1774 0x22 0xa8eb  72
Router   192.168.5.5      192.168.5.5      0x800004eb      1466 0x22 0x7ad6  72
Router   192.168.5.6      192.168.5.6      0x800004ba      1467 0x22 0x8adb  72
Network  172.22.201.2     192.168.5.2      0x800003bd       547 0x22 0x9ffb  32
Network  172.22.202.2     192.168.5.4      0x800001e4       917 0x22 0x541d  32
Network  172.22.203.2     192.168.5.5      0x8000025f      1017 0x22 0x7f70  32
Network  172.22.204.2     192.168.5.6      0x80000373      1467 0x22 0x5b7b  32
Network  172.22.205.2     192.168.5.5      0x8000011e       160 0x22 0xd25f  32
Network  172.22.206.2     192.168.5.3      0x80000155      1453 0x22 0x51ac  32
Network  172.22.207.2     192.168.5.6      0x8000000c       595 0x22 0xf54a  32
Network  172.22.210.2     192.168.5.1      0x80000044       179 0x22 0xff15  32
Network  172.22.211.2     192.168.5.4      0x8000005f      2631 0x22 0xca28  32
Network  172.22.212.2     192.168.5.3      0x80000001      1732 0x22 0x86ca  32
Network  172.22.213.2     192.168.5.6      0x80000001      1724 0x22 0x87c2  32
OpaqArea*1.0.0.1  192.168.1.1      0x80000001         9 0x22 0xb0a7  28
OpaqArea 1.0.0.1        192.168.5.1      0x80000358      2679 0x22 0x1f4  28
OpaqArea 1.0.0.1        192.168.5.2      0x80000362         48 0x22 0xf0f8  28
OpaqArea 1.0.0.1        192.168.5.3      0x80000352         575 0x22 0x15e2  28
OpaqArea 1.0.0.1        192.168.5.4      0x80000355         489 0x22 0x13df  28
OpaqArea 1.0.0.1        192.168.5.5      0x80000357      2303 0x22 0x13db  28
OpaqArea 1.0.0.1        192.168.5.6      0x8000034f      1344 0x22 0x27cd  28
OpaqArea*1.0.0.3  192.168.1.1      0x80000001         9 0x22 0x212f 124
OpaqArea 1.0.0.3        192.168.5.1      0x80000379         679 0x22 0x6f69 124
---(more 63%)---
```

```
lab@dani> show ted database
TED database: 0 ISIS nodes 19 INET nodes
ID                Type Age(s) LnkIn LnkOut Protocol
192.168.1.1        Rtr   22    2    2 OSPF(0.0.0.0)
  To: 172.22.210.1-1, Local: 172.22.210.1, Remote: 0.0.0.0
  Local interface index: 0, Remote interface index: 0
  To: 172.22.211.1-1, Local: 172.22.211.1, Remote: 0.0.0.0
  Local interface index: 0, Remote interface index: 0
ID                Type Age(s) LnkIn LnkOut Protocol
192.168.5.1        Rtr   22    3    3 OSPF(0.0.0.0)
  To: 172.22.201.2-1, Local: 172.22.201.1, Remote: 0.0.0.0
  Local interface index: 0, Remote interface index: 0
  To: 172.22.202.2-1, Local: 172.22.202.1, Remote: 0.0.0.0
  Local interface index: 0, Remote interface index: 0
  To: 172.22.210.1-1, Local: 172.22.210.2, Remote: 0.0.0.0
  Local interface index: 0, Remote interface index: 0
ID                Type Age(s) LnkIn LnkOut Protocol
172.22.210.1-1    Net   22    2    2 OSPF(0.0.0.0)
  To: 192.168.5.1, Local: 0.0.0.0, Remote: 0.0.0.0
  Local interface index: 0, Remote interface index: 0
  To: 192.168.1.1, Local: 0.0.0.0, Remote: 0.0.0.0
  Local interface index: 0, Remote interface index: 0
ID                Type Age(s) LnkIn LnkOut Protocol
172.22.211.1-1    Net   22    2    2 OSPF(0.0.0.0)
  To: 192.168.5.4, Local: 0.0.0.0, Remote: 0.0.0.0
  Local interface index: 0, Remote interface index: 0
  To: 192.168.1.1, Local: 0.0.0.0, Remote: 0.0.0.0
  Local interface index: 0, Remote interface index: 0
ID                Type Age(s) LnkIn LnkOut Protocol
172.22.212.1-1    Net   22    1    2 OSPF(0.0.0.0)
  To: 192.168.5.3, Local: 0.0.0.0, Remote: 0.0.0.0
  Local interface index: 0, Remote interface index: 0
  To: 192.168.1.2, Local: 0.0.0.0, Remote: 0.0.0.0
  Local interface index: 0, Remote interface index: 0
```

2.4: show ted database extensive 192.168.1.1

```
10.10.42.37 - PuTTY
lab@dani> show ted database extensive 192.168.1.1
TED database: 0 ISIS nodes 19 INET nodes
NodeID: 192.168.1.1
  Type: Rtr, Age: 221 secs, LinkIn: 2, LinkOut: 2
  Protocol: OSPF(0.0.0.0)
    To: 172.22.210.2-1, Local: 172.22.210.1, Remote: 0.0.0.0
      Local interface index: 0, Remote interface index: 0
      Color: 0 <none>
      Metric: 1
      Static BW: 1000Mbps
      Reservable BW: 1000Mbps
      Available BW [priority] bps:
        [0] 1000Mbps    [1] 1000Mbps    [2] 1000Mbps    [3] 1000Mbps
        [4] 1000Mbps    [5] 1000Mbps    [6] 1000Mbps    [7] 1000Mbps
      Interface Switching Capability Descriptor(1):
        Switching type: Packet
        Encoding type: Packet
        Maximum LSP BW [priority] bps:
          [0] 1000Mbps    [1] 1000Mbps    [2] 1000Mbps    [3] 1000Mbps
          [4] 1000Mbps    [5] 1000Mbps    [6] 1000Mbps    [7] 1000Mbps
    To: 172.22.211.2-1, Local: 172.22.211.1, Remote: 0.0.0.0
      Local interface index: 0, Remote interface index: 0
      Color: 0 <none>
      Metric: 1
      Static BW: 1000Mbps
      Reservable BW: 1000Mbps
      Available BW [priority] bps:
        [0] 1000Mbps    [1] 1000Mbps    [2] 1000Mbps    [3] 1000Mbps
        [4] 1000Mbps    [5] 1000Mbps    [6] 1000Mbps    [7] 1000Mbps
      Interface Switching Capability Descriptor(1):
        Switching type: Packet
        Encoding type: Packet
        Maximum LSP BW [priority] bps:
          [0] 1000Mbps    [1] 1000Mbps    [2] 1000Mbps    [3] 1000Mbps
          [4] 1000Mbps    [5] 1000Mbps    [6] 1000Mbps    [7] 1000Mbps
```

Part 3: Configuring RSVP-Signalled LSPs

3.4: show rsvp session

```
10.10.42.37 - PuTTY
statistics          Show RSVP statistics
lab@dani> show rsvp session
Ingress RSVP: 4 sessions
To          From          State   Rt Style Labelin Labelout LSPname
192.168.1.2 192.168.1.1   Up      0  1 FF      -   309024 pel-to-pe2-1
192.168.1.2 192.168.1.1   Up      0  1 FF      -   309952 lsp-bronze-pel-to-pe2-1
192.168.1.2 192.168.1.1   Up      0  1 FF      -   309968 lsp-gold-pel-to-pe2-1
192.168.1.2 192.168.1.1   Up      0  1 FF      -   309984 lsp-silver-pel-to-pe2-1
Total 4 displayed, Up 4, Down 0

Egress RSVP: 0 sessions
Total 0 displayed, Up 0, Down 0

Transit RSVP: 0 sessions
Total 0 displayed, Up 0, Down 0
```

```
10.10.42.37 - PuTTY
lab@dani> show rsvp session extensive
Ingress RSVP: 4 sessions

192.168.1.2
  From: 192.168.1.1, LSPstate: Up, ActiveRoute: 0
  LSPname: lsp-bronze-pel-to-pe2-1, LSPpath: Primary
  LSPtype: Static Configured
  Suggested label received: -, Suggested label sent: -
  Recovery label received: -, Recovery label sent: 629312
  Resv style: 1 FF, Label in: -, Label out: 629312
  Time left: -, Since: Sun Sep 5 01:01:18 2021
  Tspec: rate 0bps size 0bps peak Infbps m 20 M 1500
  Port number: sender 1 receiver 43144 protocol 0
  Enhanced FRR: Enabled (Downstream)
  PATH rcvfrom: localclient
  Adspec: sent MTU 1500
  Path MTU: received 1500
  PATH sentto: 172.22.210.2 (ge-0/0/0.210) 1 pkts
    outgoing message state: refreshing, Message ID: 6135, Epoch: 15826994
  RESV rcvfrom: 172.22.210.2 (ge-0/0/0.210) 1 pkts, Entropy label: Yes
    incoming message handle: R-20618/1, Message ID: 25078, Epoch: 15827948
  Explot route: 172.22.210.2 192.168.5.2
  Record route: <self> 172.22.210.2 172.22.201.2 172.22.206.2 172.22.212.1

192.168.1.2
  From: 192.168.1.1, LSPstate: Up, ActiveRoute: 0
  LSPname: lsp-gold-pel-to-pe2-1, LSPpath: Primary
  LSPtype: Static Configured
  Suggested label received: -, Suggested label sent: -
  Recovery label received: -, Recovery label sent: 629296
  Resv style: 1 FF, Label in: -, Label out: 629296
  Time left: -, Since: Sun Sep 5 01:01:18 2021
  Tspec: rate 0bps size 0bps peak Infbps m 20 M 1500
  Port number: sender 1 receiver 43145 protocol 0
  Enhanced FRR: Enabled (Downstream)
  PATH rcvfrom: localclient
  Adspec: sent MTU 1500
  Path MTU: received 1500
  PATH sentto: 172.22.210.2 (ge-0/0/0.210) 1 pkts
    outgoing message state: refreshing, Message ID: 6136, Epoch: 15826994
  RESV rcvfrom: 172.22.210.2 (ge-0/0/0.210) 1 pkts, Entropy label: Yes
    incoming message handle: R-20617/1, Message ID: 25077, Epoch: 15827948
  Explot route: 172.22.210.2 192.168.5.2
```

```
Record route: <self> 172.22.210.2 172.22.201.2 172.22.206.2 172.22.212.1
```

```
192.168.1.2
```

```
From: 192.168.1.1, LSPstate: Up, ActiveRoute: 0
LSPname: lsp-silver-pel-to-pe2-1, LSPpath: Primary
LSPTYPE: Static Configured
Suggested label received: -, Suggested label sent: -
Recovery label received: -, Recovery label sent: 629280
Resv style: 1 FF, Label in: -, Label out: 629280
Time left: -, Since: Sun Sep 5 01:01:18 2021
Tspec: rate Obps size Obps peak Infbps m 20 M 1500
Port number: sender 1 receiver 43146 protocol 0
Enhanced FRR: Enabled (Downstream)
PATH rcvfrom: localclient
Adspec: sent MTU 1500
Path MTU: received 1500
PATH sentto: 172.22.210.2 (ge-0/0/0.210) 1 pkts
  outgoing message state: refreshing, Message ID: 6137, Epoch: 15826994
RESV rcvfrom: 172.22.210.2 (ge-0/0/0.210) 1 pkts, Entropy label: Yes
  incoming message handle: R-20616/1, Message ID: 25076, Epoch: 15827948
Explct route: 172.22.210.2 192.168.5.2
Record route: <self> 172.22.210.2 172.22.201.2 172.22.206.2 172.22.212.1
```

```
192.168.1.2
```

```
From: 192.168.1.1, LSPstate: Up, ActiveRoute: 0
LSPname: pel-to-pe2-1, LSPpath: Primary
LSPTYPE: Static Configured
Suggested label received: -, Suggested label sent: -
Recovery label received: -, Recovery label sent: 575648
Resv style: 1 FF, Label in: -, Label out: 575648
Time left: -, Since: Sun Sep 5 01:01:18 2021
Tspec: rate Obps size Obps peak Infbps m 20 M 1500
Port number: sender 1 receiver 43147 protocol 0
Enhanced FRR: Enabled (Downstream)
PATH rcvfrom: localclient
Adspec: sent MTU 1500
Path MTU: received 1500
PATH sentto: 172.22.211.2 (ge-0/0/1.211) 1 pkts
  outgoing message state: refreshing, Message ID: 6138, Epoch: 15826994
RESV rcvfrom: 172.22.211.2 (ge-0/0/1.211) 1 pkts, Entropy label: Yes
  incoming message handle: R-20612/1, Message ID: 7357, Epoch: 15827948
Explct route: 172.22.211.2 192.168.5.3
Record route: <self> 172.22.211.2 172.22.203.2 172.22.205.1 172.22.206.2 172.22.212.1
```



```
10.10.42.37 - PuTTY
Total 4 displayed, Up 4, Down 0
Egress RSVP: 3 sessions
192.168.1.1
From: 192.168.1.2, LSPstate: Up, ActiveRoute: 0
LSPname: lsp-bronze-pe2-to-pe1-1, LSPpath: Primary
Suggested label received: -, Suggested label sent: -
Recovery label received: -, Recovery label sent: -
Resv style: 1 FF, Label in: 3, Label out: -
Time left: 6173, Since: Sun Sep 5 01:02:54 2021
Tspec: rate 0bps size 0bps peak Infbps m 20 M 1500
Port number: sender 1 receiver 33826 protocol 0
Enhanced FRR: Enabled (Upstream)
PATH rcvfrom: 172.22.210.2 (ge-0/0/0.210) 1 pkts
incoming message handle: P-20614/1, Message ID: 25072, Epoch: 15827948
Adspec: received MTU 1500
PATH sentto: localclient
RESV rcvfrom: localclient , Entropy label: Yes
RESV
outgoing message state: refreshing, Message ID: 6140, Epoch: 15826994
Record route: 172.22.212.1 172.22.207.1 172.22.204.2 172.22.205.2 172.22.201.2 172.22.210.2 <self>
192.168.1.1
From: 192.168.1.2, LSPstate: Up, ActiveRoute: 0
LSPname: lsp-gold-pe2-to-pe1-1, LSPpath: Primary
Suggested label received: -, Suggested label sent: -
Recovery label received: -, Recovery label sent: -
Resv style: 1 FF, Label in: 3, Label out: -
Time left: 6173, Since: Sun Sep 5 01:02:54 2021
Tspec: rate 0bps size 0bps peak Infbps m 20 M 1500
Port number: sender 1 receiver 33827 protocol 0
Enhanced FRR: Enabled (Upstream)
PATH rcvfrom: 172.22.211.2 (ge-0/0/1.211) 1 pkts
incoming message handle: P-20615/1, Message ID: 7360, Epoch: 15827948
Adspec: received MTU 1500
PATH sentto: localclient
RESV rcvfrom: localclient , Entropy label: Yes
RESV
outgoing message state: refreshing, Message ID: 6141, Epoch: 15826994
Record route: 172.22.213.1 172.22.204.2 172.22.205.2 172.22.201.2 172.22.202.1 172.22.211.2 <self>
```

```
10.10.42.37 - PuTTY
192.168.1.1
From: 192.168.1.2, LSPstate: Up, ActiveRoute: 0
LSPname: lsp-silver-pe2-to-pe1-1, LSPpath: Primary
Suggested label received: -, Suggested label sent: -
Recovery label received: -, Recovery label sent: -
Resv style: 1 FF, Label in: 3, Label out: -
Time left: 6172, Since: Sun Sep 5 01:02:53 2021
Tspec: rate 0bps size 0bps peak Infbps m 20 M 1500
Port number: sender 1 receiver 33828 protocol 0
Enhanced FRR: Enabled (Upstream)
PATH rcvfrom: 172.22.210.2 (ge-0/0/0.210) 1 pkts
incoming message handle: P-20613/1, Message ID: 25070, Epoch: 15827948
Adspec: received MTU 1500
PATH sentto: localclient
RESV rcvfrom: localclient , Entropy label: Yes
RESV
outgoing message state: refreshing, Message ID: 6139, Epoch: 15826994
Record route: 172.22.212.1 172.22.206.2 172.22.205.1 172.22.203.2 172.22.202.2 172.22.210.2 <self>
Total 3 displayed, Up 3, Down 0
Transit RSVP: 0 sessions
Total 0 displayed, Up 0, Down 0
```

Part 4: Adding administrative groups to core-facing interfaces

4.4: show mpls interface

