

1. Configure the respective physical interfaces & also configure the loopback interfaces on all the routers in the configuration mode as per the network topology and paste screenshots of the configuration on EACH router.

J1

```

[edit]
admin@Juniper-Router# ... unit 0 family inet address 10.0.2.5/30
[edit]
admin@Juniper-Router# ... unit 0 family inet address 10.0.2.1/30
[edit]
admin@Juniper-Router# ... 0 family inet address 5.5.5.5/32
[edit]
admin@Juniper-Router# commit
commit complete
  
```

J2

```

[edit]
admin@Juniper-Router# ... unit 0 family inet address 10.0.2.13/30
[edit]
admin@Juniper-Router#
[edit]
admin@Juniper-Router#
[edit]
admin@Juniper-Router# ... unit 0 family inet address 10.0.2.2/30
[edit]
admin@Juniper-Router# ... 0 family inet address 8.8.8.8/32
[edit]
admin@Juniper-Router# commit
commit complete
  
```

J3

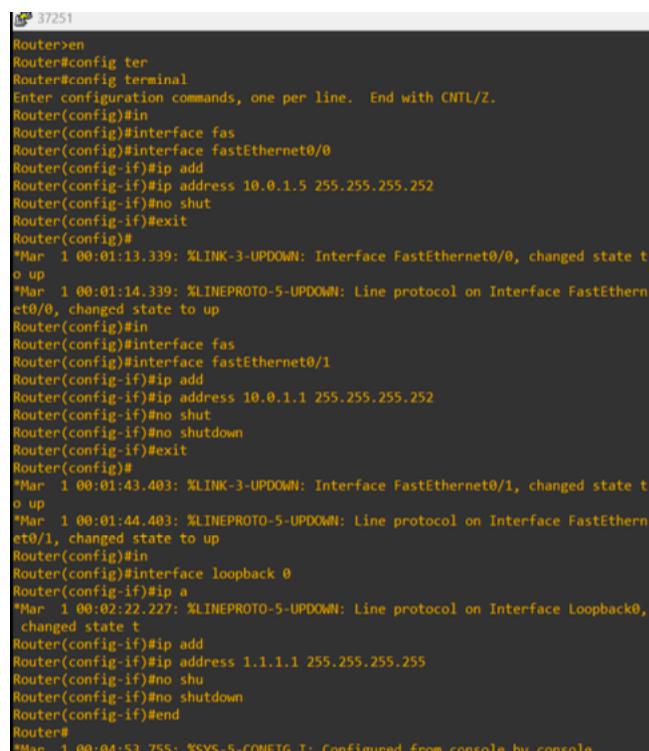
```
[edit]
admin@Juniper-Router# ... unit 0 family inet address 10.0.2.9/30

[edit]
admin@Juniper-Router# ... unit 0 family inet address 10.0.2.14/30

[edit]
admin@Juniper-Router# ... 0 family inet address 6.6.6.6/32

[edit]
admin@Juniper-Router# commit
```

