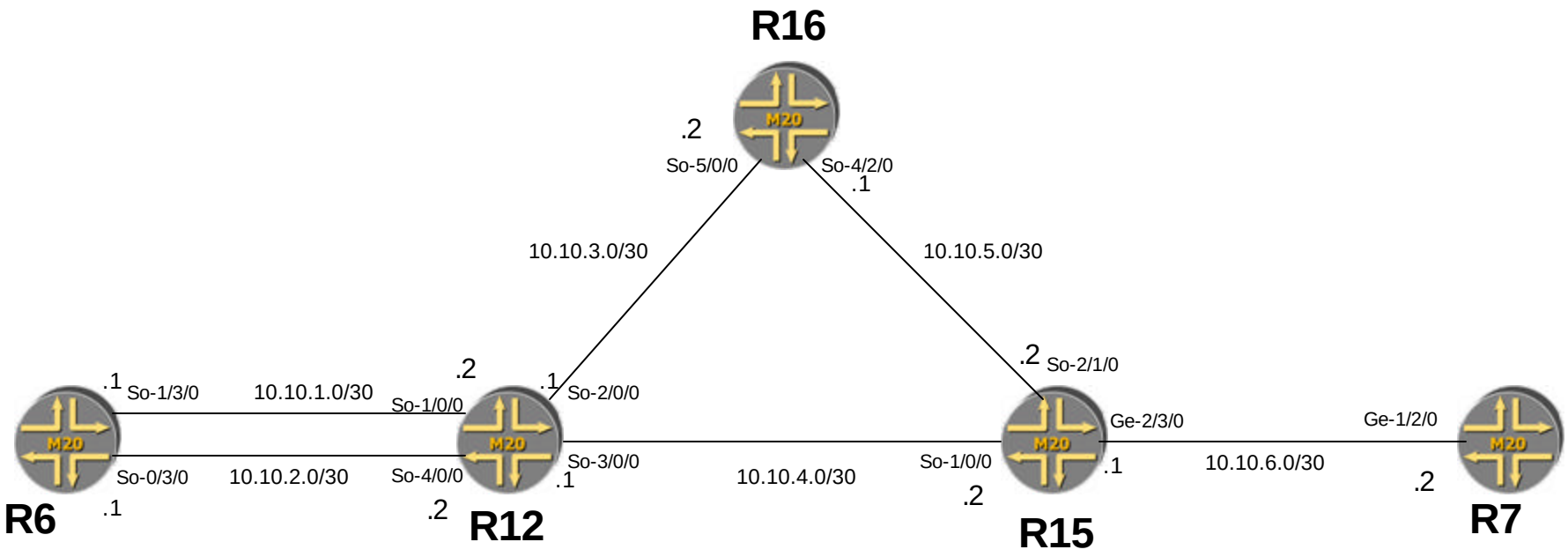
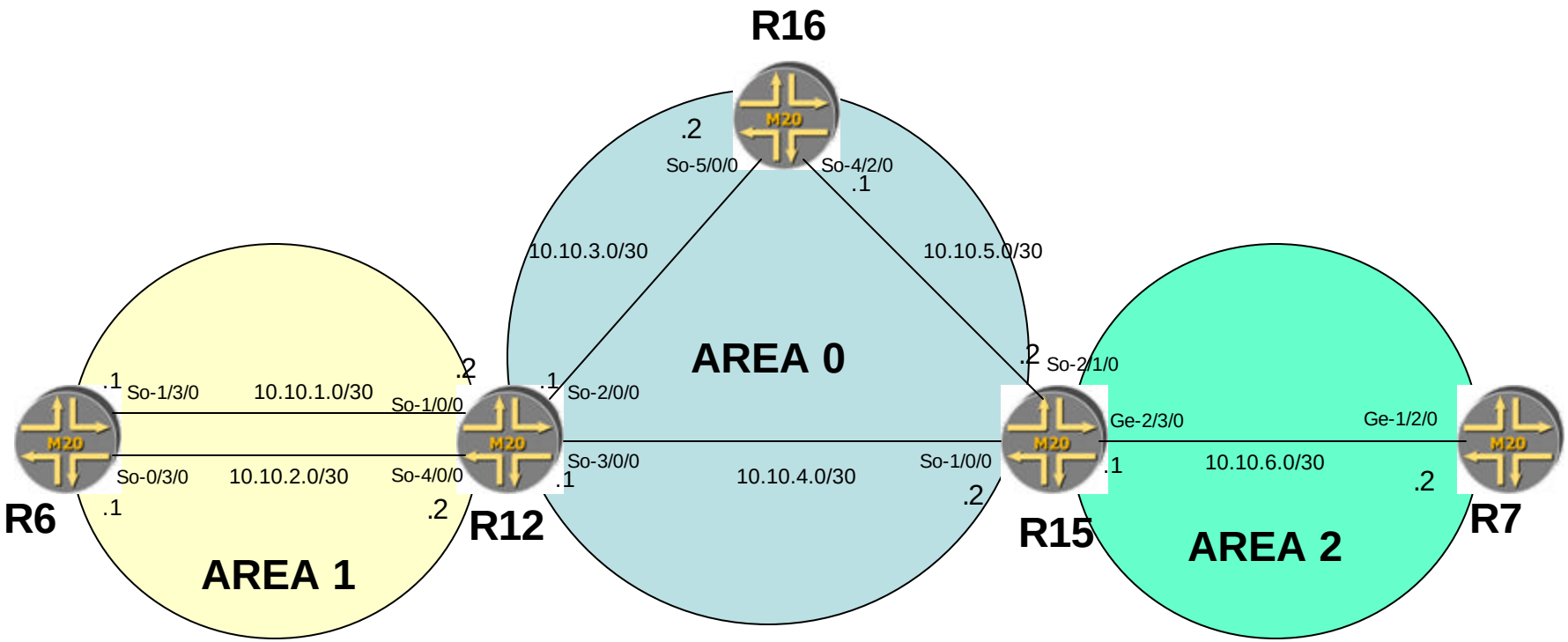
Lab Topology