```
10.10.42.37 - PuTTY
lab@dani> show mpls interface
Interface      State      Administrative groups (x: extended)
ge-0/0/0.210  Up        bronze
              silver
ge-0/0/1.211  Up        gold
```

4.5: show ted database 192.168.1.1 extensive

```
10.10.42.37 - PuTTY
lab@dani> show ted database 192.168.1.1 extensive
TED database: 0 ISIS nodes 19 INET nodes
NodeID: 192.168.1.1
Type: Rtr, Age: 242 secs, LinkIn: 2, LinkOut: 2
Protocol: OSPF(0.0.0.0)
To: 172.22.210.2-1, Local: 172.22.210.1, Remote: 0.0.0.0
Local interface index: 0, Remote interface index: 0
Color: 0xc bronze silver
Metric: 1
Static BW: 1000Mbps
Reservable BW: 1000Mbps
Available BW [priority] bps:
  [0] 1000Mbps   [1] 1000Mbps   [2] 1000Mbps   [3] 1000Mbps
  [4] 1000Mbps   [5] 1000Mbps   [6] 1000Mbps   [7] 1000Mbps
Interface Switching Capability Descriptor(1):
Switching type: Packet
Encoding type: Packet
Maximum LSP BW [priority] bps:
  [0] 1000Mbps   [1] 1000Mbps   [2] 1000Mbps   [3] 1000Mbps
  [4] 1000Mbps   [5] 1000Mbps   [6] 1000Mbps   [7] 1000Mbps
To: 172.22.211.2-1, Local: 172.22.211.1, Remote: 0.0.0.0
Local interface index: 0, Remote interface index: 0
Color: 0x2 gold
Metric: 1
Static BW: 1000Mbps
Reservable BW: 1000Mbps
Available BW [priority] bps:
  [0] 1000Mbps   [1] 1000Mbps   [2] 1000Mbps   [3] 1000Mbps
  [4] 1000Mbps   [5] 1000Mbps   [6] 1000Mbps   [7] 1000Mbps
Interface Switching Capability Descriptor(1):
Switching type: Packet
Encoding type: Packet
Maximum LSP BW [priority] bps:
  [0] 1000Mbps   [1] 1000Mbps   [2] 1000Mbps   [3] 1000Mbps
  [4] 1000Mbps   [5] 1000Mbps   [6] 1000Mbps   [7] 1000Mbps
```


Part 5: Configuring LSPs to take gold, silver, and bronze paths using CSPF

5.3:

10.10.42.37 - PuTTY

```
[edit protocols mpls]
lab@dani# set label-switched-path lsp-bronze-pel-to-pe2-1 primary lsp-bronze-pel-to-pe2-1 admin-group include-any bronze
```

10.10.42.37 - PuTTY

```
lab@dani# edit protocols mpls

[edit protocols mpls]
lab@dani# show
admin-groups {
  gold 1;
  silver 2;
  bronze 3;
}
label-switched-path lsp-gold-pel-to-pe2-1 {
  to 192.168.1.2;
  primary lsp-gold-pel-to-pe2-1 {
    admin-group include-any gold;
  }
}
label-switched-path lsp-silver-pel-to-pe2-1 {
  to 192.168.1.2;
  primary lsp-gold-pel-to-pe2-1 {
    admin-group include-any silver;
  }
}
label-switched-path lsp-bronze-pel-to-pe2-1 {
  to 192.168.1.2;
  primary lsp-gold-pel-to-pe2-1 {
    admin-group include-any bronze;
  }
}
path lsp-gold-pel-to-pe2-1 {
  192.168.5.2 loose;
}
interface ge-0/0/0.210 {
  admin-group [ silver bronze ];
}
interface ge-0/0/1.211 {
  admin-group gold;
}
```

5.4: show

10.10.42.37 - PuTTY

```
lab@dani> show rsvp session
Ingress RSVP: 3 sessions
To          From          State   Rt Style Labelin Labelout LSPname
192.168.1.2 192.168.1.1   Up      0  1 FF  -    629904 lsp-bronze-pel-to-pe2-1
192.168.1.2 192.168.1.1   Up      0  1 FF  -    576176 lsp-gold-pel-to-pe2-1
192.168.1.2 192.168.1.1   Up      0  1 FF  -    629936 lsp-silver-pel-to-pe2-1
Total 3 displayed, Up 3, Down 0

Egress RSVP: 2 sessions
To          From          State   Rt Style Labelin Labelout LSPname
192.168.1.1 192.168.1.2   Up      0  1 FF  3    -    lsp-gold-pe2-to-pe1-1
192.168.1.1 192.168.1.2   Up      0  1 FF  3    -    lsp-silver-pe2-to-pe1-1
Total 2 displayed, Up 2, Down 0

Transit RSVP: 0 sessions
Total 0 displayed, Up 0, Down 0

lab@dani>
```

10.10.42.37 - PuTTY

```
lab@dani> show rsvp session detail
Ingress RSVP: 3 sessions

192.168.1.2
  From: 192.168.1.1, LSPstate: Up, ActiveRoute: 0
  LSPname: lsp-bronze-pel-to-pe2-1, LSPpath: Primary
  LSPtype: Static Configured
  Suggested label received: -, Suggested label sent: -
  Recovery label received: -, Recovery label sent: 629904
  Resv style: 1 FF, Label in: -, Label out: 629904
  Time left: -, Since: Sun Sep 5 11:47:01 2021
  Tspec: rate Obps size Obps peak Infbps m 20 M 1500
  Port number: sender 2 receiver 43148 protocol 0
  PATH rcvfrom: localclient
  Adspec: sent MTU 1500
  Path MTU: received 1500
  PATH sentto: 172.22.210.2 (ge-0/0/0.210) 3 pkts
  RESV rcvfrom: 172.22.210.2 (ge-0/0/0.210) 2 pkts, Entropy label: Yes
  Explct route: 172.22.210.2 172.22.201.2 172.22.205.2 172.22.204.2 172.22.207.1 172.22.212.1
  Record route: <self> 172.22.210.2 172.22.201.2 172.22.205.2 172.22.204.2 172.22.207.1 172.22.212.1

192.168.1.2
  From: 192.168.1.1, LSPstate: Up, ActiveRoute: 0
  LSPname: lsp-gold-pel-to-pe2-1, LSPpath: Primary
  LSPtype: Static Configured
  Suggested label received: -, Suggested label sent: -
  Recovery label received: -, Recovery label sent: 576176
  Resv style: 1 FF, Label in: -, Label out: 576176
  Time left: -, Since: Sun Sep 5 11:47:01 2021
  Tspec: rate Obps size Obps peak Infbps m 20 M 1500
  Port number: sender 2 receiver 43149 protocol 0
  PATH rcvfrom: localclient
  Adspec: sent MTU 1500
  Path MTU: received 1500
  PATH sentto: 172.22.211.2 (ge-0/0/1.211) 4 pkts
  RESV rcvfrom: 172.22.211.2 (ge-0/0/1.211) 2 pkts, Entropy label: Yes
  Explct route: 172.22.211.2 172.22.202.1 172.22.201.2 172.22.205.2 172.22.204.2 172.22.213.1
  Record route: <self> 172.22.211.2 172.22.202.1 172.22.201.2 172.22.205.2 172.22.204.2 172.22.213.1
```

10.10.42.37 - PuTTY

```
192.168.1.2
From: 192.168.1.1, LSPstate: Up, ActiveRoute: 0
LSPname: lsp-silver-pel-to-pe2-1, LSPpath: Primary
LSPtype: Static Configured
Suggested label received: -, Suggested label sent: -
Recovery label received: -, Recovery label sent: 629936
Resv style: 1 FF, Label in: -, Label out: 629936
Time left: -, Since: Sun Sep 5 11:47:01 2021
Tspec: rate Obps size Obps peak Infbps m 20 M 1500
Port number: sender 2 receiver 43150 protocol 0
PATH rcvfrom: localclient
Adspec: sent MTU 1500
Path MTU: received 1500
PATH sentto: 172.22.210.2 (ge-0/0/0.210) 3 pkts
RESV rcvfrom: 172.22.210.2 (ge-0/0/0.210) 2 pkts, Entropy label: Yes
Explot route: 172.22.210.2 172.22.202.2 172.22.203.2 172.22.205.1 172.22.206.2 172.22.212.1
Record route: <self> 172.22.210.2 172.22.202.2 172.22.203.2 172.22.205.1 172.22.206.2 172.22.212.1
Total 3 displayed, Up 3, Down 0

Egress RSVP: 2 sessions
```

```
192.168.1.1
From: 192.168.1.2, LSPstate: Up, ActiveRoute: 0
LSPname: lsp-gold-pe2-to-pel-1, LSPpath: Primary
Suggested label received: -, Suggested label sent: -
Recovery label received: -, Recovery label sent: -
Resv style: 1 FF, Label in: 3, Label out: -
Time left: 5708, Since: Sun Sep 5 11:40:51 2021
Tspec: rate Obps size Obps peak Infbps m 20 M 1500
Port number: sender 5 receiver 33827 protocol 0
PATH rcvfrom: 172.22.211.2 (ge-0/0/1.211) 1 pkts
Adspec: received MTU 1500
PATH sentto: localclient
RESV rcvfrom: localclient , Entropy label: Yes
Record route: 172.22.213.1 172.22.204.2 172.22.205.2 172.22.201.2 172.22.202.1 172.22.211.2 <self>
```

10.10.42.37 - PuTTY

```
192.168.1.1
From: 192.168.1.2, LSPstate: Up, ActiveRoute: 0
LSPname: lsp-silver-pe2-to-pel-1, LSPpath: Primary
Suggested label received: -, Suggested label sent: -
Recovery label received: -, Recovery label sent: -
Resv style: 1 FF, Label in: 3, Label out: -
Time left: 5804, Since: Sun Sep 5 11:42:27 2021
Tspec: rate Obps size Obps peak Infbps m 20 M 1500
Port number: sender 7 receiver 33828 protocol 0
PATH rcvfrom: 172.22.210.2 (ge-0/0/0.210) 1 pkts
Adspec: received MTU 1500
PATH sentto: localclient
RESV rcvfrom: localclient , Entropy label: Yes
Record route: 172.22.212.1 172.22.206.2 172.22.205.1 172.22.203.2 172.22.202.2 172.22.210.2 <self>
Total 2 displayed, Up 2, Down 0

Transit RSVP: 0 sessions
Total 0 displayed, Up 0, Down 0
```

Lab 6: VPN Baseline Configuration (Detailed)

Part 1: Creating the baseline SP network and enabling PE for Layer 3 VPN Signaling

1.8: show

10.10.42.37 - PuTTY

```
lab@dani> show mpls interface
Interface      State      Administrative groups (x: extended)
ge-0/0/0.210   Up         <none>
ge-0/0/1.211   Up         <none>

lab@dani> show rsvp interface
RSVP interface: 2 active
Interface      State      Active  Subscr-  Static   Available  Reserved  Highwater
                resv      iption  BW       BW        BW         BW         mark
ge-0/0/0.210   Up         0      100%    1000Mbps 1000Mbps   0bps      0bps
ge-0/0/1.211   Up         0      100%    1000Mbps 1000Mbps   0bps      0bps
```

1.9: show ospf neighbor

10.10.42.37 - PuTTY

```
lab@dani> show ospf neighbor
Address        Interface      State      ID          Pri  Dead
172.22.210.2  ge-0/0/0.210  Full      192.168.5.1 128  38
172.22.211.2  ge-0/0/1.211  Full      192.168.5.4 128  36
```

1.10: show bgp neighbor 192.168.1.2

10.10.42.37 - PuTTY

```
lab@dani> show bgp neighbor 192.168.1.2
Peer: 192.168.1.2+179 AS 65512 Local: 192.168.1.1+58705 AS 65512
  Group: my-int-group          Routing-Instance: master
  Forwarding routing-instance: master
  Type: Internal      State: Established      Flags: <Sync>
  Last State: OpenConfirm  Last Event: RecvKeepAlive
  Last Error: None
  Options: <Preference LocalAddress AddressFamily Rib-group Refresh>
  Address families configured: inet-unicast inet-vpn-unicast
  Local Address: 192.168.1.1 Holdtime: 90 Preference: 170
  Number of flaps: 0
  Peer ID: 192.168.1.2      Local ID: 192.168.1.1      Active Holdtime: 90
  Keepalive Interval: 30      Group index: 0      Peer index: 0      SNMP index: 0
  I/O Session Thread: bgpio-0 State: Enabled
  BFD: disabled, down
  NLRI for restart configured on peer: inet-unicast inet-vpn-unicast
  NLRI advertised by peer: inet-unicast
  NLRI for this session: inet-unicast
  Peer supports Refresh capability (2)
  Stale routes from peer are kept for: 300
  Peer does not support Restarter functionality
  Restart flag received from the peer: Notification
  NLRI that restart is negotiated for: inet-unicast
  NLRI of received end-of-rib markers: inet-unicast
  NLRI of all end-of-rib markers sent: inet-unicast
  Peer does not support LLGR Restarter functionality
  Peer supports 4 byte AS extension (peer-as 65512)
  Peer does not support Addpath
  Table inet.0 Bit: 20001
    RIB State: BGP restart is complete
    Send state: in sync
    Active prefixes:          2
    Received prefixes:        2
    Accepted prefixes:        2
    Suppressed due to damping: 0
    Advertised prefixes:      0
  Last traffic (seconds): Received 526992 Sent 147 Checked 526992
  Input messages:  Total 8      Updates 2      Refreshes 0      Octets 189
  Output messages: Total 6      Updates 0      Refreshes 0      Octets 118
  Output Queue[1]: 0          (inet.0, inet-unicast)
```

10.10.42.37 - PuTTY

```
lab@dani> show bgp summary
Groups: 3 Peers: 3 Down peers: 0
Table      Tot Paths  Act Paths  Suppressed  History Damp State  Pending
inet.0
          2          2          0          0          0          0
bgp.l3vpn.0
          0          0          0          0          0          0
Peer      AS      InPkt    OutPkt    OutQ    Flaps Last Up/Dwn State|#Active/Received/Accepted/Damped...
10.0.10.1 65512   2053     1939     0       1    14:37:29 Establ
  cel-1.inet.0: 2/2/2/0
10.0.10.2 65101   1939     2052     0       3    14:37:29 Establ
  inet.0: 0/0/0/0
192.168.1.2 65512   12       10       0       0    4:18 Establ
  inet.0: 2/2/2/0
```

Part 2: Configuring the CE Router Properties

2.9: show route table ce1-1.inet

10.10.42.37 - PuTTY

```
lab@dani> show route table ce1-1.inet

cel-1.inet.0: 7 destinations, 7 routes (7 active, 0 holddown, 0 hidden)
+ = Active Route, - = Last Active, * = Both

10.0.10.0/24      *[Direct/0] 04:40:23
                  > via ge-0/0/8.610
10.0.10.2/32     *[Local/0] 04:40:23
                  Local via ge-0/0/8.610
172.10.0.0/24   *[Static/5] 04:40:23
                  Reject
172.10.1.0/24   *[Static/5] 04:40:23
                  Reject
172.10.2.0/24   *[Static/5] 04:40:23
                  Reject
172.10.3.0/24   *[Static/5] 04:40:23
                  Reject
192.168.11.1/32 *[Direct/0] 6d 07:39:01
                  > via lo0.1

cel-1.inet6.0: 1 destinations, 1 routes (1 active, 0 holddown, 0 hidden)
+ = Active Route, - = Last Active, * = Both

ff02::2/128     *[INET6/0] 6d 07:39:13
                  MultiRecv
```

Lab 7: Layer 3 VPN with Static and BGP Routing (detailed)

Part 1: Loading and Verifying the VPN Baseline Configuration

1.2: show

```
10.10.42.37 - PuTTY
lab@dani> show ospf neighbor
Address      Interface      State      ID           Pri  Dead
172.22.210.2 ge-0/0/0.210   Full      192.168.5.1  128  39
172.22.211.2 ge-0/0/1.211   Full      192.168.5.4  128  32

lab@dani> show bgp summary
Groups: 2 Peers: 2 Down peers: 2
Table      Tot Paths  Act Paths Suppressed  History  Damp State   Pending
inet.0
          0         0         0           0         0     0       0
bgp.l3vpn.0
          0         0         0           0         0     0       0
Peer      AS      InPkt   OutPkt   OutQ   Flaps  Last Up/Dwn State|#Active/Received/Accepted/Damped...
10.0.10.2 65101   2020    2132     0      4     5:01:46 Idle
192.168.1.2 65512   0        0        0     34     1:25:48 Connect
```

1.3: show routing-instances ce1-1