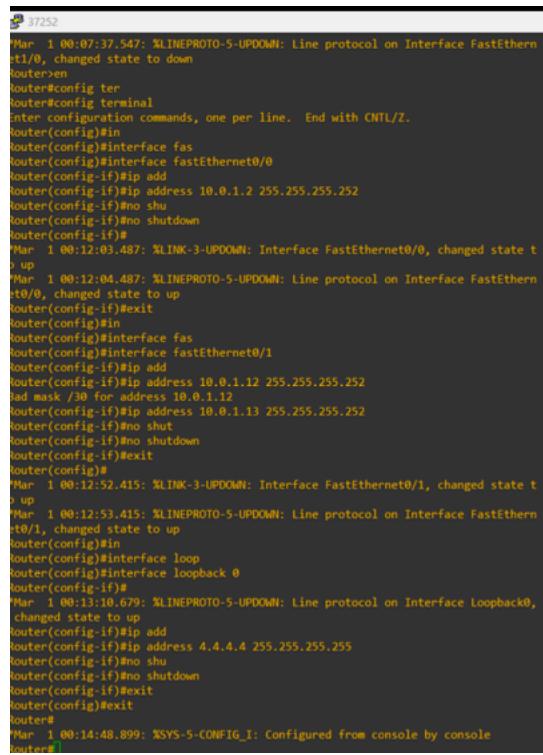
C1



A terminal window titled '37251' showing configuration and log output. The configuration includes setting up FastEthernet0/0 and FastEthernet0/1 interfaces with IP addresses 10.0.1.5 and 10.0.1.1 respectively, and a loopback interface with IP address 1.1.1.1. The log output shows various system and link events.

```
Router>en
Router#config ter
Router#config terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface fas
Router(config)#interface fastEthernet0/0
Router(config-if)#ip add
Router(config-if)#ip address 10.0.1.5 255.255.255.252
Router(config-if)#no shut
Router(config-if)#exit
Router(config)#
*Mar 1 00:01:13.339: %LINK-3-UPDOWN: Interface FastEthernet0/0, changed state to up
*Mar 1 00:01:14.339: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
Router(config)#interface fas
Router(config)#interface fastEthernet0/1
Router(config-if)#ip add
Router(config-if)#ip address 10.0.1.1 255.255.255.252
Router(config-if)#no shut
Router(config-if)#no shutdown
Router(config-if)#exit
Router(config)#
*Mar 1 00:01:43.403: %LINK-3-UPDOWN: Interface FastEthernet0/1, changed state to up
*Mar 1 00:01:44.403: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up
Router(config)#in
Router(config)#interface loopback 0
Router(config-if)#ip a
*Mar 1 00:02:22.227: %LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback0, changed state to up
Router(config-if)#ip add
Router(config-if)#ip address 1.1.1.1 255.255.255.255
Router(config-if)#no shu
Router(config-if)#no shutdown
Router(config-if)#end
Router#
*Mar 1 00:04:53.755: %SYS-5-CONFIG_I: Configured from console by console
```

C2

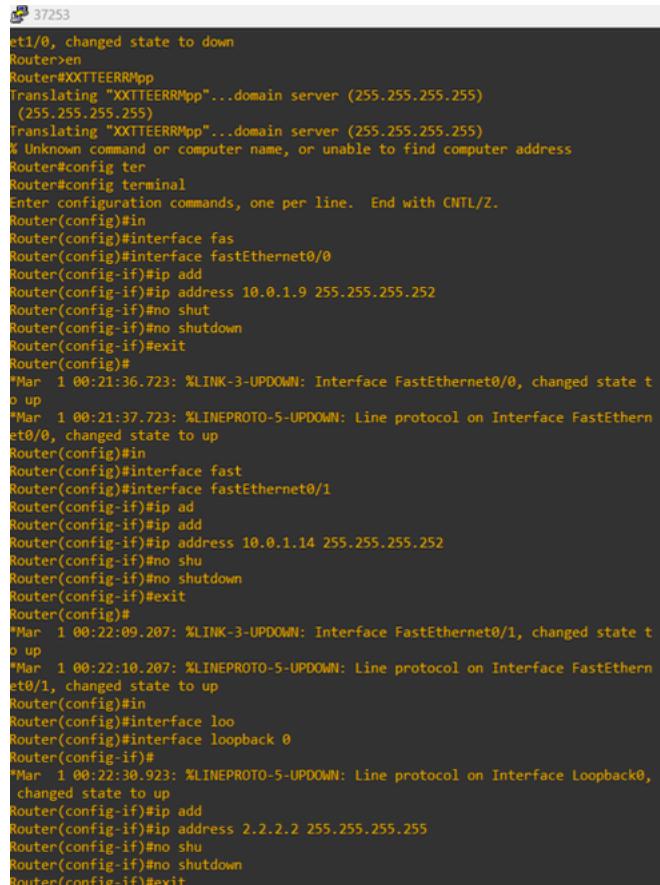


```

37252
Mar 1 00:07:37.547: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to down
Router>en
Router#config ter
Router#config terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#in
Router(config)#interface fas
Router(config)#interface fastEthernet0/0
Router(config-if)#ip add
Router(config-if)#ip address 10.0.1.2 255.255.255.252
Router(config-if)#no shu
Router(config-if)#no shutdown
Router(config-if)#
Mar 1 00:12:03.487: %LINK-3-UPDOWN: Interface FastEthernet0/0, changed state to up
Router(config-if)#
Mar 1 00:12:04.487: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
Router(config-if)#exit
Router(config)#in
Router(config)#interface fas
Router(config)#interface fastEthernet0/1
Router(config-if)#ip add
Router(config-if)#ip address 10.0.1.12 255.255.255.252
Mask /30 for address 10.0.1.12
Router(config-if)#ip address 10.0.1.13 255.255.255.252
Router(config-if)#no shut
Router(config-if)#no shutdown
Router(config-if)#
Router(config-if)#
Mar 1 00:12:52.415: %LINK-3-UPDOWN: Interface FastEthernet0/1, changed state to up
Router(config-if)#
Mar 1 00:12:53.415: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up
Router(config)#in
Router(config)#interface loop
Router(config)#interface loopback 0
Router(config)#
Mar 1 00:13:10.679: %LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback0, changed state to up
Router(config-if)#ip add
Router(config-if)#ip address 4.4.4.4 255.255.255.255
Router(config-if)#no shu
Router(config-if)#no shutdown
Router(config-if)#
Router(config)#
Router#
Mar 1 00:14:48.899: %SYS-5-CONFIG_I: Configured from console by console
Router#