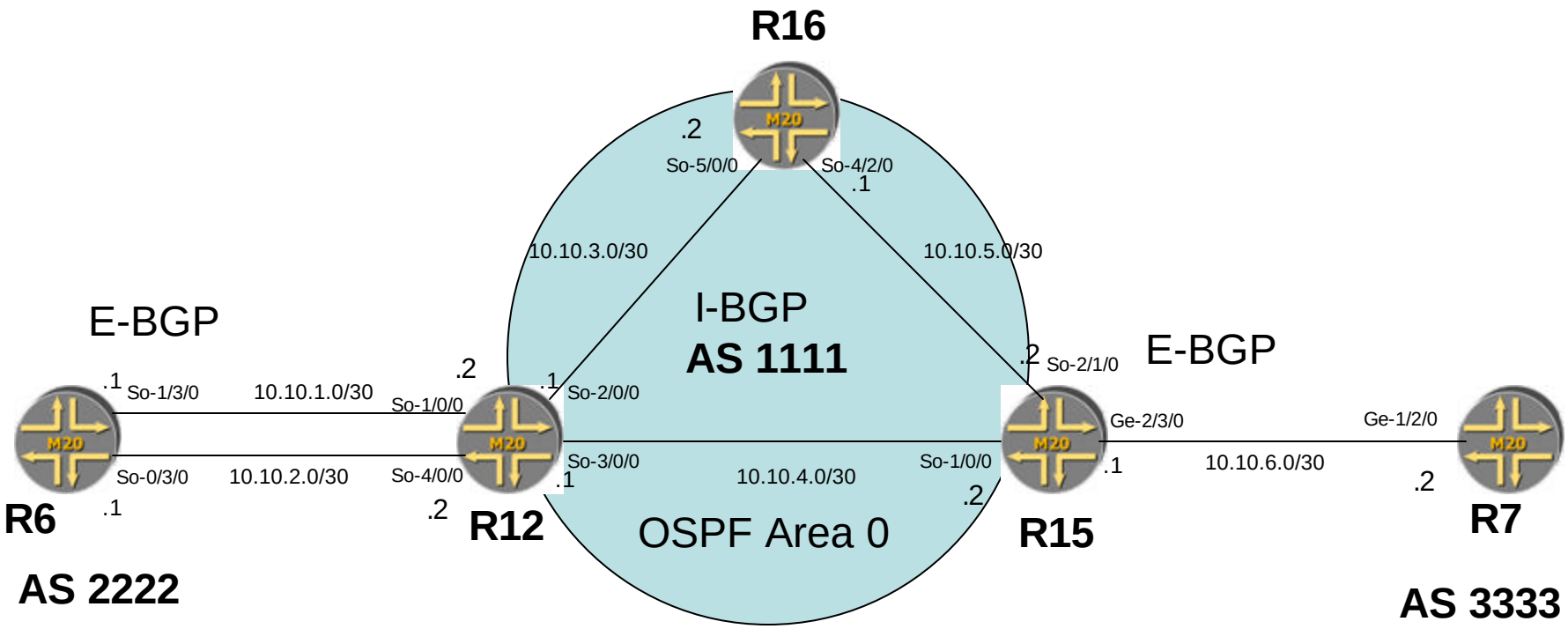
Lo
R6- 10.10.10.6/32
R12 -10.10.10.12/32
R16- 10.10.10.16/32
R15- 10.10.10.15/32
R7 -10.10.10.7/32