```
10.10.42.37 - PuTTY
lab@dani# show routing-instances ce1-1
instance-type virtual-router;
interface ge-0/0/8.610;
interface lo0.1;
routing-options {
  static {
    route 172.10.0.0/24 reject;
    route 172.10.1.0/24 reject;
    route 172.10.2.0/24 reject;
    route 172.10.3.0/24 reject;
  }
  autonomous-system 65101;
}
```

Part 2: Establishing an RSVP Signaled LSP between PE routers

2.1: show

```
10.10.42.37 - PuTTY
syntax error.
lab@dani# set label-switched-path pe1-to-pe2-1 to 192.168.1.2

[edit protocols mpls]
lab@dani# show
label-switched-path pe1-to-pe2-1 {
  to 192.168.1.2;
}
interface ge-0/0/0.210;
interface ge-0/0/1.211;

[edit protocols mpls]
lab@dani# commit and-quit
commit complete
Exiting configuration mode
```

2.2: show mpls lsp – show route table inet.3

```
lab@vmx1> show mpls lsp
Ingress LSP: 1 sessions
To          From          State Rt P    ActivePath      LSPname
192.168.1.2 192.168.1.1   Up    0 *
Total 1 displayed, Up 1, Down 0

Egress LSP: 1 sessions
To          From          State  Rt Style Labelin Labelout LSPname
192.168.1.1 192.168.1.2   Up     0  1 FF      3      - pe2-to-pe1-1
Total 1 displayed, Up 1, Down 0

Transit LSP: 0 sessions
Total 0 displayed, Up 0, Down 0

10.10.42.37 - PuTTY
lab@vmx1> show route table inet.3

inet.3: 1 destinations, 1 routes (1 active, 0 holddown, 0 hidden)
+ = Active Route, - = Last Active, * = Both

192.168.1.2/32      *[RSVP/7/1] 00:00:14, metric 4
                   > to 172.22.211.2 via ge-0/0/1.211, label-switched-path pe1-to-pe2-1
```


2.3: ping

10.10.42.37 - PuTTY

```
lab@vmxl> ping mpls rsvp pe1-to-pe2-1
!!!!
--- lsping statistics ---
5 packets transmitted, 5 packets received, 0% packet loss
```

Part 3: Configuring the PE to CE Interface

3.2: Ping 10.0.10.2 count 3

10.10.42.37 - PuTTY

```
lab@vmxl> ping 10.0.10.2 count 3
PING 10.0.10.2 (10.0.10.2): 56 data bytes
64 bytes from 10.0.10.2: icmp_seq=0 ttl=64 time=2.072 ms
64 bytes from 10.0.10.2: icmp_seq=1 ttl=64 time=71.002 ms
64 bytes from 10.0.10.2: icmp_seq=2 ttl=64 time=400.350 ms

--- 10.0.10.2 ping statistics ---
3 packets transmitted, 3 packets received, 0% packet loss
round-trip min/avg/max/stddev = 2.072/157.808/400.350/173.796 ms
```

Part 4: Configuring a Layer 3 VPN Instance

4.5: show

10.10.42.37 - PuTTY

```
lab@vmxl#
[edit routing-instances vpn-1]
lab@vmxl# set vrf-target target:65512:1

[edit routing-instances vpn-1]
lab@vmxl# show
instance-type vrf;
interface ge-0/0/4.610;
route-distinguisher 192.168.1.1:1;
vrf-target target:65512:1;

[edit routing-instances vpn-1]
lab@vmxl# commit and-quit
commit complete
Exiting configuration mode
```

4.6: show route table vpn-1. inet.0

```
lab@vmxl> show route table vpn-1.inet.0

vpn-1.inet.0: 2 destinations, 2 routes (2 active, 0 holddown, 0 hidden)
+ = Active Route, - = Last Active, * = Both

10.0.10.0/24      *[Direct/0] 00:01:02
                  > via ge-0/0/4.610
10.0.10.1/32     *[Local/0] 00:01:02
                  Local via ge-0/0/4.610
```

Part 5: Configuring Static Routing between the PE and CE Routers

5.3: show route advertising-protocol bgp 192.168.1.2

10.10.42.37 - PuTTY

```
lab@vmxl> show route advertising-protocol bgp 192.168.1.2

vpn-1.inet.0: 13 destinations, 13 routes (13 active, 0 holddown, 0 hidden)
  Prefix          Nexthop          MED    Lclpref    AS path
* 10.0.10.0/24    Self             100     I          I
* 172.10.0.0/24   Self             100     I          I
* 172.10.1.0/24   Self             100     I          I
* 172.10.2.0/24   Self             100     I          I
* 172.10.3.0/24   Self             100     I          I
* 192.168.11.1/32 Self             100     I          I
```

5.4: show route receive-protocol bgp 192.168.1.2

```
10.10.42.37 - PuTTY
lab@vmx1> show route receive-protocol bgp 192.168.1.2

inet.0: 25 destinations, 25 routes (25 active, 0 holddown, 0 hidden)

inet.3: 1 destinations, 1 routes (1 active, 0 holddown, 0 hidden)

cel-1.inet.0: 8 destinations, 8 routes (8 active, 0 holddown, 0 hidden)

vpn-1.inet.0: 13 destinations, 13 routes (13 active, 0 holddown, 0 hidden)
  Prefix                Nexthop                MED    Lclpref    AS path
* 10.0.11.0/24           192.168.1.2           100    I          I
* 172.10.4.0/24          192.168.1.2           100    I          I
* 172.10.5.0/24          192.168.1.2           100    I          I
* 172.10.6.0/24          192.168.1.2           100    I          I
* 172.10.7.0/24          192.168.1.2           100    I          I
* 192.168.11.2/32        192.168.1.2           100    I          I

mpls.0: 7 destinations, 7 routes (7 active, 0 holddown, 0 hidden)

bgp.13vpn.0: 6 destinations, 6 routes (6 active, 0 holddown, 0 hidden)
  Prefix                Nexthop                MED    Lclpref    AS path
  192.168.1.2:1:10.0.11.0/24
*                   192.168.1.2           100    I          I
  192.168.1.2:1:172.10.4.0/24
*                   192.168.1.2           100    I          I
  192.168.1.2:1:172.10.5.0/24
*                   192.168.1.2           100    I          I
  192.168.1.2:1:172.10.6.0/24
*                   192.168.1.2           100    I          I
  192.168.1.2:1:172.10.7.0/24
*                   192.168.1.2           100    I          I
  192.168.1.2:1:192.168.11.2/32
*                   192.168.1.2           100    I          I

inet6.0: 1 destinations, 1 routes (1 active, 0 holddown, 0 hidden)

cel-1.inet6.0: 1 destinations, 1 routes (1 active, 0 holddown, 0 hidden)

vpn-1.inet6.0: 1 destinations, 1 routes (1 active, 0 holddown, 0 hidden)
```

5.5: show route table vpn-1. inet.0

10.10.42.37 - PuTTY

```
lab@vmx1> show route table vpn-1.inet.0

vpn-1.inet.0: 13 destinations, 13 routes (13 active, 0 holddown, 0 hidden)
+ = Active Route, - = Last Active, * = Both

10.0.10.0/24      * [Direct/0] 00:03:44
                  > via ge-0/0/4.610
10.0.10.1/32     * [Local/0] 00:03:44
                  Local via ge-0/0/4.610
10.0.11.0/24     * [BGP/170] 00:01:50, localpref 100, from 192.168.1.2
                  AS path: I, validation-state: unverified
                  > to 172.22.211.2 via ge-0/0/1.211, label-switched-path pel-to-pe2-1
172.10.0.0/24   * [Static/5] 00:03:44
                  > to 10.0.10.2 via ge-0/0/4.610
172.10.1.0/24   * [Static/5] 00:03:44
                  > to 10.0.10.2 via ge-0/0/4.610
172.10.2.0/24   * [Static/5] 00:03:44
                  > to 10.0.10.2 via ge-0/0/4.610
172.10.3.0/24   * [Static/5] 00:03:44
                  > to 10.0.10.2 via ge-0/0/4.610
172.10.4.0/24   * [BGP/170] 00:01:49, localpref 100, from 192.168.1.2
                  AS path: 65101 I, validation-state: unverified
                  > to 172.22.211.2 via ge-0/0/1.211, label-switched-path pel-to-pe2-1
172.10.5.0/24   * [BGP/170] 00:01:49, localpref 100, from 192.168.1.2
                  AS path: 65101 I, validation-state: unverified
                  > to 172.22.211.2 via ge-0/0/1.211, label-switched-path pel-to-pe2-1
172.10.6.0/24   * [BGP/170] 00:01:49, localpref 100, from 192.168.1.2
                  AS path: 65101 I, validation-state: unverified
                  > to 172.22.211.2 via ge-0/0/1.211, label-switched-path pel-to-pe2-1
172.10.7.0/24   * [BGP/170] 00:01:49, localpref 100, from 192.168.1.2
                  AS path: 65101 I, validation-state: unverified
                  > to 172.22.211.2 via ge-0/0/1.211, label-switched-path pel-to-pe2-1
192.168.11.1/32 * [Static/5] 00:03:44
                  > to 10.0.10.2 via ge-0/0/4.610
192.168.11.2/32 * [BGP/170] 00:01:49, localpref 100, from 192.168.1.2
                  AS path: 65101 I, validation-state: unverified
                  > to 172.22.211.2 via ge-0/0/1.211, label-switched-path pel-to-pe2-1
```

5.6: ping

10.10.42.37 - PuTTY

```
lab@vmx1> ping 192.168.11.2 source 192.168.11.1 routing-instance cel-1 count 5
PING 192.168.11.2 (192.168.11.2): 56 data bytes
64 bytes from 192.168.11.2: icmp_seq=0 ttl=59 time=301.515 ms
64 bytes from 192.168.11.2: icmp_seq=1 ttl=59 time=268.641 ms
64 bytes from 192.168.11.2: icmp_seq=2 ttl=59 time=357.681 ms
64 bytes from 192.168.11.2: icmp_seq=3 ttl=59 time=29.267 ms
64 bytes from 192.168.11.2: icmp_seq=4 ttl=59 time=11.785 ms

--- 192.168.11.2 ping statistics ---
5 packets transmitted, 5 packets received, 0% packet loss
round-trip min/avg/max/stddev = 11.785/193.778/357.681/144.403 ms
```

Part 6: Configuring BGP Routing between the PE and CE Routers

6.3: show route table vpn-1. inet.0

```
10.10.42.37 - PuTTY
lab@vmx1> show route table vpn-1.inet.0

vpn-1.inet.0: 2 destinations, 2 routes (2 active, 0 holddown, 0 hidden)
+ = Active Route, - = Last Active, * = Both

10.0.10.0/24      *[Direct/0] 00:34:54
                  > via ge-0/0/4.610
10.0.10.1/32     *[Local/0] 00:34:54
                  Local via ge-0/0/4.610
```

6.4: show

```
10.10.42.37 - PuTTY
[edit routing-instances cel-1 protocols bgp]
lab@vmx1# show
group my-ext-group {
    type external;
    export exp-policy;
    peer-as 65512;
    neighbor 10.0.10.1;
}
```

6.5: show

```
10.10.42.37 - PuTTY
[edit routing-instances vpn-1 protocols bgp]
lab@vmx1# show
group my-ext-group {
    type external;
    peer-as 65101;
    neighbor 10.0.10.2;
}
```

6.6: show route receive-protocol bgp 10.0.10.2

```
10.10.42.37 - PuTTY
lab@vmx1> show route receive-protocol bgp 10.0.10.2

inet.0: 25 destinations, 25 routes (25 active, 0 holddown, 0 hidden)

inet.3: 1 destinations, 1 routes (1 active, 0 holddown, 0 hidden)

cel-1.inet.0: 7 destinations, 7 routes (7 active, 0 holddown, 0 hidden)

vpn-1.inet.0: 7 destinations, 8 routes (7 active, 0 holddown, 0 hidden)
  Prefix          Nexthop          MED    Lclpref    AS path
  10.0.10.0/24    10.0.10.2
* 172.10.0.0/24  10.0.10.2        65101 I
* 172.10.1.0/24  10.0.10.2        65101 I
* 172.10.2.0/24  10.0.10.2        65101 I
* 172.10.3.0/24  10.0.10.2        65101 I
* 192.168.11.1/32 10.0.10.2        65101 I

mpls.0: 6 destinations, 6 routes (6 active, 0 holddown, 0 hidden)

inet6.0: 1 destinations, 1 routes (1 active, 0 holddown, 0 hidden)

cel-1.inet6.0: 1 destinations, 1 routes (1 active, 0 holddown, 0 hidden)

vpn-1.inet6.0: 1 destinations, 1 routes (1 active, 0 holddown, 0 hidden)
```

6.7: show route

```
10.10.42.37 - PuTTY
lab@vmx1> show route advertising-protocol bgp 192.168.1.2

vpn-1.inet.0: 13 destinations, 14 routes (13 active, 0 holddown, 0 hidden)
  Prefix          Nexthop          MED    Lclpref    AS path
* 10.0.10.0/24    Self             100    I
* 172.10.0.0/24  Self             100    65101 I
* 172.10.1.0/24  Self             100    65101 I
* 172.10.2.0/24  Self             100    65101 I
* 172.10.3.0/24  Self             100    65101 I
* 192.168.11.1/32 Self             100    65101 I
```


6.9: show route

```
10.10.42.37 - PuTTY
lab@vmx1> show route receive-protocol bgp 10.0.10.1

inet.0: 25 destinations, 25 routes (25 active, 0 holddown, 0 hidden)

inet.3: 1 destinations, 1 routes (1 active, 0 holddown, 0 hidden)

cel-1.inet.0: 8 destinations, 8 routes (8 active, 0 holddown, 0 hidden)
  Prefix          Nexthop          MED      Lclpref    AS path
* 10.0.11.0/24    10.0.10.1
                               65512 I

vpn-1.inet.0: 13 destinations, 14 routes (13 active, 0 holddown, 0 hidden)

mpls.0: 7 destinations, 7 routes (7 active, 0 holddown, 0 hidden)

bgp.13vpn.0: 6 destinations, 6 routes (6 active, 0 holddown, 0 hidden)

inet6.0: 1 destinations, 1 routes (1 active, 0 holddown, 0 hidden)

cel-1.inet6.0: 1 destinations, 1 routes (1 active, 0 holddown, 0 hidden)

vpn-1.inet6.0: 1 destinations, 1 routes (1 active, 0 holddown, 0 hidden)

lab@vmx1>
```

6.10: show route

```
10.10.42.37 - PuTTY
lab@vmx1> show route advertising-protocol bgp 10.0.10.2

vpn-1.inet.0: 13 destinations, 14 routes (13 active, 0 holddown, 0 hidden)
  Prefix          Nexthop          MED      Lclpref    AS path
* 10.0.11.0/24    Self
                               I
```


6.11: show route 172.10.4.0/24 extensive

10.10.42.37 - PuTTY

```
lab@vmx1> show route 172.10.4.0/24 extensive

vpn-1.inet.0: 13 destinations, 14 routes (13 active, 0 holddown, 0 hidden)
172.10.4.0/24 (1 entry, 1 announced)
TSI:
KRT in-kernel 172.10.4.0/24 -> {indirect(1048574)}
  *BGP      Preference: 170/-101
            Route Distinguisher: 192.168.1.2:1
            Next hop type: Indirect, Next hop index: 0
            Address: 0xb6795f0
            Next-hop reference count: 18
            Source: 192.168.1.2
            Next hop type: Router, Next hop index: 643
            Next hop: 172.22.210.2 via ge-0/0/0.210, selected
            Label-switched-path pel-to-pe2-1
            Label operation: Push 477744, Push 630432(top)
            Label TTL action: prop-ttl, prop-ttl(top)
            Load balance label: Label 477744: None; Label 630432: None;
            Label element ptr: 0xb679b20
            Label parent element ptr: 0xb679520
            Label element references: 1
            Label element child references: 0
            Label element lsp id: 0
            Session Id: 0xedc
            Protocol next hop: 192.168.1.2
            Label operation: Push 477744
            Label TTL action: prop-ttl
            Load balance label: Label 477744: None;
            Indirect next hop: 0xba7f480 1048574 INH Session ID: 0xef3
            State: <Secondary Active Int Ext ProtectionCand>
            Local AS: 65512 Peer AS: 65512
            Age: 2:52      Metric2: 4
            Validation State: unverified
            Task: BGP_65512.192.168.1.2
            Announcement bits (1): 1-KRT
            AS path: 65101 I
            Communities: target:65512:1
            Import Accepted
            VPN Label: 477744
            Localpref: 100
            Router ID: 192.168.1.2
            Primary Routing Table bgp.13vpn.0
            Indirect next hops: 1
```