```

C3

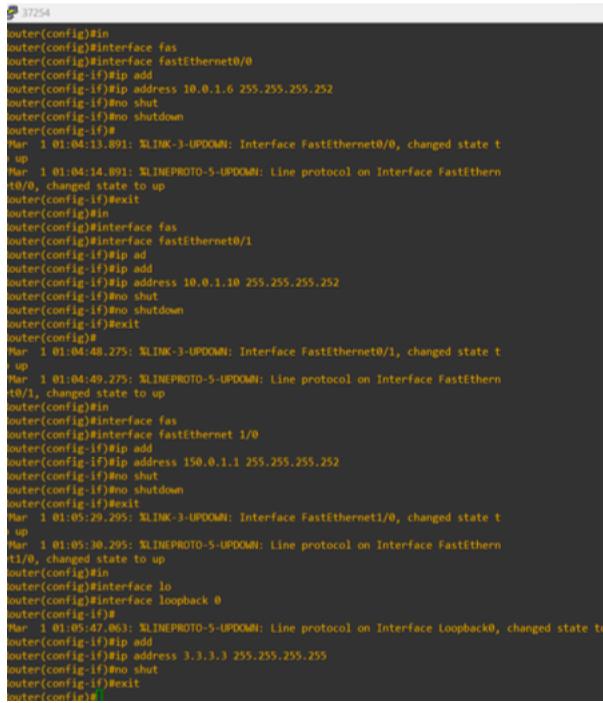


```

37253
FastEthernet0/0, changed state to down
Router>en
Router#XXTTEERRMpp
Translating "XXTTEERRMpp"...domain server (255.255.255.255)
(255.255.255.255)
Translating "XXTTEERRMpp"...domain server (255.255.255.255)
% Unknown command or computer name, or unable to find computer address
Router#config ter
Router#config terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#
Router(config)#interface fas
Router(config)#interface fastEthernet0/0
Router(config-if)#ip add
Router(config-if)#ip address 10.0.1.9 255.255.255.252
Router(config-if)#no shut
Router(config-if)#no shutdown
Router(config-if)#
Router(config)#
Mar 1 00:21:36.723: %LINK-3-UPDOWN: Interface FastEthernet0/0, changed state to up
Router(config-if)#
Mar 1 00:21:37.723: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
Router(config)#in
Router(config)#interface fast
Router(config)#interface fastEthernet0/1
Router(config-if)#ip add
Router(config-if)#ip address 10.0.1.14 255.255.255.252
Router(config-if)#no shu
Router(config-if)#no shutdown
Router(config-if)#
Router(config)#
Mar 1 00:22:09.207: %LINK-3-UPDOWN: Interface FastEthernet0/1, changed state to up
Router(config-if)#
Mar 1 00:22:10.207: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up
Router(config)#
Router(config)#in
Router(config)#interface loo
Router(config)#interface loopback 0
Router(config-if)#
Mar 1 00:22:30.923: %LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback0, changed state to up
Router(config-if)#ip add
Router(config-if)#ip address 2.2.2.2 255.255.255.255
Router(config-if)#no shu
Router(config-if)#no shutdown
Router(config-if)#