OSPF Hands-on



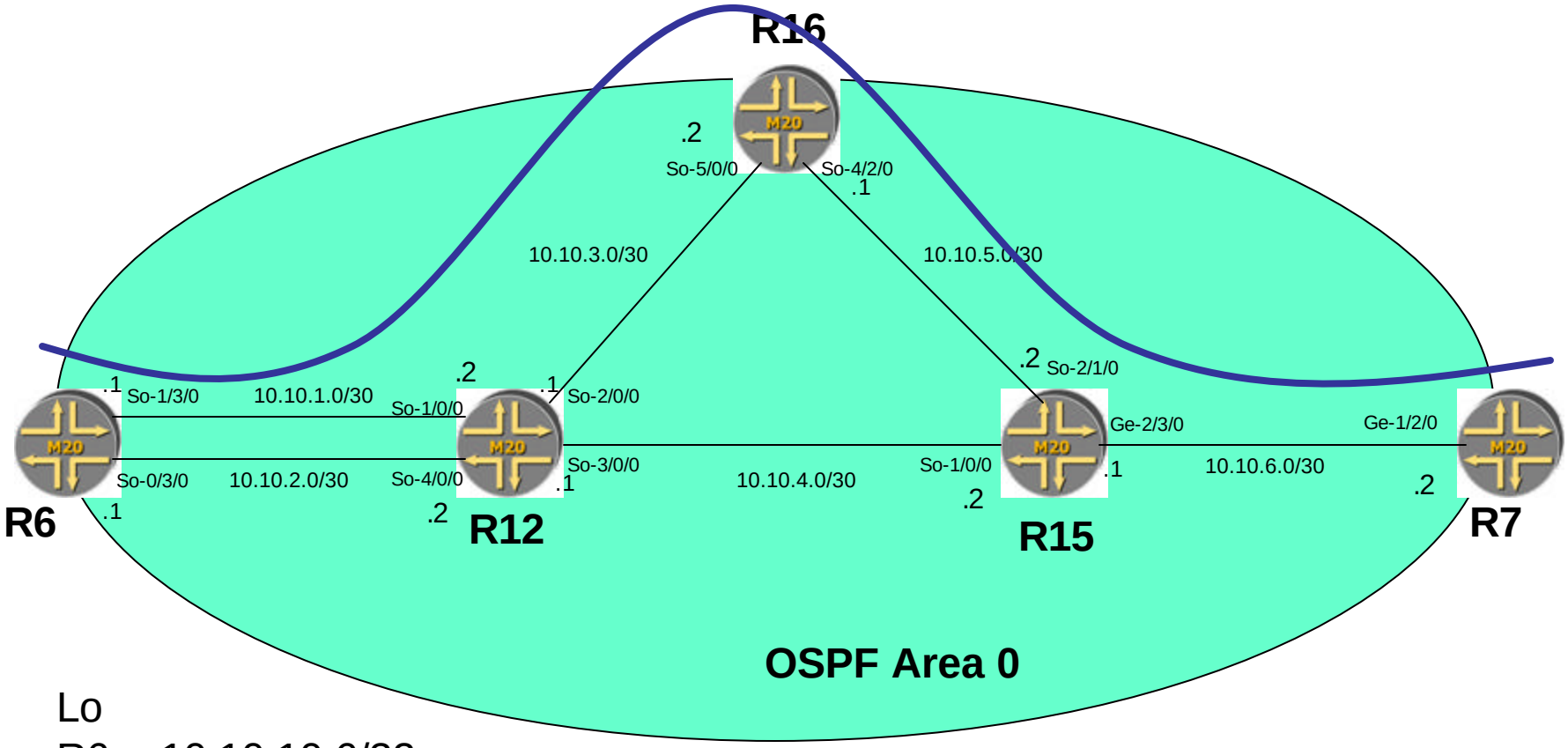
Lo
R6- 10.10.10.6/32
R12 -10.10.10.12/32
R16- 10.10.10.16/32
R15- 10.10.10.15/32
R7 -10.10.10.7/32