```
Protocol next hop: 192.168.1.2 Metric: 4
Label operation: Push 477744
Label TTL action: prop-ttl
Load balance label: Label 477744: None;
Indirect next hop: 0xba7f480 1048574 INH Session ID: 0xef3
Indirect path forwarding next hops: 1
  Next hop type: Router
  Next hop: 172.22.210.2 via ge-0/0/0.210
  Session Id: 0xedc
  192.168.1.2/32 Originating RIB: inet.3
  Metric: 4 Node path count: 1
  Forwarding nexthops: 1
    Nexthop: 172.22.210.2 via ge-0/0/0.210
    Session Id: 0

bgp.l3vpn.0: 6 destinations, 6 routes (6 active, 0 holddown, 0 hidden)

192.168.1.2:1:172.10.4.0/24 (1 entry, 0 announced)
  *BGP Preference: 170/-101
  Route Distinguisher: 192.168.1.2:1
  Next hop type: Indirect, Next hop index: 0
  Address: 0xb6795f0
  Next-hop reference count: 18
  Source: 192.168.1.2
  Next hop type: Router, Next hop index: 643
  Next hop: 172.22.210.2 via ge-0/0/0.210, selected
  Label-switched-path pe1-to-pe2-1
  Label operation: Push 477744, Push 630432(top)
  Label TTL action: prop-ttl, prop-ttl(top)
  Load balance label: Label 477744: None; Label 630432: None;
  Label element ptr: 0xb679b20
  Label parent element ptr: 0xb679520
  Label element references: 1
  Label element child references: 0
  Label element lsp id: 0
  Session Id: 0xedc
  Protocol next hop: 192.168.1.2
  Label operation: Push 477744
  Label TTL action: prop-ttl
  Load balance label: Label 477744: None;
  Indirect next hop: 0xba7f480 1048574 INH Session ID: 0xef3
  State: <Active Int Ext ProtectionPath ProtectionCand>
  Local AS: 65512 Peer AS: 65512
```

DOM

10.10.42.37 - PuTTY

```
Age: 2:52      Metric2: 4
Validation State: unverified
Task: BGP_65512.192.168.1.2
AS path: 65101 I
Communities: target:65512:1
Import Accepted
VPN Label: 477744
Localpref: 100
Router ID: 192.168.1.2
Secondary Tables: vpn-1.inet.0
Indirect next hops: 1
  Protocol next hop: 192.168.1.2 Metric: 4
  Label operation: Push 477744
  Label TTL action: prop-ttl
  Load balance label: Label 477744: None;
  Indirect next hop: 0xba7f480 1048574 INH Session ID: 0xef3
  Indirect path forwarding next hops: 1
    Next hop type: Router
    Next hop: 172.22.210.2 via ge-0/0/0.210
    Session Id: 0xedc
    192.168.1.2/32 Originating RIB: inet.3
    Metric: 4      Node path count: 1
    Forwarding nexthops: 1
      Nexthop: 172.22.210.2 via ge-0/0/0.210
      Session Id: 0
```

6.13: show route

10.10.42.37 - PuTTY

```
lab@vmx1> show route receive-protocol bgp 10.0.10.1

inet.0: 25 destinations, 25 routes (25 active, 0 holddown, 0 hidden)

inet.3: 1 destinations, 1 routes (1 active, 0 holddown, 0 hidden)

cel-1.inet.0: 13 destinations, 13 routes (13 active, 0 holddown, 0 hidden)
  Prefix          Nexthop          MED      Lclpref    AS path
* 10.0.11.0/24    10.0.10.1
* 172.10.4.0/24   10.0.10.1        65512    65512    I
* 172.10.5.0/24   10.0.10.1        65512    65512    I
* 172.10.6.0/24   10.0.10.1        65512    65512    I
* 172.10.7.0/24   10.0.10.1        65512    65512    I
* 192.168.11.2/32 10.0.10.1        65512    65512    I

vpn-1.inet.0: 13 destinations, 14 routes (13 active, 0 holddown, 0 hidden)

mpls.0: 7 destinations, 7 routes (7 active, 0 holddown, 0 hidden)

bgp.13vpn.0: 6 destinations, 6 routes (6 active, 0 holddown, 0 hidden)

inet6.0: 1 destinations, 1 routes (1 active, 0 holddown, 0 hidden)

cel-1.inet6.0: 1 destinations, 1 routes (1 active, 0 holddown, 0 hidden)

vpn-1.inet6.0: 1 destinations, 1 routes (1 active, 0 holddown, 0 hidden)
```

6.14: ping 192.168.11.2

10.10.42.37 - PuTTY

```
lab@vmx1> ping 192.168.11.2 source 192.168.11.1 routing-instance cel-1 count 5
PING 192.168.11.2 (192.168.11.2): 56 data bytes
64 bytes from 192.168.11.2: icmp_seq=0 ttl=59 time=15.742 ms
64 bytes from 192.168.11.2: icmp_seq=1 ttl=59 time=25.488 ms
64 bytes from 192.168.11.2: icmp_seq=2 ttl=59 time=37.124 ms
64 bytes from 192.168.11.2: icmp_seq=3 ttl=59 time=391.404 ms
64 bytes from 192.168.11.2: icmp_seq=4 ttl=59 time=48.432 ms

--- 192.168.11.2 ping statistics ---
5 packets transmitted, 5 packets received, 0% packet loss
round-trip min/avg/max/stddev = 15.742/103.638/391.404/144.301 ms
```

Lab 8: Route Reflection and Internet Access (Detailed)

Part 1: Loading and Verifying the VPN baseline configuration

1.2: show

10.10.42.37 - PuTTY

```
lab@vmx1> show ospf neighbor
Address          Interface          State      ID              Pri  Dead
172.22.210.2    ge-0/0/0.210      Full      192.168.5.1    128  36
172.22.211.2    ge-0/0/1.211      Full      192.168.5.4    128  39
```

10.10.42.37 - PuTTY

```
lab@dani> show bgp summary
Groups: 2 Peers: 2 Down peers: 1
Table          Tot Paths  Act Paths  Suppressed  History  Damp  State  Pending
inet.0
  0          0          0          0          0       0     0       0
bgp.13vpn.0
  0          0          0          0          0       0     0       0
Peer          AS      InPkt    OutPkt    OutQ    Flaps  Last Up/Dwn  State|#Active/Received/Accepted/Damped...
10.0.10.2     65101  0        0         0       0      2:08 Idle
192.168.1.2   65512  4        3         0       1      23 Establ
inet.0: 0/0/0/0
bgp.13vpn.0: 0/0/0/0
```

1.3: show

```
10.10.42.37 - PuTTY
[edit]
lab@dani# show routing-instances cel-1
instance-type virtual-router;
interface ge-0/0/8.610;
interface lo0.1;
routing-options {
  static {
    route 172.10.0.0/24 reject;
    route 172.10.1.0/24 reject;
    route 172.10.2.0/24 reject;
    route 172.10.3.0/24 reject;
  }
  autonomous-system 65101;
}
```

Part 2: Configuring your PE router to peer with the Route Reflector

2.1: show

```
10.10.42.37 - PuTTY
[edit protocols bgp group my-int-group]
lab@dani# show
type internal;
local-address 192.168.1.1;
family inet {
  unicast;
}
family inet-vpn {
  unicast;
}
neighbor 192.168.5.2;
```

2.2: show bgp summary

```
10.10.42.37 - PuTTY
lab@dani> show bgp summary
Groups: 2 Peers: 2 Down peers: 1
Table          Tot Paths  Act Paths Suppressed    History Damp State   Pending
inet.0
  0          0          0          0          0          0          0
bgp.13vpn.0
  0          0          0          0          0          0          0
Peer          AS         InPkt   OutPkt   OutQ   Flaps Last Up/Dwn State|#Active/Received/Accepted/Damped...
10.0.10.2     65101      0       0       0       0       0       6:09 Idle
192.168.5.2   65512      3       3       0       0       0       2 Establ
  inet.0: 0/0/0/0
  bgp.13vpn.0: 0/0/0/0
```

10.10.42.37 - PuTTY

```
lab@dani> show bgp neighbor 192.168.5.2
Peer: 192.168.5.2+179 AS 65512 Local: 192.168.1.1+59484 AS 65512
  Group: my-int-group          Routing-Instance: master
  Forwarding routing-instance: master
  Type: Internal   State: Established   Flags: <Sync>
  Last State: OpenConfirm   Last Event: RecvKeepAlive
  Last Error: None
  Options: <Preference LocalAddress HoldTime AddressFamily Rib-group Refresh>
  Address families configured: inet-unicast inet-vpn-unicast
  Local Address: 192.168.1.1 Holdtime: 0 Preference: 170
  Number of flaps: 0
  Peer ID: 192.168.5.2      Local ID: 192.168.1.1      Active Holdtime: 90
  Keepalive Interval: 30    Group index: 0             Peer index: 0           SNMP index: 11
  I/O Session Thread: bgpio-0 State: Enabled
  BFD: disabled, down
  NLRI for restart configured on peer: inet-unicast inet-vpn-unicast
  NLRI advertised by peer: inet-unicast inet-vpn-unicast route-target
  NLRI for this session: inet-unicast inet-vpn-unicast
  Peer supports Refresh capability (2)
  Stale routes from peer are kept for: 300
  Peer does not support Restarter functionality
  Restart flag received from the peer: Notification
  NLRI that restart is negotiated for: inet-unicast inet-vpn-unicast
  NLRI of received end-of-rib markers: inet-unicast inet-vpn-unicast
  NLRI of all end-of-rib markers sent: inet-unicast inet-vpn-unicast
  Peer does not support LLGR Restarter functionality
  Peer supports 4 byte AS extension (peer-as 65512)
  Peer does not support Addpath
  Table inet.0 Bit: 20000
  RIB State: BGP restart is complete
  Send state: in sync
  Active prefixes:          0
  Received prefixes:       0
  Accepted prefixes:       0
```

Part 3: Establishing LDP signaled LSPs between PE routers and router reflector

3.2: show

10.10.42.37 - PuTTY

```
lab@dani> show ldp neighbor
Address          Interface      Label space ID  Hold time
172.22.210.2    ge-0/0/0.210  192.168.5.1:0  12
172.22.211.2    ge-0/0/1.211  192.168.5.4:0  11

lab@dani> show ldp session
Address          State      Connection  Hold time  Adv. Mode
192.168.5.1     Operational Open         28         DU
192.168.5.4     Operational Open         28         DU
```

3.3: show route table inet.3

10.10.42.37 - PuTTY

```
lab@dani> show route table inet.3

inet.3: 7 destinations, 7 routes (7 active, 0 holddown, 0 hidden)
+ = Active Route, - = Last Active, * = Both

192.168.1.2/32      *[LDP/9] 00:00:02, metric 1
                   to 172.22.210.2 via ge-0/0/0.210, Push 630512
                   > to 172.22.211.2 via ge-0/0/1.211, Push 576608
192.168.5.1/32     *[LDP/9] 00:01:55, metric 1
                   > to 172.22.210.2 via ge-0/0/0.210
192.168.5.2/32     *[LDP/9] 00:01:55, metric 1
                   > to 172.22.210.2 via ge-0/0/0.210, Push 630464
192.168.5.3/32     *[LDP/9] 00:01:55, metric 1
                   > to 172.22.210.2 via ge-0/0/0.210, Push 630480
192.168.5.4/32     *[LDP/9] 00:01:55, metric 1
                   > to 172.22.211.2 via ge-0/0/1.211
192.168.5.5/32     *[LDP/9] 00:01:55, metric 1
                   > to 172.22.211.2 via ge-0/0/1.211, Push 576512
192.168.5.6/32     *[LDP/9] 00:01:55, metric 1
                   > to 172.22.211.2 via ge-0/0/1.211, Push 576544
```

DO NOT

Part 4: Configuring another CE router using a virtual router

4.7: show route table ce1-3

10.10.42.37 - PuTTY

```
lab@dani> show route table cel-3.inet

cel-3.inet.0: 7 destinations, 7 routes (7 active, 0 holddown, 0 hidden)
+ = Active Route, - = Last Active, * = Both

10.1.10.0/24      *[Direct/0] 00:00:13
                  > via ge-0/0/9.611
10.1.10.2/32     *[Local/0] 00:00:13
                  Local via ge-0/0/9.611
172.11.0.0/24    *[Static/5] 00:00:13
                  Reject
172.11.1.0/24    *[Static/5] 00:00:13
                  Reject
172.11.2.0/24    *[Static/5] 00:00:13
                  Reject
172.11.3.0/24    *[Static/5] 00:00:13
                  Reject
192.168.21.1/32  *[Direct/0] 00:00:13
                  > via lo0.2

cel-3.inet6.0: 1 destinations, 1 routes (1 active, 0 holddown, 0 hidden)
+ = Active Route, - = Last Active, * = Both

ff02::2/128      *[INET6/0] 00:00:13
                  MultiRecv
```


Part 5: Configuring the PE to CE interfaces

5.2: ping

10.10.42.37 - PuTTY

```
lab@dani> ping 10.0.10.2 count 5
PING 10.0.10.2 (10.0.10.2): 56 data bytes
64 bytes from 10.0.10.2: icmp_seq=0 ttl=64 time=1.924 ms
64 bytes from 10.0.10.2: icmp_seq=1 ttl=64 time=47.170 ms
64 bytes from 10.0.10.2: icmp_seq=2 ttl=64 time=1.842 ms
64 bytes from 10.0.10.2: icmp_seq=3 ttl=64 time=20.750 ms
64 bytes from 10.0.10.2: icmp_seq=4 ttl=64 time=1.522 ms

--- 10.0.10.2 ping statistics ---
5 packets transmitted, 5 packets received, 0% packet loss
round-trip min/avg/max/stddev = 1.522/14.642/47.170/17.850 ms

lab@dani> ping 10.1.10.2 count 5
PING 10.1.10.2 (10.1.10.2): 56 data bytes
64 bytes from 10.1.10.2: icmp_seq=0 ttl=64 time=10.904 ms
64 bytes from 10.1.10.2: icmp_seq=1 ttl=64 time=7.541 ms
64 bytes from 10.1.10.2: icmp_seq=2 ttl=64 time=67.065 ms
64 bytes from 10.1.10.2: icmp_seq=3 ttl=64 time=7.159 ms
64 bytes from 10.1.10.2: icmp_seq=4 ttl=64 time=257.578 ms

--- 10.1.10.2 ping statistics ---
5 packets transmitted, 5 packets received, 0% packet loss
round-trip min/avg/max/stddev = 7.159/70.049/257.578/96.474 ms
```

Part 6: Configuring two layer 3 VPN instances

6.1: show

10.10.42.37 - PuTTY

```
[edit routing-instances vpn1-a]
lab@dani# show
instance-type vrf;
interface ge-0/0/4.610;
vrf-target target:65512:101;
```

6.2: show

10.10.42.37 - PuTTY

```
[edit routing-instances vpn1-b]
lab@dani# show
instance-type vrf;
interface ge-0/0/5.611;
vrf-target target:65512:102;
```

6.3: show routes

10.10.42.37 - PuTTY

```
lab@dani> show route table vpn1-a

vpn1-a.inet.0: 2 destinations, 2 routes (2 active, 0 holddown, 0 hidden)
+ = Active Route, - = Last Active, * = Both

10.0.10.0/24      *[Direct/0] 00:03:17
                  > via ge-0/0/4.610
10.0.10.1/32     *[Local/0] 00:03:17
                  Local via ge-0/0/4.610

vpn1-a.inet6.0: 1 destinations, 1 routes (1 active, 0 holddown, 0 hidden)
+ = Active Route, - = Last Active, * = Both

ff02::2/128     *[INET6/0] 00:03:17
                  MultiRecv

lab@dani> show route table vpn1-b

vpn1-b.inet.0: 2 destinations, 2 routes (2 active, 0 holddown, 0 hidden)
+ = Active Route, - = Last Active, * = Both