```

C4



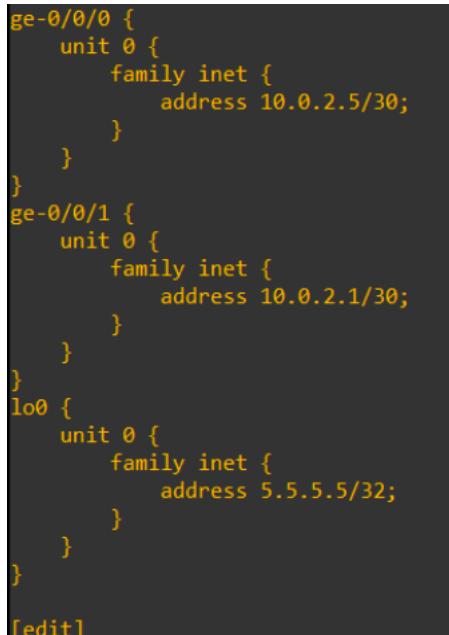
```

37254
outer(config)#interface fas
outer(config)#interface fastEthernet0/0
outer(config-if)#ip add
outer(config-if)#ip address 10.0.1.6 255.255.255.252
outer(config-if)#no shut
outer(config-if)#no shutdown
outer(config-if)#
Mar 1 01:04:13.891: %LINK-3-UPDOWN: Interface FastEthernet0/0, changed state t
+ up
Mar 1 01:04:14.891: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet
t0/0, changed state to up
outer(config-if)#exit
outer(config)#
outer(config)#interface fas
outer(config)#interface fastEthernet0/1
outer(config-if)#ip ad
outer(config-if)#ip address 10.0.1.10 255.255.255.252
outer(config-if)#no shut
outer(config-if)#no shutdown
outer(config-if)#exit
outer(config)#
Mar 1 01:04:48.275: %LINK-3-UPDOWN: Interface FastEthernet0/1, changed state t
+ up
Mar 1 01:04:49.275: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet
t0/1, changed state to up
outer(config)#
outer(config)#interface fas
outer(config)#interface fastEthernet 1/0
outer(config-if)#ip add
outer(config-if)#ip address 150.0.1.1 255.255.255.252
outer(config-if)#no shut
outer(config-if)#no shutdown
outer(config-if)#
Mar 1 01:05:29.295: %LINK-3-UPDOWN: Interface FastEthernet1/0, changed state t
+ up
Mar 1 01:05:30.295: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet
t1/0, changed state to up
outer(config)#
outer(config)#interface lo
outer(config)#interface loopback 0
outer(config-if)#
Mar 1 01:05:47.063: %LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback0, changed state to
outer(config-if)#
outer(config-if)#ip add
outer(config-if)#ip address 3.3.3.3 255.255.255.255
outer(config-if)#
outer(config-if)#exit
outer(config)#

```

2. Verify the interfaces on all the Cisco and Juniper routers and paste screenshots of the show command on EACH router.

J1



```

ge-0/0/0 {
    unit 0 {
        family inet {
            address 10.0.2.5/30;
        }
    }
}
ge-0/0/1 {
    unit 0 {
        family inet {
            address 10.0.2.1/30;
        }
    }
}
lo0 {
    unit 0 {
        family inet {
            address 5.5.5.5/32;
        }
    }
}

[edit]

```

J2

```
ge-0/0/0 {
    unit 0 {
        family inet {
            address 10.0.2.9/30;
        }
    }
}
ge-0/0/1 {
    unit 0 {
        family inet {
            address 10.0.2.14/30;
        }
    }
}
lo0 {
    unit 0 {
        family inet {
            address 6.6.6.6/32;
        }
    }
}

[edit]
```

J3

```
ge-0/0/0 {
    unit 0 {
        family inet {
            address 10.0.2.6/30;
        }
    }
}
ge-0/0/1 {
    unit 0 {
        family inet {
            address 10.0.2.10/30;
        }
    }
}
ge-0/0/2 {
    unit 0 {
        family inet {
            address 150.0.1.2/30;
        }
    }
}
lo0 {
    unit 0 {
        family inet {
            address 7.7.7.7/32;
        }
    }
}

[edit]
```

J4

```

ge-0/0/0 {
    unit 0 {
        family inet {
            address 10.0.2.13/30;
        }
    }
}
ge-0/0/1 {
    unit 0 {
        family inet {
            address 10.0.2.2/30;
        }
    }
}
lo0 {
    unit 0 {
        family inet {
            address 8.8.8.8/32;
        }
    }
}

[edit]