BGP Hands-on



Lo
R6- 10.10.10.6/32
R12 -10.10.10.12/32
R16- 10.10.10.16/32
R15- 10.10.10.15/32
R7 -10.10.10.7/32

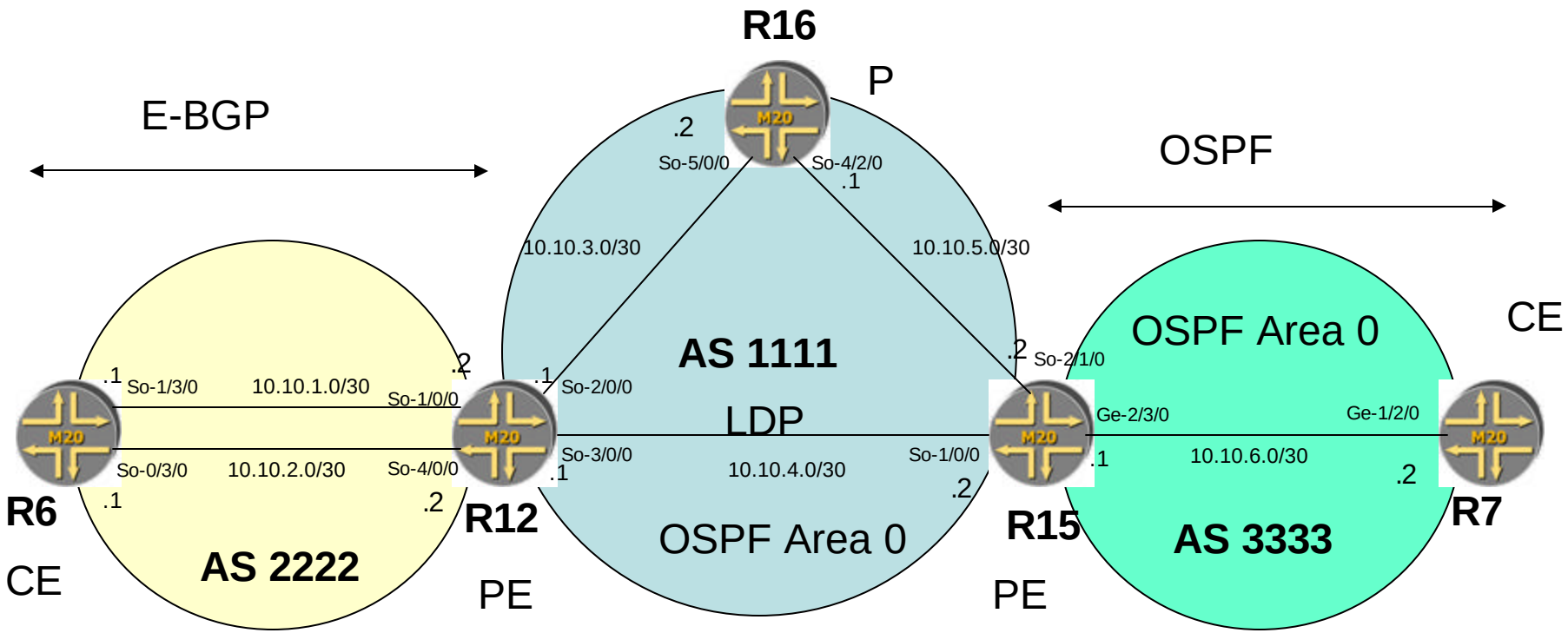
MPLS – TE hands-on



Lo
R6- 10.10.10.6/32
R12 -10.10.10.12/32
R16- 10.10.10.16/32
R15- 10.10.10.15/32
R7 -10.10.10.7/32

RSVP-TE LSP

MPLS VPN Hands-on



Lo
R6- 10.10.10.6/32
R12 -10.10.10.12/32
R16- 10.10.10.16/32
R15- 10.10.10.15/32
R7 -10.10.10.7/32

I-BGP (MPBGP)

Basic OSPF Configuration

Basic OSPF configuration, 1

Enable IP on All Router Interfaces

[edit] set interface *interface-name* unit 0 family inet

[edit]

Enable all interfaces on area 0.0.0.0

[edit]	**edit protocols OSPF**
[edit protocols ospf]	**set area 0 interface all**
[edit protocols ospf]	**set area 0 interface fxp0 disable**
[edit protocols ospf]	**set area 0 interface *interface-name* metric *metric-value***
[edit protocols ospf]	**top**
[edit]	**commit**

To check the network

To see the OSPF interfaces

[edit] exit

user@host> show ospf interface brief / extensive

To see OSPF neighborss :

user@host> show ospf neighbor brief / extensive

To see OSPF routes :

user@host> show ospf route detail

To see the database

user@host> show OSPF database brief

Show OSPF Interfaces

- `show ospf interface ?`
  - View status of an interface

```
user@host> show ospf interface ?
Possible completions:
 <[Enter]>                Execute this command
 brief                    Show brief status
 detail                   Show detailed status
 extensive                Show extensive status
 user@host> show ospf interface brief
 Intf            State     Area      DR ID          BDR ID
Nbrs
 ge-1/2/3.0      DRother   0.0.0.0   10.250.240.8   10.250.240.35
3