10.1.10.0/24     *[Direct/0] 00:00:54
                  > via ge-0/0/5.611
10.1.10.1/32     *[Local/0] 00:00:54
                  Local via ge-0/0/5.611

vpn1-b.inet6.0: 1 destinations, 1 routes (1 active, 0 holddown, 0 hidden)
+ = Active Route, - = Last Active, * = Both

ff02::2/128     *[INET6/0] 00:00:54
                  MultiRecv
```

Part 7: Configuring bgp routing between the PE and CE Routers

7.1: show

10.10.42.37 - PuTTY

```
[edit routing-instances vpn1-a protocols bgp]
lab@dani# show
group my-ext-group-a {
  type external;
  peer-as 65101;
  as-override;
  neighbor 10.0.10.2;
}
```

7.2: show

10.10.42.37 - PuTTY

```
[edit routing-instances cel-1 protocols bgp]
lab@dani# show
group my-ext-group {
  type external;
  export exp-policy;
  peer-as 65512;
  neighbor 10.0.10.1;
}
```

7.3: show routes

10.10.42.37 - PuTTY

```
lab@dani> show route receive-protocol bgp 10.0.10.2

inet.0: 26 destinations, 26 routes (26 active, 0 holddown, 0 hidden)

inet.3: 7 destinations, 7 routes (7 active, 0 holddown, 0 hidden)

cel-3.inet.0: 7 destinations, 7 routes (7 active, 0 holddown, 0 hidden)

vpn1-a.inet.0: 13 destinations, 14 routes (13 active, 0 holddown, 0 hidden)
  Prefix          Nexthop          MED      Lclpref    AS path
  10.0.10.0/24    10.0.10.2        0         0          65101 I
  * 172.10.0.0/24 10.0.10.2        0         0          65101 I
  * 172.10.1.0/24 10.0.10.2        0         0          65101 I
  * 172.10.2.0/24 10.0.10.2        0         0          65101 I
  * 172.10.3.0/24 10.0.10.2        0         0          65101 I
  * 192.168.11.1/32 10.0.10.2        0         0          65101 I

vpn1-b.inet.0: 2 destinations, 2 routes (2 active, 0 holddown, 0 hidden)

cel-1.inet.0: 13 destinations, 13 routes (13 active, 0 holddown, 0 hidden)

mpls.0: 16 destinations, 16 routes (16 active, 0 holddown, 0 hidden)

bgp.13vpn.0: 6 destinations, 6 routes (6 active, 0 holddown, 0 hidden)

inet6.0: 1 destinations, 1 routes (1 active, 0 holddown, 0 hidden)

cel-3.inet6.0: 1 destinations, 1 routes (1 active, 0 holddown, 0 hidden)

vpn1-a.inet6.0: 1 destinations, 1 routes (1 active, 0 holddown, 0 hidden)

vpn1-b.inet6.0: 1 destinations, 1 routes (1 active, 0 holddown, 0 hidden)

cel-1.inet6.0: 1 destinations, 1 routes (1 active, 0 holddown, 0 hidden)
```

10.10.42.37 - PuTTY

```
lab@dani> show route advertising-protocol bgp 192.168.5.2

vpn1-a.inet.0: 13 destinations, 14 routes (13 active, 0 holddown, 0 hidden)
  Prefix          Nexthop          MED      Lclpref    AS path
  * 10.0.10.0/24  Self             100      100        I
  * 172.10.0.0/24  Self             100      100        65101 I
  * 172.10.1.0/24  Self             100      100        65101 I
  * 172.10.2.0/24  Self             100      100        65101 I
  * 172.10.3.0/24  Self             100      100        65101 I
  * 192.168.11.1/32 Self             100      100        65101 I

vpn1-b.inet.0: 2 destinations, 2 routes (2 active, 0 holddown, 0 hidden)
  Prefix          Nexthop          MED      Lclpref    AS path
  * 10.1.10.0/24  Not advertised   100      100        I
```

10.10.42.37 - PuTTY

```
lab@dani> show route receive-protocol bgp 192.168.5.2

inet.0: 26 destinations, 26 routes (26 active, 0 holddown, 0 hidden)

inet.3: 7 destinations, 7 routes (7 active, 0 holddown, 0 hidden)

cel-3.inet.0: 7 destinations, 7 routes (7 active, 0 holddown, 0 hidden)

vpn1-a.inet.0: 13 destinations, 14 routes (13 active, 0 holddown, 0 hidden)
  Prefix                Nexthop          MED      Lclpref   AS path
* 10.0.11.0/24          192.168.1.2      100      100       I
* 172.10.4.0/24         192.168.1.2      100      100       65101 I
* 172.10.5.0/24         192.168.1.2      100      100       65101 I
* 172.10.6.0/24         192.168.1.2      100      100       65101 I
* 172.10.7.0/24         192.168.1.2      100      100       65101 I
* 192.168.11.2/32       192.168.1.2      100      100       65101 I

vpn1-b.inet.0: 2 destinations, 2 routes (2 active, 0 holddown, 0 hidden)

cel-1.inet.0: 13 destinations, 13 routes (13 active, 0 holddown, 0 hidden)

mpls.0: 16 destinations, 16 routes (16 active, 0 holddown, 0 hidden)

bgp.13vpn.0: 6 destinations, 6 routes (6 active, 0 holddown, 0 hidden)
  Prefix                Nexthop          MED      Lclpref   AS path
192.168.1.2:24:10.0.11.0/24
*                          192.168.1.2      100      100       I
192.168.1.2:24:172.10.4.0/24
*                          192.168.1.2      100      100       65101 I
192.168.1.2:24:172.10.5.0/24
*                          192.168.1.2      100      100       65101 I
192.168.1.2:24:172.10.6.0/24
*                          192.168.1.2      100      100       65101 I
192.168.1.2:24:172.10.7.0/24
*                          192.168.1.2      100      100       65101 I
192.168.1.2:24:192.168.11.2/32
*                          192.168.1.2      100      100       65101 I

inet6.0: 1 destinations, 1 routes (1 active, 0 holddown, 0 hidden)

cel-3.inet6.0: 1 destinations, 1 routes (1 active, 0 holddown, 0 hidden)

vpn1-a.inet6.0: 1 destinations, 1 routes (1 active, 0 holddown, 0 hidden)

vpn1-b.inet6.0: 1 destinations, 1 routes (1 active, 0 holddown, 0 hidden)

cel-1.inet6.0: 1 destinations, 1 routes (1 active, 0 holddown, 0 hidden)
```

```
lab@dani> show route receive-protocol bgp 192.168.5.2

inet.0: 26 destinations, 26 routes (26 active, 0 holddown, 0 hidden)

inet.3: 5 destinations, 5 routes (5 active, 0 holddown, 0 hidden)

cel-3.inet.0: 7 destinations, 7 routes (7 active, 0 holddown, 0 hidden)

vpn1-a.inet.0: 13 destinations, 14 routes (13 active, 0 holddown, 0 hidden)
  Prefix                Nexthop          MED    Lclpref  AS path
* 10.0.11.0/24          192.168.1.2      100    100      I
* 172.10.4.0/24        192.168.1.2      100    100      65101 I
* 172.10.5.0/24        192.168.1.2      100    100      65101 I
* 172.10.6.0/24        192.168.1.2      100    100      65101 I
* 172.10.7.0/24        192.168.1.2      100    100      65101 I
* 192.168.11.2/32      192.168.1.2      100    100      65101 I

vpn1-b.inet.0: 2 destinations, 2 routes (2 active, 0 holddown, 0 hidden)

cel-1.inet.0: 13 destinations, 13 routes (13 active, 0 holddown, 0 hidden)

mpls.0: 14 destinations, 14 routes (14 active, 0 holddown, 0 hidden)

bgp.13vpn.0: 6 destinations, 6 routes (6 active, 0 holddown, 0 hidden)
  Prefix                Nexthop          MED    Lclpref  AS path
192.168.1.2:24:10.0.11.0/24
*                      192.168.1.2      100    100      I
192.168.1.2:24:172.10.4.0/24
*                      192.168.1.2      100    100      65101 I
192.168.1.2:24:172.10.5.0/24
*                      192.168.1.2      100    100      65101 I
192.168.1.2:24:172.10.6.0/24
*                      192.168.1.2      100    100      65101 I
192.168.1.2:24:172.10.7.0/24
*                      192.168.1.2      100    100      65101 I
192.168.1.2:24:192.168.11.2/32
*                      192.168.1.2      100    100      65101 I

inet6.0: 1 destinations, 1 routes (1 active, 0 holddown, 0 hidden)

cel-3.inet6.0: 1 destinations, 1 routes (1 active, 0 holddown, 0 hidden)

vpn1-a.inet6.0: 1 destinations, 1 routes (1 active, 0 holddown, 0 hidden)

vpn1-b.inet6.0: 1 destinations, 1 routes (1 active, 0 holddown, 0 hidden)

cel-1.inet6.0: 1 destinations, 1 routes (1 active, 0 holddown, 0 hidden)
```

10.10.42.37 - PuTTY

```
lab@dani> show route receive-protocol bgp 10.0.10.1

inet.0: 26 destinations, 26 routes (26 active, 0 holddown, 0 hidden)
inet.3: 5 destinations, 5 routes (5 active, 0 holddown, 0 hidden)
cel-3.inet.0: 7 destinations, 7 routes (7 active, 0 holddown, 0 hidden)
vpn1-a.inet.0: 13 destinations, 14 routes (13 active, 0 holddown, 0 hidden)
vpn1-b.inet.0: 2 destinations, 2 routes (2 active, 0 holddown, 0 hidden)

cel-1.inet.0: 13 destinations, 13 routes (13 active, 0 holddown, 0 hidden)
  Prefix          Nexthop          MED      Lclpref    AS path
* 10.0.11.0/24    10.0.10.1                65512 I
* 172.10.4.0/24   10.0.10.1                65512 65512 I
* 172.10.5.0/24   10.0.10.1                65512 65512 I
* 172.10.6.0/24   10.0.10.1                65512 65512 I
* 172.10.7.0/24   10.0.10.1                65512 65512 I
* 192.168.11.2/32 10.0.10.1                65512 65512 I

mpls.0: 14 destinations, 14 routes (14 active, 0 holddown, 0 hidden)
bgp.13vpn.0: 6 destinations, 6 routes (6 active, 0 holddown, 0 hidden)
inet6.0: 1 destinations, 1 routes (1 active, 0 holddown, 0 hidden)
cel-3.inet6.0: 1 destinations, 1 routes (1 active, 0 holddown, 0 hidden)
vpn1-a.inet6.0: 1 destinations, 1 routes (1 active, 0 holddown, 0 hidden)
vpn1-b.inet6.0: 1 destinations, 1 routes (1 active, 0 holddown, 0 hidden)
cel-1.inet6.0: 1 destinations, 1 routes (1 active, 0 holddown, 0 hidden)
```

10.10.42.37 - PuTTY

```
cel-3
lab@dani> ping 192.168.11.2 source 192.168.11.1 routing-instance cel-1 count 5
PING 192.168.11.2 (192.168.11.2): 56 data bytes
64 bytes from 192.168.11.2: icmp_seq=0 ttl=59 time=18.437 ms
64 bytes from 192.168.11.2: icmp_seq=1 ttl=59 time=239.250 ms
64 bytes from 192.168.11.2: icmp_seq=2 ttl=59 time=23.552 ms
64 bytes from 192.168.11.2: icmp_seq=3 ttl=59 time=289.876 ms
64 bytes from 192.168.11.2: icmp_seq=4 ttl=59 time=94.737 ms

--- 192.168.11.2 ping statistics ---
5 packets transmitted, 5 packets received, 0% packet loss
round-trip min/avg/max/stddev = 18.437/133.170/289.876/111.774 ms
lab@dani>
```

7.4: show

10.10.42.37 - PuTTY

```
[edit routing-instances vpn1-b protocols bgp]
lab@dani# show
group my-ext-group-b {
    type external;
    peer-as 65102;
    as-override;
    neighbor 10.1.10.2;
}
```

7.5: show

10.10.42.37 - PuTTY

```
[edit routing-instances cel-3 protocols bgp]
lab@dani# show
group my-ext-group {
    type external;
    export exp-policy;
    peer-as 65512;
    neighbor 10.1.10.1;
}
```


7.6: shows

10.10.42.37 - PuTTY

```
lab@dani> show route advertising-protocol bgp 10.1.10.1

cel-3.inet.0: 13 destinations, 13 routes (13 active, 0 holddown, 0 hidden)
  Prefix                Nexthop          MED    Lclpref   AS path
* 10.1.10.0/24          Self             0      0         I
* 172.11.0.0/24         Self             0      0         I
* 172.11.1.0/24         Self             0      0         I
* 172.11.2.0/24         Self             0      0         I
* 172.11.3.0/24         Self             0      0         I
* 192.168.21.1/32      Self             0      0         I

lab@dani> show route receive-protocol bgp 10.1.10.1

inet.0: 26 destinations, 26 routes (26 active, 0 holddown, 0 hidden)

inet.3: 5 destinations, 5 routes (5 active, 0 holddown, 0 hidden)

cel-3.inet.0: 13 destinations, 13 routes (13 active, 0 holddown, 0 hidden)
  Prefix                Nexthop          MED    Lclpref   AS path
* 10.1.11.0/24          10.1.10.1       0      0         65512 I
* 172.11.4.0/24         10.1.10.1       0      0         65512 65512 I
* 172.11.5.0/24         10.1.10.1       0      0         65512 65512 I
* 172.11.6.0/24         10.1.10.1       0      0         65512 65512 I
* 172.11.7.0/24         10.1.10.1       0      0         65512 65512 I
* 192.168.21.2/32      10.1.10.1       0      0         65512 65512 I

vpn1-a.inet.0: 13 destinations, 14 routes (13 active, 0 holddown, 0 hidden)
vpn1-b.inet.0: 13 destinations, 14 routes (13 active, 0 holddown, 0 hidden)
cel-1.inet.0: 13 destinations, 13 routes (13 active, 0 holddown, 0 hidden)
mpls.0: 15 destinations, 15 routes (15 active, 0 holddown, 0 hidden)
bgp.13vpn.0: 12 destinations, 12 routes (12 active, 0 holddown, 0 hidden)
inet6.0: 1 destinations, 1 routes (1 active, 0 holddown, 0 hidden)
cel-3.inet6.0: 1 destinations, 1 routes (1 active, 0 holddown, 0 hidden)
vpn1-a.inet6.0: 1 destinations, 1 routes (1 active, 0 holddown, 0 hidden)
vpn1-b.inet6.0: 1 destinations, 1 routes (1 active, 0 holddown, 0 hidden)
cel-1.inet6.0: 1 destinations, 1 routes (1 active, 0 holddown, 0 hidden)
```

10.10.42.37 - PuTTY

```
lab@dani> ping 192.168.21.2 source 192.168.21.1 routing-instance cel-3 count 5
PING 192.168.21.2 (192.168.21.2): 56 data bytes
64 bytes from 192.168.21.2: icmp_seq=0 ttl=59 time=21.059 ms
64 bytes from 192.168.21.2: icmp_seq=1 ttl=59 time=47.851 ms
64 bytes from 192.168.21.2: icmp_seq=2 ttl=59 time=183.332 ms
64 bytes from 192.168.21.2: icmp_seq=3 ttl=59 time=292.302 ms
64 bytes from 192.168.21.2: icmp_seq=4 ttl=59 time=147.609 ms

--- 192.168.21.2 ping statistics ---
5 packets transmitted, 5 packets received, 0% packet loss
round-trip min/avg/max/stddev = 21.059/138.431/292.302/97.732 ms
```

Part 8: Implementing route target filtering

8.2: show route table bgp.13vpn.0

10.10.42.37 - PuTTY

```
lab@dani> show route table bgp.13vpn.0

bgp.13vpn.0: 6 destinations, 6 routes (6 active, 0 holddown, 0 hidden)
+ = Active Route, - = Last Active, * = Both