```

C1

```

Router>en
Router#sh ip int
Router#sh ip interface bri
Interface          IP-Address      OK? Method Status      Protocol
FastEthernet0/0    10.0.1.5       YES manual up       up
FastEthernet0/1    10.0.1.1       YES manual up       up
FastEthernet1/0    unassigned     YES unset administratively down down
Loopback0          1.1.1.1       YES manual up       up
Router#q

```

C2

```

Router>en
Router#sh ip in
Router#sh ip int
Router#sh ip interface bri
Router#sh ip interface brief
Interface          IP-Address      OK? Method Status      Prot
ocol
FastEthernet0/0    10.0.1.9       YES manual up       up
FastEthernet0/1    10.0.1.14      YES manual up       up
FastEthernet1/0    unassigned     YES unset administratively down down
Loopback0          2.2.2.2       YES manual up       up

```

C3

```
Router>en
Router#sh ip inter
Router#sh ip interface brief
Interface          IP-Address      OK? Method Status      Protocol
FastEthernet0/0    10.0.1.6        YES manual up       up
FastEthernet0/1    10.0.1.10       YES manual up       up
FastEthernet1/0    150.0.1.1       YES manual up       up
Loopback0          3.3.3.3         YES manual up       up
Router#
```

C4

```
Router>en
Router#sh ip in
Router#sh ip inter
Router#sh ip interface brief
Interface          IP-Address      OK? Method Status      Prot
ocol
FastEthernet0/0    10.0.1.2        YES manual up       up
FastEthernet0/1    10.0.1.13       YES manual up       up
FastEthernet1/0    unassigned      YES unset administratively down down
Loopback0          4.4.4.4         YES manual up       up
```

3. Configure OSPF separately for Cisco routers in AS 100 as well as for Juniper routers in AS 200. and paste screenshots of the summary of the configuration on EACH router.

C1

```
Router#config ter
Router#config terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#router ospf 1
Router(config-router)#network 10.0.1.4 0.0.0.3 area 0
Router(config-router)#network 10.0.1.0 0.0.0.3 area 0
Router(config-router)#network 1.1.1.1 0.0.0.0 area 0
Router(config-router)#end
Router#
*Mar 1 00:55:53.803: %SYS-5-CONFIG_I: Configured from console by console
Router#
```

C2

```
Router#config ter
Router#config terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#router ospf 1
Router(config-router)#net
Router(config-router)#network 10.0.1.8 0.0.0.3 area 0
Router(config-router)#network 10.0.1.12 0.0.0.3 area 0
Router(config-router)#network 2.2.2.2 0.0.0.0 area 0
Router(config-router)#[
```

C3

```

Router>en
Router#config ter
Router#config terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#router ospf 1
Router(config-router)#network 10.0.1.4 0.0.0.3 area 0
Router(config-router)#
*Mar 1 01:36:16.731: %OSPF-5-ADJCHG: Process 1, Nbr 1.1.1.1 on FastEthernet0/0
from LOADING to FULL, Loading Done
Router(config-router)#network 10.0.1.8 0.0.0.3 area 0
Router(config-router)#
*Mar 1 01:36:40.171: %OSPF-5-ADJCHG: Process 1, Nbr 2.2.2.2 on FastEthernet0/1
from LOADING to FULL, Loading Done
Router(config-router)#network 150.0.1.0 0.0.0.0 area 0
Router(config-router)#network 3.3.3.3 0.0.0.0 area 0
Router(config-router)#end
Router#
*Mar 1 01:37:17.967: %SYS-5-CONFIG_I: Configured from console by console

```

C4

```

Router>
Router>en
Router#config ter
Router#config terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#router ospf 1
Router(config-router)#network 10.0.1.0 0.0.0.3 area 0
Router(config-router)#
*Mar 1 01:00:56.751: %OSPF-5-ADJCHG: Process 1, Nbr 1.1.1.1 on FastEthernet0/0
from LOADING to FULL, Loading Done
Router(config-router)#network 10.0.1.12 0.0.0.3 area 0
Router(config-router)#
*Mar 1 01:01:14.827: %OSPF-5-ADJCHG: Process 1, Nbr 2.2.2.2 on FastEthernet0/1
from LOADING to FULL, Loading Done
Router(config-router)#network 4.4.4.4 0.0.0.0 area 0
Router(config-router)#end
Router#
*Mar 1 01:01:30.795: %SYS-5-CONFIG_I: Configured from console by console