 ge-2/0/0.0      DR        1.0.0.0   10.250.240.17  10.250.240.11
2
 ge-2/1/9.0      DR        1.0.0.0   10.250.240.17  10.250.240.9
1
 ge-4/1/3.0      DR        1.0.0.0   10.250.240.17  10.250.240.10
1
```

Show OSPF Interfaces

- `show ospf interface extensive`
  - View more extensive OSPF interface information

```
user@host> show ospf interface extensive
Intf                State    Area        DR ID         BDR ID        Nbrs
ge-1/2/3.0          Drother  0.0.0.0   10.250.240.8  10.250.240.35      3
  Type LAN, address 192.168.254.227, mask 255.255.255.240, MTU 1500, cost 1
  DR addr 192.168.254.230, BDR addr 192.168.254.229, adj count 2

fxp2.0              DR       1.0.0.0   10.250.240.17 10.250.240.11      2
  Type LAN, address 10.1.1.130, mask 255.255.255.128, MTU 1500, cost 1
  DR addr 10.1.1.130, BDR addr 10.1.1.131, adj count 2

fxp1.0              DR       1.0.0.0   10.250.240.17 10.250.240.9       1
  Type LAN, address 10.1.2.2, mask 255.255.255.240, MTU 1500, cost 1
  DR addr 10.1.2.2, BDR addr 10.1.2.1, adj count 1
```

View OSPF Statistics

- `show ospf statistics`
  - View basic OSPF protocol statistics

```
user@host> show ospf statistics
Packet type          Total                Last 5 seconds
                Sent       Received       Sent       Received
   Hello      505739      990495          4             5
     DbD          20          26          0             0
   LSReq           6           5          0             0
LSUpdate       27060       15319          0             0
   LSAck       10923       52470          0             0

LSAs retransmitted: 16, last 5 seconds: 0
Receive errors:
 862 no interface found
 115923 no virtual link found
```