192.168.1.2:24:10.0.11.0/24
    *[BGP/170] 00:13:46, localpref 100, from 192.168.5.2
    AS path: I, validation-state: unverified
    > to 172.22.210.2 via ge-0/0/0.210, Push 322240, Push 477392 (top)
    > to 172.22.211.2 via ge-0/0/1.211, Push 322240, Push 448032 (top)
192.168.1.2:24:172.10.4.0/24
    *[BGP/170] 00:13:45, localpref 100, from 192.168.5.2
    AS path: 65101 I, validation-state: unverified
    > to 172.22.210.2 via ge-0/0/0.210, Push 322240, Push 477392 (top)
    > to 172.22.211.2 via ge-0/0/1.211, Push 322240, Push 448032 (top)
192.168.1.2:24:172.10.5.0/24
    *[BGP/170] 00:13:45, localpref 100, from 192.168.5.2
    AS path: 65101 I, validation-state: unverified
    > to 172.22.210.2 via ge-0/0/0.210, Push 322240, Push 477392 (top)
    > to 172.22.211.2 via ge-0/0/1.211, Push 322240, Push 448032 (top)
192.168.1.2:24:172.10.6.0/24
    *[BGP/170] 00:13:45, localpref 100, from 192.168.5.2
    AS path: 65101 I, validation-state: unverified
    > to 172.22.210.2 via ge-0/0/0.210, Push 322240, Push 477392 (top)
    > to 172.22.211.2 via ge-0/0/1.211, Push 322240, Push 448032 (top)
192.168.1.2:24:172.10.7.0/24
    *[BGP/170] 00:13:45, localpref 100, from 192.168.5.2
    AS path: 65101 I, validation-state: unverified
    > to 172.22.210.2 via ge-0/0/0.210, Push 322240, Push 477392 (top)
    > to 172.22.211.2 via ge-0/0/1.211, Push 322240, Push 448032 (top)
192.168.1.2:24:192.168.11.2/32
    *[BGP/170] 00:13:45, localpref 100, from 192.168.5.2
    AS path: 65101 I, validation-state: unverified
    > to 172.22.210.2 via ge-0/0/0.210, Push 322240, Push 477392 (top)
    > to 172.22.211.2 via ge-0/0/1.211, Push 322240, Push 448032 (top)
```

8.4: show route table bgp.13vpn.0

10.10.42.37 - PuTTY

```
lab@dani> show route table bgp.13vpn.0

bgp.13vpn.0: 12 destinations, 12 routes (12 active, 0 holddown, 0 hidden)
+ = Active Route, - = Last Active, * = Both

192.168.1.2:24:10.0.11.0/24
    *[BGP/170] 00:15:37, localpref 100, from 192.168.5.2
    AS path: I, validation-state: unverified
    > to 172.22.210.2 via ge-0/0/0.210, Push 322240, Push 477392(top)
    to 172.22.211.2 via ge-0/0/1.211, Push 322240, Push 448032(top)
192.168.1.2:24:172.10.4.0/24
    *[BGP/170] 00:15:36, localpref 100, from 192.168.5.2
    AS path: 65101 I, validation-state: unverified
    > to 172.22.210.2 via ge-0/0/0.210, Push 322240, Push 477392(top)
    to 172.22.211.2 via ge-0/0/1.211, Push 322240, Push 448032(top)
192.168.1.2:24:172.10.5.0/24
    *[BGP/170] 00:15:36, localpref 100, from 192.168.5.2
    AS path: 65101 I, validation-state: unverified
    > to 172.22.210.2 via ge-0/0/0.210, Push 322240, Push 477392(top)
    to 172.22.211.2 via ge-0/0/1.211, Push 322240, Push 448032(top)
192.168.1.2:24:172.10.6.0/24
    *[BGP/170] 00:15:36, localpref 100, from 192.168.5.2
    AS path: 65101 I, validation-state: unverified
    > to 172.22.210.2 via ge-0/0/0.210, Push 322240, Push 477392(top)
    to 172.22.211.2 via ge-0/0/1.211, Push 322240, Push 448032(top)
192.168.1.2:24:172.10.7.0/24
    *[BGP/170] 00:15:36, localpref 100, from 192.168.5.2
    AS path: 65101 I, validation-state: unverified
    > to 172.22.210.2 via ge-0/0/0.210, Push 322240, Push 477392(top)
    to 172.22.211.2 via ge-0/0/1.211, Push 322240, Push 448032(top)
192.168.1.2:24:192.168.11.2/32
    *[BGP/170] 00:15:36, localpref 100, from 192.168.5.2
    AS path: 65101 I, validation-state: unverified
    > to 172.22.210.2 via ge-0/0/0.210, Push 322240, Push 477392(top)
    to 172.22.211.2 via ge-0/0/1.211, Push 322240, Push 448032(top)
192.168.1.2:25:10.1.11.0/24
    *[BGP/170] 00:00:10, localpref 100, from 192.168.5.2
    AS path: I, validation-state: unverified
    > to 172.22.210.2 via ge-0/0/0.210, Push 322256, Push 477392(top)
    to 172.22.211.2 via ge-0/0/1.211, Push 322256, Push 448032(top)
192.168.1.2:25:172.11.4.0/24
    *[BGP/170] 00:00:10, localpref 100, from 192.168.5.2
    AS path: 65102 I, validation-state: unverified
    > to 172.22.210.2 via ge-0/0/0.210, Push 322256, Push 477392(top)
    to 172.22.211.2 via ge-0/0/1.211, Push 322256, Push 448032(top)
192.168.1.2:25:172.11.5.0/24
    *[BGP/170] 00:00:10, localpref 100, from 192.168.5.2
    AS path: 65102 I, validation-state: unverified
    > to 172.22.210.2 via ge-0/0/0.210, Push 322256, Push 477392(top)
    to 172.22.211.2 via ge-0/0/1.211, Push 322256, Push 448032(top)
```

```

192.168.1.2:25:172.11.6.0/24
  * [BGP/170] 00:00:10, localpref 100, from 192.168.5.2
    AS path: 65102 I, validation-state: unverified
    > to 172.22.210.2 via ge-0/0/0.210, Push 322256, Push 477392 (top)
    to 172.22.211.2 via ge-0/0/1.211, Push 322256, Push 448032 (top)
192.168.1.2:25:172.11.7.0/24
  * [BGP/170] 00:00:10, localpref 100, from 192.168.5.2
    AS path: 65102 I, validation-state: unverified
    > to 172.22.210.2 via ge-0/0/0.210, Push 322256, Push 477392 (top)
    to 172.22.211.2 via ge-0/0/1.211, Push 322256, Push 448032 (top)
192.168.1.2:25:192.168.21.2/32
  * [BGP/170] 00:00:10, localpref 100, from 192.168.5.2
    AS path: 65102 I, validation-state: unverified
    to 172.22.210.2 via ge-0/0/0.210, Push 322256, Push 477392 (top)
    > to 172.22.211.2 via ge-0/0/1.211, Push 322256, Push 448032 (top)

```

8.6: show route table bgp.13vpn.0

10.10.42.37 - PuTTY

```

lab@dani> show route table bgp.13vpn.0

bgp.13vpn.0: 6 destinations, 6 routes (6 active, 0 holddown, 0 hidden)
+ = Active Route, - = Last Active, * = Both

192.168.1.2:24:10.0.11.0/24
  * [BGP/170] 00:00:13, localpref 100, from 192.168.5.2
    AS path: I, validation-state: unverified
    > to 172.22.210.2 via ge-0/0/0.210, Push 322320, Push 477488 (top)
    to 172.22.211.2 via ge-0/0/1.211, Push 322320, Push 448112 (top)
192.168.1.2:24:172.10.4.0/24
  * [BGP/170] 00:00:13, localpref 100, from 192.168.5.2
    AS path: 65101 I, validation-state: unverified
    > to 172.22.210.2 via ge-0/0/0.210, Push 322320, Push 477488 (top)
    to 172.22.211.2 via ge-0/0/1.211, Push 322320, Push 448112 (top)
192.168.1.2:24:172.10.5.0/24
  * [BGP/170] 00:00:13, localpref 100, from 192.168.5.2
    AS path: 65101 I, validation-state: unverified
    > to 172.22.210.2 via ge-0/0/0.210, Push 322320, Push 477488 (top)
    to 172.22.211.2 via ge-0/0/1.211, Push 322320, Push 448112 (top)
192.168.1.2:24:172.10.6.0/24
  * [BGP/170] 00:00:13, localpref 100, from 192.168.5.2
    AS path: 65101 I, validation-state: unverified
    > to 172.22.210.2 via ge-0/0/0.210, Push 322320, Push 477488 (top)
    to 172.22.211.2 via ge-0/0/1.211, Push 322320, Push 448112 (top)
192.168.1.2:24:172.10.7.0/24
  * [BGP/170] 00:00:13, localpref 100, from 192.168.5.2
    AS path: 65101 I, validation-state: unverified
    > to 172.22.210.2 via ge-0/0/0.210, Push 322320, Push 477488 (top)
    to 172.22.211.2 via ge-0/0/1.211, Push 322320, Push 448112 (top)
192.168.1.2:24:192.168.11.2/32
  * [BGP/170] 00:00:13, localpref 100, from 192.168.5.2
    AS path: 65101 I, validation-state: unverified
    > to 172.22.210.2 via ge-0/0/0.210, Push 322320, Push 477488 (top)
    to 172.22.211.2 via ge-0/0/1.211, Push 322320, Push 448112 (top)

```

Part 9: Configuring internet access using a non-vrf interface

```
10.10.42.37 - PuTTY
lab@dani> ping 192.168.5.6 source 192.168.11.1 routing-instance cel-1 count 5
PING 192.168.5.6 (192.168.5.6): 56 data bytes
64 bytes from 192.168.5.6: icmp_seq=0 ttl=61 time=38.165 ms
64 bytes from 192.168.5.6: icmp_seq=1 ttl=61 time=15.090 ms
64 bytes from 192.168.5.6: icmp_seq=2 ttl=61 time=2.923 ms
64 bytes from 192.168.5.6: icmp_seq=3 ttl=61 time=9.934 ms
64 bytes from 192.168.5.6: icmp_seq=4 ttl=61 time=29.152 ms

--- 192.168.5.6 ping statistics ---
5 packets transmitted, 5 packets received, 0% packet loss
round-trip min/avg/max/stddev = 2.923/19.053/38.165/12.855 ms
```

Lab 12: Virtual Private LAN Service

Part 1: Loading and verifying the VPN baseline configuration

1.2: Shows

```
lab@dani> show ospf neighbor
Address      Interface      State  ID          Pri  Dead
172.22.210.2 ge-0/0/0.210   Full  192.168.5.1 128  38
172.22.211.2 ge-0/0/1.211   Full  192.168.5.4 128  35

lab@dani> show bgp summary
Groups: 2 Peers: 2 Down peers: 1
Table
inet.0
      0      0      0      0      0      0      0
bgp.13vpn.0
      0      0      0      0      0      0      0
Peer      AS      InPkt  OutPkt  OutQ  Flaps  Last Up/Dwn  State|#Active/Received/Accepted/Damped...
10.0.10.2 65101  0      0      0      0      5:29 Idle
192.168.1.2 65512  6      6      0      0      1:48 Establ
inet.0: 0/0/0/0
bgp.13vpn.0: 0/0/0/0
```


1.3: show routing-instances ce1-1

```
lab@dani> configure
Entering configuration mode

[edit]
lab@dani# show routing-instances ce1-1
instance-type virtual-router;
interface ge-0/0/8.610;
interface lo0.1;
routing-options {
  static {
    route 172.10.0.0/24 reject;
    route 172.10.1.0/24 reject;
    route 172.10.2.0/24 reject;
    route 172.10.3.0/24 reject;
  }
  autonomous-system 65101;
}
```

Part 2: Adjusting the properties of the virtual router

2.2: show

 10.10.42.37 - PuTTY

```
lab@dani# show
c-router-1-1 {
  instance-type virtual-router;
  interface ge-0/0/8.610;
  interface lo0.1;
  routing-options {
    static {
      route 172.10.0.0/24 reject;
      route 172.10.1.0/24 reject;
      route 172.10.2.0/24 reject;
      route 172.10.3.0/24 reject;
    }
    autonomous-system 65101;
  }
}
```

Part 3: Configuring a virtual switch instance

3.4: show bridge domain

```
10.10.42.37 - PuTTY
lab@dani> show bridge domain
```

Routing instance	Bridge domain	VLAN ID	Interfaces
ce-vsl-1	vlan_610	610	ge-0/0/14.610 ge-0/0/15.610 ge-0/0/4.610

Part 4: Enabling LDP signaling in the core

4.2: show ldp neighbor

```
10.10.42.37 - PuTTY
lab@dani> show ldp neighbor
```

Address	Interface	Label space ID	Hold time
172.22.210.2	ge-0/0/0.210	192.168.5.1:0	13
172.22.211.2	ge-0/0/1.211	192.168.5.4:0	10

4.3: show ldp database

```
10.10.42.37 - PuTTY

lab@dani> show ldp database
Input label database, 192.168.1.1:0--192.168.5.1:0
Labels received: 8
  Label      Prefix
  476720     192.168.1.1/32
  476736     192.168.1.2/32
  3          192.168.5.1/32
  476656     192.168.5.2/32
  476704     192.168.5.3/32
  476688     192.168.5.4/32
  476560     192.168.5.5/32
  476640     192.168.5.6/32

Output label database, 192.168.1.1:0--192.168.5.1:0
Labels advertised: 8
  Label      Prefix
  3          192.168.1.1/32
  338224     192.168.1.2/32
  338128     192.168.5.1/32
  338144     192.168.5.2/32
  338160     192.168.5.3/32
  338176     192.168.5.4/32
  338192     192.168.5.5/32
  338208     192.168.5.6/32

Input label database, 192.168.1.1:0--192.168.5.4:0
Labels received: 8
  Label      Prefix
  447312     192.168.1.1/32
  447328     192.168.1.2/32
  447264     192.168.5.1/32
  447200     192.168.5.2/32
  447216     192.168.5.3/32
  3          192.168.5.4/32
  447152     192.168.5.5/32
  447296     192.168.5.6/32

Output label database, 192.168.1.1:0--192.168.5.4:0
Labels advertised: 8
  Label      Prefix
  3          192.168.1.1/32
  338224     192.168.1.2/32
  338128     192.168.5.1/32
  338144     192.168.5.2/32
  338160     192.168.5.3/32
  338176     192.168.5.4/32
  338192     192.168.5.5/32
  338208     192.168.5.6/32
```


Part 5: Configuring an LDP VPLS instance

5.5: show vpls connections

```
10.10.42.37 - PuTTY
lab@dani> show vpls connections
Layer-2 VPN connections:

Legend for connection status (St)
EI -- encapsulation invalid          NC -- interface encapsulation not CCC/TCC/VPLS
EM -- encapsulation mismatch         WE -- interface and instance encaps not same
VC-Dn -- Virtual circuit down       NP -- interface hardware not present
CM -- control-word mismatch         -> -- only outbound connection is up
CN -- circuit not provisioned       <- -- only inbound connection is up
OR -- out of range                  Up -- operational
OL -- no outgoing label             Dn -- down
LD -- local site signaled down      CF -- call admission control failure
RD -- remote site signaled down     SC -- local and remote site ID collision
LN -- local site not designated     LM -- local site ID not minimum designated
RN -- remote site not designated    RM -- remote site ID not minimum designated
XX -- unknown connection status    IL -- no incoming label
MM -- MTU mismatch                 MI -- Mesh-Group ID not available
BK -- Backup connection             ST -- Standby connection
PF -- Profile parse failure         PB -- Profile busy
RS -- remote site standby           SN -- Static Neighbor
LB -- Local site not best-site      RB -- Remote site not best-site
VM -- VLAN ID mismatch              HS -- Hot-standby Connection

Legend for interface status
Up -- operational
Dn -- down

Instance: vpn-1
VPLS-id: 100
Neighbor                Type  St    Time last up    # Up trans
192.168.1.2 (vpls-id 100) rmt  NP
```

5.7: show vpls connections extensive

```
10.10.42.37 - PuTTY
Exiting configuration mode

lab@dani> show vpls connections extensive
Layer-2 VPN connections:

Legend for connection status (St)
EI -- encapsulation invalid      NC -- interface encapsulation not CCC/TCC/VPLS
EM -- encapsulation mismatch     WE -- interface and instance encaps not same
VC-Dn -- Virtual circuit down   NP -- interface hardware not present
CM -- control-word mismatch     -> -- only outbound connection is up
CN -- circuit not provisioned   <- -- only inbound connection is up
OR -- out of range              Up -- operational
OL -- no outgoing label         Dn -- down
LD -- local site signaled down  CF -- call admission control failure
RD -- remote site signaled down SC -- local and remote site ID collision
LN -- local site not designated LM -- local site ID not minimum designated
RN -- remote site not designated RM -- remote site ID not minimum designated
XX -- unknown connection status IL -- no incoming label
MM -- MTU mismatch              MI -- Mesh-Group ID not available
BK -- Backup connection         ST -- Standby connection
PF -- Profile parse failure     PB -- Profile busy
RS -- remote site standby       SN -- Static Neighbor
LB -- Local site not best-site  RB -- Remote site not best-site
VM -- VLAN ID mismatch         HS -- Hot-standby Connection