```

4. Verify OSPF neighborship on all the Routers. and paste screenshots of the appropriate show command on EACH router.

R1

```

Router>en
Router#sh ip ospf neig
Router#sh ip ospf neighbor

Neighbor ID      Pri   State            Dead Time     Address          Interface
4.4.4.4           1    FULL/BDR        00:00:32      10.0.1.2       FastEthernet0/1
3.3.3.3           1    FULL/BDR        00:00:36      10.0.1.6       FastEthernet0/0
Router#
```

C2

```
*Mar 1 01:03:30.823: %SYS-5-CONFIG_I: Configured from console by console
Router>en
Router#sh ip ospf nei
Router#sh ip ospf neighbor

Neighbor ID      Pri  State            Dead Time    Address          Interface
4.4.4.4           1    FULL/BDR        00:00:33    10.0.1.13       FastEthernet0/1
3.3.3.3           1    FULL/BDR        00:00:37    10.0.1.10       FastEthernet0/0
Router#
```

C3

```
Router>en
Router#sh ip ospf nei
Router#sh ip ospf neighbor

Neighbor ID      Pri  State            Dead Time    Address          Interface
2.2.2.2           1    FULL/DR         00:00:36    10.0.1.9        FastEthernet0/1
1.1.1.1           1    FULL/DR         00:00:32    10.0.1.5        FastEthernet0/0
Router#
```

C4

```
Router>en
Router#sh ip ospf nei
Router#sh ip ospf neighbor

Neighbor ID      Pri  State            Dead Time    Address          Interface
2.2.2.2           1    FULL/DR         00:00:36    10.0.1.14       FastEthernet0/1
1.1.1.1           1    FULL/DR         00:00:38    10.0.1.1        FastEthernet0/0
Router#
```

J1

Address	Interface	State	ID	Pri	Dead
10.0.2.6	ge-0/0/0.0	Full	7.7.7.7	128	31
10.0.2.2	ge-0/0/1.0	Full	8.8.8.8	128	34

J2

Address	Interface	State	ID	Pri	Dead
10.0.2.10	ge-0/0/0.0	ExStart	7.7.7.7	128	39
10.0.2.13	ge-0/0/1.0	Full	8.8.8.8	128	36

J3

Address	Interface	State	ID	Pri	Dead
10.0.2.5	ge-0/0/0.0	Full	5.5.5.5	128	35
10.0.2.9	ge-0/0/1.0	ExStart	6.6.6.6	128	35

J4

Address	Interface	State	ID	Pri	Dead
10.0.2.14	ge-0/0/0.0	Full	6.6.6.6	128	37
10.0.2.1	ge-0/0/1.0	Full	5.5.5.5	128	37

5. Configure I-BGP in AS 100 between routers C1, C2 and C3. (Note: Do not configure BGP on C4 and do not forget NEXT-HOP-SELF). and paste screenshots of the summary of configuration on EACH router.

C1

```
Router#config ter
Router#config terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#router bgp [~[~[~
^
% Invalid input detected at '^' marker.

Router(config)#router bgp 100
Router(config-router)#nei
Router(config-router)#neighbor 3.3.3.3 rem
Router(config-router)#neighbor 3.3.3.3 remote-as 100
Router(config-router)#
Router(config-router)#neighbor 3.3.3.3 remote
*Mar 1 02:19:26.875: %OSPF-5-ADJCHG: Process 1, Nbr 4.4.4.4 on FastEthernet0/1
from LOADING to FULL, Loading Done
*Mar 1 02:19:26.879: %OSPF-5-ADJCHG: Process 1, Nbr 3.3.3.3 on FastEthernet0/0
from LOADING to exit
^
% Invalid input detected at '^' marker.

Router(config-router)#exit
Router(config)#exit
Router#
*Mar 1 02:21:58.855: %SYS-5-CONFIG_I: Configured from console by console
Router#config router
^
% Invalid input detected at '^' marker.

Router#config ter
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#router bgp 100
Router(config-router)#neighbor 3.3.3.3 upd
Router(config-router)#neighbor 3.3.3.3 update-source loopback 0
Router(config-router)#neighbor 3.3.3.3 net
Router(config-router)#neighbor 3.3.3.3 nex
Router(config-router)#neighbor 3.3.3.3 next-hop-self
Router(config-router)#neigh
Router(config-router)#neighbor 2.2.2.2 remo
Router(config-router)#neighbor 2.2.2.2 remote-as 100
Router(config-router)#neighbor 2.2.2.2 ne
Router(config-router)#neighbor 2.2.2.2 next-hop-self
Router(config-router)#end
```