Show OSPF Route Example

- **user@host>** show ospf route detail
- **Prefix Route/Path Type Metric Next hop i/f Next hop addr**
- **1.1.1.0/24 Ext2 Network 0 ge-0/0/0.0 10.10.0.16**
- **area 0.0.0.0, options 0x0, origin 1.1.1.1**
- **1.1.1.1/32 Intra AS BR 1 ge-0/0/0.0 10.10.0.16**
- **area 0.0.0.0, options 0x0, origin 1.1.1.1**
- **1.2.3.0/24 Ext2 Network 0 ge-0/0/0.0 10.10.0.16**
- **area 0.0.0.0, options 0x0, origin 1.1.1.1**

View OSPF Database

- `show ospf database`
  - View the LSA database

```
user@host> show ospf database ?
Possible completions:
  <[Enter]>                      Execute this command
  advertising-router             Router ID of advertising router
  area                           OSPF area ID
  asbrsummary                    Show OSPF summary ASBR link-state database
  brief                          Show brief view
  detail                         Show detailed view
  extensive                      Show extensive view
  extern                         Show OSPF external link-state database
  lsa-id                         LSA ID
  netsummary                     Show OSPF summary network link-state database
  network                        Show OSPF network link-state database
  nssa                           Show OSPF NSSA link-state database
  router                         Show OSPF router link-state database
  summary                        Show summary view
```

Show OSPF Database Example

```
user@host> show ospf database brief
OSPF link state database, area 0.0.0.0
Type       ID               Adv Rtr          Seq         Age
   Cksum  Len
Router     10.250.240.8     10.250.240.8     0x800001fc  2388
   0x3684  36
Router     10.250.240.17    10.250.240.17    0x80000217  1835
   0x444c  36
Router     10.250.240.32    10.250.240.32    0x80000232  1876
   0x0158  36
Router     10.250.240.35    10.250.240.35    0x80000291  1100
   0x4aa5  36
Network    192.168.254.230  10.250.240.8     0x800001cc   117
   0xab67  40
Summary    10.1.2.0         10.250.240.17    0x80000216  1535
   0x1729  28
Summary    10.1.3.34        10.250.240.8     0x8000013a  2217
   0x842f  28
```

Basic BGP Configuration

IBGP Configuration Overview

```
bgp {
    traceoptions {
        file bgp_log size 5m files 10;
        flag open;
        flag state;
        flag normal;
    }
    group core {
        type internal;
       local-address 192.168.255.7;
        peer-as 65000;
        authentication-key "$9$eDbKX-Y2aUi.oJfz3npuBIE";
        neighbor 192.168.255.1;
        neighbor 192.168.255.2;
        neighbor 192.168.255.3;
    }
}
```

EBGP Configuration Overview

```
bgp {
group core {
        type internal;
         local-address 192.168.255.7;
        peer-as 65000;
        authentication-key "$9$eDbKX-Y2aUi.oJfz3npuBIE";
        neighbor 192.168.255.1;
        neighbor 192.168.255.2;
}
group AS_692 {
        type external;
        peer-as 692;
        import next-hop-self;
        authentication-key"$9$c6ZylMdb2JUHM8ZjkP3n/Ct";
        neighbor 172.16.5.1;
    }
}
policy-options {
    policy-statement next-hop-self {
        then {
            nexthop self;
        }
    }
}
}
```

BGP Information

- Several commands display a wide variety of BGP information either from the protocol itself or from BGP routes

```
user@host> show bgp ?
Possible completions:
  group                Show the BGP group database
  neighbor             Show the BGP neighbor database
  next-hop-database    Show the BGP next hop database
  summary              Show an overview of the BGP
                       information
```

Show BGP Summary

- `show bgp summary`
  - View basic information about all BGP neighbors

```
user@host> show bgp summary
Groups: 12       Peers: 26       Unestablished peers: 2

Peer             AS   InPkt    OutPkt  OutQ  Flaps Last Up/Dn
   State|#Act/Recv/Da…
131.103.0.2      45   1225     55263   50511     0    18:22:14
   47769/50591/0
192.168.1.1      33   911      0       0         0    18:22:27
   Active
192.168.1.97     23   10458    2201    41043     0    18:22:03
   0/0/0
192.168.1.100    432  10458    163     17643     0    17:01:18
   Active
```