Legend for interface status
Up -- operational
Dn -- down

Instance: vpn-1
VPLS-id: 100
Number of local interfaces: 1
Number of local interfaces up: 1
ge-0/0/10.610
vt-0/0/10.1048576          Intf - vpls vpn-1 neighbor 192.168.1.2 vpls-id 100
Neighbor                  Type  St   Time last up      # Up trans
192.168.1.2(vpls-id 100)  rmt   Up   Jul 29 01:10:26 2021    1
Remote PE: 192.168.1.2, Negotiated control-word: No
Incoming label: 800000, Outgoing label: 800000
Negotiated PW status TLV: No
Local interface: vt-0/0/10.1048576, Status: Up, Encapsulation: ETHERNET
Description: Intf - vpls vpn-1 neighbor 192.168.1.2 vpls-id 100
Flow Label Transmit: No, Flow Label Receive: No
Connection History:
Jul 29 01:10:26 2021  status update timer
Jul 29 01:10:26 2021  PE route changed
Jul 29 01:10:26 2021  Out lbl Update                800000
Jul 29 01:10:26 2021  In lbl Update                  800000
Jul 29 01:10:26 2021  loc intf up                    vt-0/0/10.1048576
```

5.8: Ping

```
10.10.42.37 - PuTTY
lab@dani> ping 10.0.10.2 routing-instance c-router-1-1 count 5
PING 10.0.10.2 (10.0.10.2): 56 data bytes
64 bytes from 10.0.10.2: icmp_seq=0 ttl=64 time=677.670 ms
64 bytes from 10.0.10.2: icmp_seq=1 ttl=64 time=61.366 ms
64 bytes from 10.0.10.2: icmp_seq=2 ttl=64 time=255.542 ms
64 bytes from 10.0.10.2: icmp_seq=3 ttl=64 time=11.112 ms
64 bytes from 10.0.10.2: icmp_seq=4 ttl=64 time=8.026 ms

--- 10.0.10.2 ping statistics ---
5 packets transmitted, 5 packets received, 0% packet loss
round-trip min/avg/max/stddev = 8.026/202.743/677.670/254.153 ms
```

5.9: show vpls statistics

```
10.10.42.37 - PuTTY
lab@dani> show vpls statistics
VPLS statistics:

Instance: vpn-1
  Local interface: ge-0/0/10.610, Index: 350
    Broadcast packets:          1
    Broadcast bytes   :         60
    Multicast packets:          0
    Multicast bytes   :          0
    Flooded packets  :          0
    Flooded bytes    :          0
    Unicast packets  :          10
    Unicast bytes    :         1020
    Current MAC count:          1 (Limit 1024)
  Local interface: vt-0/0/10.1048576, Index: 352
  Remote PE: 192.168.1.2
    Broadcast packets:          0
    Broadcast bytes   :          0
    Multicast packets:          0
    Multicast bytes   :          0
    Flooded packets  :          0
    Flooded bytes    :          0
    Unicast packets  :          11
    Unicast bytes    :         1080
    Current MAC count:          1
```

5.10: show vpls mac-table

```
10.10.42.37 - PuTTY
lab@dani> show vpls mac-table

MAC flags          (S -static MAC, D -dynamic MAC, L -locally learned, C -Control MAC
O -OVSDB MAC, SE -Statistics enabled, NM -Non configured MAC, R -Remote PE MAC, P -Pinned MAC)

Routing instance : vpn-1
Bridging domain : __vpn-1__, VLAN : NA
  MAC          MAC          Logical   NH      MAC          active
  address      flags      interface Index  property  source
  02:06:0a:ae:ea:a9  D      ge-0/0/10.610
  02:06:0a:ae:ea:b9  D      vt-0/0/10.1048576
```

Part 6: Using MSTP to prevent a layer 2 loop in a vpls

6.3: show vpls connections extensive

```
10.10.42.37 - PuTTY
lab@dani> show vpls connections extensive
Layer-2 VPN connections:

Legend for connection status (St)
EI -- encapsulation invalid      NC -- interface encapsulation not CCC/TCC/VPLS
EM -- encapsulation mismatch     WE -- interface and instance encaps not same
VC-Dn -- Virtual circuit down    NP -- interface hardware not present
CM -- control-word mismatch      -> -- only outbound connection is up
CN -- circuit not provisioned    <- -- only inbound connection is up
OR -- out of range              Up -- operational
OL -- no outgoing label         Dn -- down
LD -- local site signaled down   CF -- call admission control failure
RD -- remote site signaled down  SC -- local and remote site ID collision
LN -- local site not designated  LM -- local site ID not minimum designated
RN -- remote site not designated RM -- remote site ID not minimum designated
XX -- unknown connection status  IL -- no incoming label
MM -- MTU mismatch              MI -- Mesh-Group ID not available
BK -- Backup connection         ST -- Standby connection
PF -- Profile parse failure      PB -- Profile busy
RS -- remote site standby       SN -- Static Neighbor
LB -- Local site not best-site   RB -- Remote site not best-site
VM -- VLAN ID mismatch          HS -- Hot-standby Connection

Legend for interface status
Up -- operational
Dn -- down

Instance: vpn-1
VPLS-id: 100
  Number of local interfaces: 2
  Number of local interfaces up: 2
  ge-0/0/10.610
  ge-0/0/11.610
Neighbor                Type St      Time last up      # Up trans
192.168.1.2 (vpls-id 100) rmt  OL
```

6.4: ping

10.10.42.37 - PuTTY

```
lab@dani> ping 10.0.10.255 routing-instance c-router-1-1 count 5
PING 10.0.10.255 (10.0.10.255): 56 data bytes
64 bytes from 10.0.10.255: icmp_seq=0 ttl=64 time=581.623 ms
64 bytes from 10.0.10.255: icmp_seq=0 ttl=64 time=581.781 ms (DUP!)
64 bytes from 10.0.10.255: icmp_seq=0 ttl=64 time=774.806 ms (DUP!)
64 bytes from 10.0.10.255: icmp_seq=0 ttl=64 time=774.848 ms (DUP!)
64 bytes from 10.0.10.255: icmp_seq=0 ttl=64 time=973.818 ms (DUP!)
64 bytes from 10.0.10.255: icmp_seq=0 ttl=64 time=973.859 ms (DUP!)
64 bytes from 10.0.10.255: icmp_seq=0 ttl=64 time=1163.733 ms (DUP!)
64 bytes from 10.0.10.255: icmp_seq=0 ttl=64 time=1180.994 ms (DUP!)
64 bytes from 10.0.10.255: icmp_seq=0 ttl=64 time=1335.137 ms (DUP!)
64 bytes from 10.0.10.255: icmp_seq=0 ttl=64 time=1343.149 ms (DUP!)
64 bytes from 10.0.10.255: icmp_seq=0 ttl=64 time=1374.880 ms (DUP!)
64 bytes from 10.0.10.255: icmp_seq=0 ttl=64 time=1380.997 ms (DUP!)
64 bytes from 10.0.10.255: icmp_seq=0 ttl=64 time=1525.284 ms (DUP!)
64 bytes from 10.0.10.255: icmp_seq=0 ttl=64 time=1525.410 ms (DUP!)
64 bytes from 10.0.10.255: icmp_seq=1 ttl=64 time=533.638 ms
64 bytes from 10.0.10.255: icmp_seq=1 ttl=64 time=534.629 ms (DUP!)
64 bytes from 10.0.10.255: icmp_seq=0 ttl=64 time=1620.219 ms (DUP!)
64 bytes from 10.0.10.255: icmp_seq=0 ttl=64 time=1633.359 ms (DUP!)
64 bytes from 10.0.10.255: icmp_seq=1 ttl=64 time=703.257 ms (DUP!)
64 bytes from 10.0.10.255: icmp_seq=1 ttl=64 time=712.744 ms (DUP!)
64 bytes from 10.0.10.255: icmp_seq=0 ttl=64 time=1829.703 ms (DUP!)
64 bytes from 10.0.10.255: icmp_seq=0 ttl=64 time=1836.133 ms (DUP!)
64 bytes from 10.0.10.255: icmp_seq=1 ttl=64 time=880.203 ms (DUP!)
64 bytes from 10.0.10.255: icmp_seq=1 ttl=64 time=886.196 ms (DUP!)
64 bytes from 10.0.10.255: icmp_seq=0 ttl=64 time=1970.072 ms (DUP!)
64 bytes from 10.0.10.255: icmp_seq=0 ttl=64 time=1994.646 ms (DUP!)
64 bytes from 10.0.10.255: icmp_seq=1 ttl=64 time=1013.154 ms (DUP!)
64 bytes from 10.0.10.255: icmp_seq=1 ttl=64 time=1020.032 ms (DUP!)
64 bytes from 10.0.10.255: icmp_seq=0 ttl=64 time=2130.460 ms (DUP!)
64 bytes from 10.0.10.255: icmp_seq=0 ttl=64 time=2139.278 ms (DUP!)
64 bytes from 10.0.10.255: icmp_seq=0 ttl=64 time=2209.858 ms (DUP!)
64 bytes from 10.0.10.255: icmp_seq=1 ttl=64 time=1254.665 ms (DUP!)
64 bytes from 10.0.10.255: icmp_seq=1 ttl=64 time=1269.947 ms (DUP!)
64 bytes from 10.0.10.255: icmp_seq=0 ttl=64 time=2332.279 ms (DUP!)
64 bytes from 10.0.10.255: icmp_seq=0 ttl=64 time=2352.944 ms (DUP!)
64 bytes from 10.0.10.255: icmp_seq=1 ttl=64 time=1389.339 ms (DUP!)
64 bytes from 10.0.10.255: icmp_seq=1 ttl=64 time=1391.853 ms (DUP!)
64 bytes from 10.0.10.255: icmp_seq=0 ttl=64 time=2449.565 ms (DUP!)
64 bytes from 10.0.10.255: icmp_seq=0 ttl=64 time=2480.741 ms (DUP!)
64 bytes from 10.0.10.255: icmp_seq=1 ttl=64 time=1533.266 ms (DUP!)
64 bytes from 10.0.10.255: icmp_seq=1 ttl=64 time=1533.891 ms (DUP!)
64 bytes from 10.0.10.255: icmp_seq=0 ttl=64 time=2615.908 ms (DUP!)
64 bytes from 10.0.10.255: icmp_seq=2 ttl=64 time=652.772 ms
64 bytes from 10.0.10.255: icmp_seq=2 ttl=64 time=656.087 ms (DUP!)
64 bytes from 10.0.10.255: icmp_seq=1 ttl=64 time=1664.260 ms (DUP!)
64 bytes from 10.0.10.255: icmp_seq=1 ttl=64 time=1666.090 ms (DUP!)
64 bytes from 10.0.10.255: icmp_seq=0 ttl=64 time=2787.780 ms (DUP!)
64 bytes from 10.0.10.255: icmp_seq=0 ttl=64 time=2812.826 ms (DUP!)
```

```

64 bytes from 10.0.10.255: icmp_seq=3 ttl=64 time=1033.389 ms (DUP!)
64 bytes from 10.0.10.255: icmp_seq=3 ttl=64 time=1150.511 ms (DUP!)
64 bytes from 10.0.10.255: icmp_seq=0 ttl=64 time=4768.454 ms (DUP!)
64 bytes from 10.0.10.255: icmp_seq=0 ttl=64 time=5090.276 ms (DUP!)
64 bytes from 10.0.10.255: icmp_seq=2 ttl=64 time=3352.685 ms (DUP!)
64 bytes from 10.0.10.255: icmp_seq=2 ttl=64 time=3468.494 ms (DUP!)
64 bytes from 10.0.10.255: icmp_seq=1 ttl=64 time=4607.834 ms (DUP!)
64 bytes from 10.0.10.255: icmp_seq=1 ttl=64 time=4643.335 ms (DUP!)
64 bytes from 10.0.10.255: icmp_seq=3 ttl=64 time=2971.499 ms (DUP!)
64 bytes from 10.0.10.255: icmp_seq=3 ttl=64 time=2971.552 ms (DUP!)
64 bytes from 10.0.10.255: icmp_seq=0 ttl=64 time=6444.317 ms (DUP!)
64 bytes from 10.0.10.255: icmp_seq=0 ttl=64 time=6665.579 ms (DUP!)
64 bytes from 10.0.10.255: icmp_seq=2 ttl=64 time=4674.546 ms (DUP!)
64 bytes from 10.0.10.255: icmp_seq=2 ttl=64 time=4682.908 ms (DUP!)
64 bytes from 10.0.10.255: icmp_seq=1 ttl=64 time=5720.089 ms (DUP!)
64 bytes from 10.0.10.255: icmp_seq=1 ttl=64 time=5722.479 ms (DUP!)
64 bytes from 10.0.10.255: icmp_seq=3 ttl=64 time=3761.085 ms (DUP!)
64 bytes from 10.0.10.255: icmp_seq=3 ttl=64 time=3761.162 ms (DUP!)
64 bytes from 10.0.10.255: icmp_seq=0 ttl=64 time=6806.690 ms (DUP!)
64 bytes from 10.0.10.255: icmp_seq=0 ttl=64 time=6838.271 ms (DUP!)
64 bytes from 10.0.10.255: icmp_seq=2 ttl=64 time=4854.208 ms (DUP!)
64 bytes from 10.0.10.255: icmp_seq=4 ttl=64 time=2896.009 ms

--- 10.0.10.255 ping statistics ---
5 packets transmitted, 5 packets received, +96 duplicates, 0% packet loss
round-trip min/avg/max/stddev = 533.638/2327.340/6838.271/1528.614 ms

```

6.8: show spanning-tree interface routing-instance

```

10.10.42.37 - PuTTY
lab@dani> show spanning-tree interface routing-instance vpn-1-l2control

Spanning tree interface parameters for instance 0

Interface          Port ID   Designated      Designated      Port   State  Role
                  port ID   port ID         bridge ID       Cost
ge-0/0/10          128:492  128:490 32768.2c6bf50404d1 20000  FWD   ROOT
ge-0/0/11          128:493  128:491 32768.2c6bf50404d1 20000  BLK   ALT

lab@dani> show spanning-tree interface routing-instance ce-vs1-1

Spanning tree interface parameters for instance 0

Interface          Port ID   Designated      Designated      Port   State  Role
                  port ID   port ID         bridge ID       Cost
ge-0/0/14          128:490  128:490 32768.2c6bf50404d1 20000  FWD   DESG
ge-0/0/15          128:491  128:491 32768.2c6bf50404d1 20000  FWD   DESG

lab@dani>

```

6.9: ping

```
10.10.42.37 - PuTTY
lab@dani> ping 10.0.10.255 routing-instance c-router-1-1 count 5
PING 10.0.10.255 (10.0.10.255): 56 data bytes
64 bytes from 10.0.10.255: icmp_seq=0 ttl=64 time=366.726 ms
64 bytes from 10.0.10.255: icmp_seq=1 ttl=64 time=154.969 ms
64 bytes from 10.0.10.255: icmp_seq=2 ttl=64 time=171.742 ms
64 bytes from 10.0.10.255: icmp_seq=3 ttl=64 time=66.253 ms
64 bytes from 10.0.10.255: icmp_seq=4 ttl=64 time=19.780 ms

--- 10.0.10.255 ping statistics ---
5 packets transmitted, 5 packets received, 0% packet loss
round-trip min/avg/max/stddev = 19.780/155.894/366.726/119.386 ms
```

Part 8: Configuring the virtual switch instance

8.3: show bridge domain

```
10.10.42.37 - PuTTY
lab@dani> show bridge domain

Routing instance      Bridge domain      VLAN ID      Interfaces
ce-vs1-1              vlan_610           610          ge-0/0/14.610
                    vlan_610           610          ge-0/0/15.610
                    vlan_610           610          ge-0/0/4.610
ce-vs1-1              vlan_611           611          ge-0/0/16.611
                    vlan_611           611          ge-0/0/17.611
                    vlan_611           611          ge-0/0/4.611
vpn-1                 __vpn-1__         NA           ge-0/0/10.610
                    __vpn-1__         NA           ge-0/0/11.610
                    __vpn-1__         NA           vt-0/0/10.1049600
```


Part 9: Configuring a BGP VPLS with redundant links between CE and PE Routers

9.7: ping

10.10.42.37 - PuTTY