C2

```
Router#config ter
Router#config terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#router bgp 100
Router(config-router)#net
Router(config-router)#network 10.0.1.0 mask 255.255.255.252
Router(config-router)#network 10.0.1.4 mask 255.255.255.252
Router(config-router)#network 1.1.1.1 mask 255.255.255.255
Router(config-router)#end
Router#
*Mar 1 02:26:13.167: %SYS-5-CONFIG_I: Configured from console by console
Router#
```

```
Router>en
Router#config ter
Router#config terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#router bgp 100
Router(config-router)#neigh
Router(config-router)#neighbor 1.1.1.1 remo
Router(config-router)#neighbor 1.1.1.1 remote-as 100
Router(config-router)#neighbor 1.1.1.1 update-s
Router(config-router)#neighbor 1.1.1.1 update-source loopback 0
Router(config-router)#
*Mar 1 02:42:43.091: %BGP-5-ADJCHANGE: neighbor 1.1.1.1 Up
Router(config-router)#neigh
Router(config-router)#neighbor 1.1.1.1 nex
Router(config-router)#neighbor 1.1.1.1 next-hop-self
Router(config-router)#end
Router#
*Mar 1 02:43:11.883: %SYS-5-CONFIG_I: Configured from console by console
Router#config ter
Router#config terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#router bgp 100
Router(config-router)#net
Router(config-router)#network 10.0.1.12 mask 255.255.255.252
Router(config-router)#netw
Router(config-router)#network 10.0.1.8 mask 255.255.255.252
Router(config-router)#network 2.2.2.2 mask 255.255.255.255
Router(config-router)#end
```

C3

```
Router#config ter
Router#config terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#router bgp 100
Router(config-router)#neigh
Router(config-router)#neighbor 1.1.1.1 remo
Router(config-router)#neighbor 1.1.1.1 remote
Router(config-router)#neighbor 1.1.1.1 remote-as 100
Router(config-router)#neigh
Router(config-router)#neighbor 1.1.1. upd
Router(config-router)#neighbor 1.1.1. update-source ;
*Mar 1 03:26:03.199: %BGP-5-neighbor 1.1.1. upda
Router(config-router)#neighbor 1.1.1. update-source loo
Router(config-router)#neighbor 1.1.1. update-source loopback 0
% Specify remote-as or peer-group commands first
Router(config-router)#neighbor 1.1.1.1 update-source loopback 0
Router(config-router)#neigh
Router(config-router)#neighbor 1.1.1.1 next
Router(config-router)#neighbor 1.1.1.1 next-hop-self
Router(config-router)#neigh
Router(config-router)#neighbor 2.2.2.2 remo
Router(config-router)#neighbor 2.2.2.2 remote
Router(config-router)#neighbor 2.2.2.2 remote-as 100
Router(config-router)#neighbor 2.2.2.2 upd
Router(config-router)#neighbor 2.2.2.2 update-source loopback 0
Router(config-router)#neigh
Router(config-router)#neighbor 2.2.2.2 next
Router(config-router)#neighbor 2.2.2.2 next-hop-self
Router(config-router)#end
Router#
*Mar 1 03:27:51.767: %SYS-5-CONFIG_I: Configured from console by console
Router#config ter
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#router bgp 100
Router(config-router)#net
Router(config-router)#network 10.0.1.8 mask 255.255.255.252
Router(config-router)#network 10.0.1.4 mask 255.255.255.252
Router(config-router)#network 3.3.3.3 mask 255.255.255.255
Router(config-router)#end
```

6. Verify I-BGP neighborship between above configured Routers and paste screenshots of the appropriate show command on EACH router.