Show BGP Neighbor

```
user@host> show bgp neighbor
Peer: 11.1.1.2+179 AS 29        Local: 11.1.1.1+1048 AS 29
  Type: Internal  State: Established    Flags: <>
  Last State: OpenConfirm       Last Event: RecvKeepAlive
  Last Error: None
  Options: <Preference HoldTime>
        Holdtime: 90    Preference: 170
  Number of flaps: 1
  Error: "Cease" Sent: 1 Recv: 0
  Peer ID: 11.1.1.2     Local ID: 0.0.0.0       Active Holdtime: 90
  NLRI advertised by peer: unicast
  NLRI for this session: unicast
  Group Bit: 0  Send state: in sync
  Table inet.0
    Active Prefixes: 0
    Received Prefixes: 0
    Suppressed due to damping: 0
  Table inet.2
    Active Prefixes: 0
    Received Prefixes: 0
    Suppressed due to damping: 0
  Last traffic (seconds):       Received 25     Sent 21 Checked 21
  Input messages:       Total 4143      Updates 0       Octets 78717
  Output messages:      Total 4156      Updates 10      Octets 79303
  Output Queue[0]: 0
  Output Queue[1]: 0
```

Show BGP Next Hop

- `show bgp next-hop-database`

```
user@host> show bgp next-hop-database brief
1.0.0.0/8
Source: 10.168.1.222 Nexthop: 10.168.1.222
10.168.1.222/32 MED 20 Next hops 192.168.200.2 192.168.200.102
2.0.0.0/8
Source: 10.168.1.222 Nexthop: 10.168.1.222
10.168.1.222/32 MED 20 Next hops 192.168.200.2 192.168.200.102
3.0.0.0/8
Source: 10.168.1.222 Nexthop: 10.168.1.222
10.168.1.222/32 MED 20 Next hops 192.168.200.2 192.168.200.102
4.0.0.0/8
Source: 10.168.1.222 Nexthop: 10.168.1.222
10.168.1.222/32 MED 20 Next hops 192.168.200.2 192.168.200.102
5.0.0.0/8
Source: 10.168.1.222 Nexthop: 10.168.1.222
10.168.1.222/32 MED 20 Next hops 192.168.200.2 192.168.200.102
6.0.0.0/8
Source: 10.168.1.222 Nexthop: 10.168.1.222
10.168.1.222/32 MED 20 Next hops 192.168.200.2 192.168.200.102
7.0.0.0/8
Source: 10.168.1.222 Nexthop: 10.168.1.222
10.168.1.222/32 MED 20 Next hops 192.168.200.2 192.168.200.102
```

Show BGP Routes

- `show route receive-protocol bgp`
  - Look at routes received by a peer *before* policy is applied

```
user@host> show route receive-protocol bgp 11.1.1.1
inet.0: 6 destinations, 6 routes (5 active, 0 holddown, 1 hidden)
Prefix                  Nexthop    MED        Lclpref      AS path
10.0.0.0/8              11.1.1.1               100    I
172.16.0.0/12           11.1.1.1               100    I
```

- `show route advertising-protocol bgp`
  - Look at routes being advertised to a specific peer

```
user@host> show route advertising-protocol bgp 11.1.1.2
inet.0: 10 destinations, 10 routes (8 active, 0 holddown, 2 hidden)
Prefix                          Nexthop     MED            Lclpref      AS path
10.0.0.0/8                      Self                  100  I
172.16.0.0/12                   Self                  100  I
```

Looking at Specific Routes

- `show route extensive`
  - Look at specific entries in the routing table

```
user@host> show route 172.16.0.0 extensive
inet.0: 6 destinations, 6 routes (5 active, 0 holddown, 1 hidden)
+ = Active Route, - = Last Active, * = Both

172.16.0.0/12 (1 entry, 1 announced)
TSI:
BGP_Sync_Any dest 172.16.0.0/12 MED 0
        *BGP    Preference: 170/-101
                Nexthop: 11.1.1.1 via fxp0.0, selected
                State: <Active Int Ext>
                Local AS:    29 Peer AS:    29
                Age: 1d 9:46:54 Metric2: 0
                Task: BGP_29.11.1.1.1+1048
                Announcement bits (2): 0-KRT 2-BGP_Sync_Any
                AS path: I
                BGP next hop: 11.1.1.1
                Localpref: 100
                Router ID: 172.18.1.1
```