```
lab@dani> ping 10.0.11.255 routing-instance c-router-1-1 count 5
PING 10.0.11.255 (10.0.11.255): 56 data bytes
64 bytes from 10.0.11.255: icmp_seq=0 ttl=64 time=297.027 ms
64 bytes from 10.0.11.255: icmp_seq=0 ttl=64 time=297.089 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=0 ttl=64 time=297.097 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=0 ttl=64 time=297.104 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=0 ttl=64 time=297.110 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=0 ttl=64 time=297.117 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=0 ttl=64 time=302.457 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=0 ttl=64 time=302.473 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=0 ttl=64 time=302.481 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=0 ttl=64 time=302.489 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=0 ttl=64 time=302.496 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=0 ttl=64 time=302.503 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=0 ttl=64 time=302.510 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=0 ttl=64 time=302.518 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=0 ttl=64 time=311.137 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=0 ttl=64 time=311.450 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=0 ttl=64 time=512.275 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=0 ttl=64 time=515.405 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=0 ttl=64 time=549.662 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=0 ttl=64 time=549.846 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=0 ttl=64 time=572.519 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=0 ttl=64 time=572.878 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=0 ttl=64 time=573.263 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=0 ttl=64 time=573.380 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=0 ttl=64 time=573.394 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=0 ttl=64 time=573.415 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=0 ttl=64 time=573.425 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=0 ttl=64 time=573.571 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=0 ttl=64 time=736.359 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=0 ttl=64 time=748.569 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=0 ttl=64 time=748.599 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=0 ttl=64 time=748.606 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=0 ttl=64 time=777.010 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=0 ttl=64 time=777.574 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=0 ttl=64 time=777.925 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=0 ttl=64 time=789.860 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=0 ttl=64 time=790.112 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=0 ttl=64 time=790.348 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=0 ttl=64 time=790.544 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=0 ttl=64 time=825.432 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=0 ttl=64 time=826.254 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=0 ttl=64 time=826.268 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=0 ttl=64 time=834.132 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=0 ttl=64 time=834.150 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=0 ttl=64 time=834.159 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=0 ttl=64 time=834.165 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=0 ttl=64 time=834.171 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=0 ttl=64 time=1083.631 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=0 ttl=64 time=1083.898 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=0 ttl=64 time=1084.100 ms (DUP!)
```


10.10.42.37 - PuTTY

```
64 bytes from 10.0.11.255: icmp_seq=3 ttl=64 time=2742.471 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=0 ttl=64 time=5746.045 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=2 ttl=64 time=3742.925 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=3 ttl=64 time=2742.489 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=1 ttl=64 time=4744.123 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=0 ttl=64 time=5746.069 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=2 ttl=64 time=3742.949 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=3 ttl=64 time=2742.513 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=1 ttl=64 time=4761.429 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=1 ttl=64 time=4761.454 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=2 ttl=64 time=3760.823 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=0 ttl=64 time=5763.965 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=3 ttl=64 time=2760.406 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=1 ttl=64 time=4762.042 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=2 ttl=64 time=3760.864 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=0 ttl=64 time=5763.998 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=3 ttl=64 time=2760.438 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=0 ttl=64 time=5764.013 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=2 ttl=64 time=3760.893 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=3 ttl=64 time=2760.458 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=1 ttl=64 time=4762.093 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=1 ttl=64 time=4771.086 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=2 ttl=64 time=3769.922 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=0 ttl=64 time=5773.058 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=3 ttl=64 time=2769.498 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=0 ttl=64 time=5773.072 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=2 ttl=64 time=3769.953 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=3 ttl=64 time=2769.518 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=1 ttl=64 time=4771.154 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=1 ttl=64 time=4771.162 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=2 ttl=64 time=3769.983 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=0 ttl=64 time=5773.117 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=3 ttl=64 time=2769.857 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=0 ttl=64 time=5773.436 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=2 ttl=64 time=3770.318 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=3 ttl=64 time=2769.884 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=1 ttl=64 time=4771.520 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=1 ttl=64 time=4775.786 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=2 ttl=64 time=3774.711 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=0 ttl=64 time=5777.847 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=3 ttl=64 time=2774.286 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=0 ttl=64 time=5778.894 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=2 ttl=64 time=3775.785 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=3 ttl=64 time=2775.351 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=1 ttl=64 time=4777.904 ms (DUP!)
64 bytes from 10.0.11.255: icmp_seq=4 ttl=64 time=1774.349 ms

--- 10.0.11.255 ping statistics ---
5 packets transmitted, 5 packets received, +1961 duplicates, 0% packet loss
round-trip min/avg/max/stddev = 297.027/3735.026/5778.894/1096.590 ms

lab@dani> █
```

9.9: show vpls connections extensive

10.10.42.37 - PuTTY

```
lab@dani> show vpls connections extensive
Layer-2 VPN connections:

Legend for connection status (St)
EI -- encapsulation invalid      NC -- interface encapsulation not CCC/TCC/VPLS
EM -- encapsulation mismatch     WE -- interface and instance encaps not same
VC-Dn -- Virtual circuit down   NP -- interface hardware not present
CM -- control-word mismatch     -> -- only outbound connection is up
CN -- circuit not provisioned   <- -- only inbound connection is up
OR -- out of range              Up -- operational
OL -- no outgoing label         Dn -- down
LD -- local site signaled down  CF -- call admission control failure
RD -- remote site signaled down SC -- local and remote site ID collision
LN -- local site not designated LM -- local site ID not minimum designated
RN -- remote site not designated RM -- remote site ID not minimum designated
XX -- unknown connection status IL -- no incoming label
MM -- MTU mismatch              MI -- Mesh-Group ID not available
BK -- Backup connection         ST -- Standby connection
PF -- Profile parse failure     PB -- Profile busy
RS -- remote site standby       SN -- Static Neighbor
LB -- Local site not best-site  RB -- Remote site not best-site
VM -- VLAN ID mismatch          HS -- Hot-standby Connection

Legend for interface status
Up -- operational
Dn -- down

Instance: vpn-11
Edge protection: Not-Primary
  Local site: ce-vs1-1 (1)
    Number of local interfaces: 2
    Number of local interfaces up: 2
    IRB interface present: no
    ge-0/0/12.611
    ge-0/0/13.611
    Interface flags: VC-Down
  vt-0/0/10.1049857  2      Intf - vpls vpn-11 local site 1 remote site 2
  Label-base      Offset   Size  Range  Preference
  800256           1       8     8       100
  connection-site      Type  St    Time last up      # Up trans
  2                    rmt  Up    Jul 29 03:02:41 2021      1
    Remote PE: 192.168.1.2, Negotiated control-word: No
    Incoming label: 800257, Outgoing label: 800256
    Local interface: vt-0/0/10.1049857, Status: Up, Encapsulation: VPLS
    Description: Intf - vpls vpn-11 local site 1 remote site 2
    Flow Label Transmit: No, Flow Label Receive: No
  Connection History:
    Jul 29 03:02:41 2021  status update timer
    Jul 29 03:02:41 2021  loc intf up          vt-0/0/10.1049857
    Jul 29 03:02:41 2021  PE route changed
    Jul 29 03:02:41 2021  Out lbl Update      800256
    Jul 29 03:02:41 2021  In lbl Update       800257
```

9.10: show route table vpn-11 extensive

10.10.42.37 - PuTTY

```
lab@dani> show route table vpn-11 extensive

vpn-11.l2vpn.0: 2 destinations, 2 routes (2 active, 0 holddown, 0 hidden)
 192.168.1.1:12:1:1/96 (1 entry, 1 announced)
TSI:
Page 0 idx 0, (group my-int-group type Internal) Type 1 val 0xcd3d6d0 (adv_entry)
  Advertised metrics:
    Flags: Nexthop Change
    Nexthop: Self
    Localpref: 100
    AS path: [65512] I
    Communities: target:65512:100 Layer2-info: encaps: VPLS, control flags:[0x0] , mtu: 0, site preference: 100
Path 192.168.1.1:12:1:1 Vector len 4. Val: 0
  *L2VPN Preference: 170/-101
    Next hop type: Indirect, Next hop index: 0
    Address: 0xb679b30
    Next-hop reference count: 2
    Protocol next hop: 192.168.1.1
    Indirect next hop: 0x0 - INH Session ID: 0x0
    State: <Active Int Ext>
    Age: 14:29 Metric2: 1
    Validation State: unverified
    Task: vpn-11-l2vpn
    Announcement bits (1): 1-BGP_RT_Background
    AS path: I
    Communities: Layer2-info: encaps: VPLS, control flags:[0x0] , mtu: 0, site preference: 100
    Label-base: 800256, range: 8, status-vector: 0x3F, offset: 1

192.168.1.2:21:2:1/96 (1 entry, 1 announced)
  *BGP Preference: 170/-101
    Route Distinguisher: 192.168.1.2:21
    Next hop type: Indirect, Next hop index: 0
    Address: 0xb679950
    Next-hop reference count: 5
    Source: 192.168.1.2
    Protocol next hop: 192.168.1.2
    Indirect next hop: 0x2 no-forward INH Session ID: 0x0
    State: <Secondary Active Int Ext>
    Local AS: 65512 Peer AS: 65512
    Age: 5:03 Metric2: 1
    Validation State: unverified
    Task: BGP_65512.192.168.1.2
    Announcement bits (1): 0-vpn-11-l2vpn
    AS path: I
    Communities: target:65512:100 Layer2-info: encaps: VPLS, control flags:[0x0] , mtu: 0, site preference: 100
    Import Accepted
    Label-base: 800256, range: 8, offset: 1
    Localpref: 100
    Router ID: 192.168.1.2
    Primary Routing Table bgp.l2vpn.0
    Indirect next hops: 1
      Protocol next hop: 192.168.1.2 Metric: 1
      Indirect next hop: 0x2 no-forward INH Session ID: 0x0
      Indirect path forwarding next hops: 2
        Next hop type: Router
        Next hop: 172.22.210.2 via ge-0/0/0.210
        Session Id: 0x0
        Next hop: 172.22.211.2 via ge-0/0/1.211
        Session Id: 0x0
        192.168.1.2/32 Originating RIB: inet.3
        Metric: 1 Node path count: 1
        Forwarding nexthops: 2
          Nexthop: 172.22.210.2 via ge-0/0/0.210
          Session Id: 0
          Nexthop: 172.22.211.2 via ge-0/0/1.211
          Session Id: 0

lab@dani>
```

9.11: ping

10.10.42.37 - PuTTY

```
lab@dani> ping 10.0.11.2 routing-instance c-router-1-1 count 5
PING 10.0.11.2 (10.0.11.2): 56 data bytes
64 bytes from 10.0.11.2: icmp_seq=0 ttl=64 time=294.177 ms
64 bytes from 10.0.11.2: icmp_seq=1 ttl=64 time=271.195 ms
64 bytes from 10.0.11.2: icmp_seq=2 ttl=64 time=233.966 ms
64 bytes from 10.0.11.2: icmp_seq=3 ttl=64 time=27.771 ms
64 bytes from 10.0.11.2: icmp_seq=4 ttl=64 time=33.395 ms

--- 10.0.11.2 ping statistics ---
5 packets transmitted, 5 packets received, 0% packet loss
round-trip min/avg/max/stddev = 27.771/172.101/294.177/117.149 ms
```

9.12: show vpls mac-table

10.10.42.37 - PuTTY

```
lab@dani> show vpls mac-table

MAC flags      (S -static MAC, D -dynamic MAC, L -locally learned, C -Control MAC
O -OVSDB MAC, SE -Statistics enabled, NM -Non configured MAC, R -Remote PE MAC, P -Pinned MAC)

Routing instance : vpn-1
Bridging domain : __vpn-1__, VLAN : NA
  MAC          MAC      Logical   NH      MAC      active
  address      flags   interface Index  property source
  02:06:0a:ae:ea:a9  D      ge-0/0/10.610
  02:06:0a:ae:ea:b9  D      vt-0/0/10.1049856

MAC flags      (S -static MAC, D -dynamic MAC, L -locally learned, C -Control MAC
O -OVSDB MAC, SE -Statistics enabled, NM -Non configured MAC, R -Remote PE MAC, P -Pinned MAC)

Routing instance : vpn-11
Bridging domain : __vpn-11__, VLAN : NA
  MAC          MAC      Logical   NH      MAC      active
  address      flags   interface Index  property source
  02:06:0a:ae:ea:a9  D      ge-0/0/12.611
  02:06:0a:ae:ea:b9  D      vt-0/0/10.1049857
```

9.14: show vpls connections extensive

10.10.42.37 - PuTTY

```
lab@dani> show vpls connections extensive
Layer-2 VPN connections:

Legend for connection status (St)
EI -- encapsulation invalid      NC -- interface encapsulation not CCC/TCC/VPLS
EM -- encapsulation mismatch     WE -- interface and instance encaps not same
VC-Dn -- Virtual circuit down   NP -- interface hardware not present
CM -- control-word mismatch     -> -- only outbound connection is up
CN -- circuit not provisioned   <- -- only inbound connection is up
OR -- out of range              Up -- operational
OL -- no outgoing label         Dn -- down
LD -- local site signaled down  CF -- call admission control failure
RD -- remote site signaled down SC -- local and remote site ID collision
LN -- local site not designated LM -- local site ID not minimum designated
RN -- remote site not designated RM -- remote site ID not minimum designated
XX -- unknown connection status IL -- no incoming label
MM -- MTU mismatch              MI -- Mesh-Group ID not available
BK -- Backup connection         ST -- Standby connection
PF -- Profile parse failure     PB -- Profile busy
RS -- remote site standby       SN -- Static Neighbor
LB -- Local site not best-site  RB -- Remote site not best-site
VM -- VLAN ID mismatch         HS -- Hot-standby Connection

Legend for interface status
Up -- operational
Dn -- down

Instance: vpn-11
Edge protection: Not-Primary
Local site: ce-vs1-1 (1)
Number of local interfaces: 2
Number of local interfaces up: 1
IRB interface present: no
ge-0/0/12.611
Interface flags: VC-Down
ge-0/0/13.611
vt-0/0/10.1049857 2          Intf - vpls vpn-11 local site 1 remote site 2
Label-base      Offset    Size Range Preference
800256          1      8      8      100
connection-site Type St      Time last up      # Up trans
2              rmt Up      Jul 29 03:02:41 2021 1
Remote PE: 192.168.1.2, Negotiated control-word: No
Incoming label: 800257, Outgoing label: 800256
Local interface: vt-0/0/10.1049857, Status: Up, Encapsulation: VPLS
Description: Intf - vpls vpn-11 local site 1 remote site 2
Flow Label Transmit: No, Flow Label Receive: No
Connection History:
Jul 29 03:02:41 2021 status update timer
Jul 29 03:02:41 2021 loc intf up          vt-0/0/10.1049857
Jul 29 03:02:41 2021 PE route changed
Jul 29 03:02:41 2021 Out lbl Update      800256
Jul 29 03:02:41 2021 In lbl Update      800257
```

9.15: ping

10.10.42.37 - PuTTY

```
lab@dani> ping 10.0.11.2 routing-instance c-router-1-1 count 5
PING 10.0.11.2 (10.0.11.2): 56 data bytes
64 bytes from 10.0.11.2: icmp_seq=0 ttl=64 time=14.998 ms
64 bytes from 10.0.11.2: icmp_seq=1 ttl=64 time=10.429 ms
64 bytes from 10.0.11.2: icmp_seq=2 ttl=64 time=245.463 ms
64 bytes from 10.0.11.2: icmp_seq=3 ttl=64 time=210.035 ms
64 bytes from 10.0.11.2: icmp_seq=4 ttl=64 time=7.090 ms

--- 10.0.11.2 ping statistics ---
5 packets transmitted, 5 packets received, 0% packet loss
round-trip min/avg/max/stddev = 7.090/97.603/245.463/106.882 ms
```

9.16: show vpls mac-table

10.10.42.37 - PuTTY

```
lab@dani> show vpls mac-table

MAC flags      (S -static MAC, D -dynamic MAC, L -locally learned, C -Control MAC
O -OVSDB MAC, SE -Statistics enabled, NM -Non configured MAC, R -Remote PE MAC, P -Pinned MAC)

Routing instance : vpn-11
Bridging domain : __vpn-11__, VLAN : NA

```

MAC address	MAC flags	Logical interface	NH Index	MAC property	active source
02:06:0a:ae:ea:a9	D	ge-0/0/13.611			
02:06:0a:ae:ea:b9	D	vt-0/0/10.1049857			