C1

```
Router#sh ip bgp neighbors
BGP neighbor is 2.2.2.2, remote AS 100, internal link
  BGP version 4, remote router ID 2.2.2.2
  BGP state = Established, up for 00:08:39
  Last read 00:00:39, last write 00:00:39, hold time is 180, keepalive interval is 60 seconds
  Neighbor capabilities:
    Route refresh: advertised and received(old & new)
    Address family IPv4 Unicast: advertised and received
  Message statistics:
    InQ depth is 0
    OutQ depth is 0
      Sent          Rcvd
    Opens:           1          1
    Notifications:  0          0
    Updates:        1          3
    Keepalives:     11         11
    Route Refresh:  0          0
    Total:          13         15
  Default minimum time between advertisement runs is 0 seconds
```

```
BGP neighbor is 3.3.3.3, remote AS 100, internal link
  BGP version 4, remote router ID 3.3.3.3
  BGP state = Established, up for 00:03:26
  Last read 00:00:26, last write 00:00:26, hold time is 180, keepalive interval is 60 seconds
  Neighbor capabilities:
    Route refresh: advertised and received(old & new)
    Address family IPv4 Unicast: advertised and received
  Message statistics:
    InQ depth is 0
    OutQ depth is 0
      Sent          Rcvd
    Opens:           1          1
    Notifications:  0          0
    Updates:        1          3
    Keepalives:     6          6
    Route Refresh:  0          0
    Total:          8          10
  Default minimum time between advertisement runs is 0 seconds
```

C2

```
Router#sh ip bgp neighbors
BGP neighbor is 1.1.1.1, remote AS 100, internal link
  BGP version 4, remote router ID 1.1.1.1
  BGP state = Established, up for 00:09:08
  Last read 00:00:08, last write 00:00:08, hold time is 180, keepalive interval
is 60 seconds
  Neighbor capabilities:
    Route refresh: advertised and received(old & new)
    Address family IPv4 Unicast: advertised and received
  Message statistics:
    InQ depth is 0
    OutQ depth is 0
      Sent          Rcvd
    Opens:           1          1
    Notifications:  0          0
    Updates:         3          1
    Keepalives:     12         12
    Route Refresh:  0          0
    Total:          16         14
  Default minimum time between advertisement runs is 0 seconds
```

```
BGP neighbor is 3.3.3.3, remote AS 100, internal link
  BGP version 4, remote router ID 3.3.3.3
  BGP state = Established, up for 00:01:06
  Last read 00:00:06, last write 00:00:06, hold time is 180, keepalive interval is 60 seconds
  Neighbor capabilities:
    Route refresh: advertised and received(old & new)
    Address family IPv4 Unicast: advertised and received
  Message statistics:
    InQ depth is 0
    OutQ depth is 0
      Sent          Rcvd
    Opens:           1          1
    Notifications:  0          0
    Updates:         3          1
    Keepalives:     4          4
    Route Refresh:  0          0
    Total:          8          6
  Default minimum time between advertisement runs is 0 seconds
```

C3

```

Router#sh ip bgp neighbor
Router#sh ip bgp neighbors
BGP neighbor is 1.1.1.1, remote AS 100, internal link
  BGP version 4, remote router ID 1.1.1.1
  BGP state = Established, up for 00:02:55
  Last read 00:00:55, last write 00:00:12, hold time is 180, keepalive interval
is 60 seconds
  Neighbor capabilities:
    Route refresh: advertised and received(old & new)
    Address family IPv4 Unicast: advertised and received
  Message statistics:
    InQ depth is 0
    OutQ depth is 0
      Sent          Rcvd
    Opens:           1          1
    Notifications:  0          0
    Updates:         3          1
    Keepalives:     5          5
    Route Refresh:  0          0
    Total:          9          7
  Default minimum time between advertisement runs is 0 seconds

```

```

BGP neighbor is 2.2.2.2, remote AS 100, internal link
  BGP version 4, remote router ID 2.2.2.2
  BGP state = Established, up for 00:02:01
  Last read 00:00:01, last write 00:00:01, hold time is 180, keepalive interval is 60 seconds
  Neighbor capabilities:
    Route refresh: advertised and received(old & new)
    Address family IPv4 Unicast: advertised and received
  Message statistics:
    InQ depth is 0
    OutQ depth is 0
      Sent          Rcvd
    Opens:           1          1
    Notifications:  0          0
    Updates:         1          3
    Keepalives:     5          5
    Route Refresh:  0          0
    Total:          7          9
  Default minimum time between advertisement runs is 0 seconds

```

8. Verify I-BGP neighborship between above configured Routers and paste screenshots of the appropriate show command on EACH router.

J1

```

Peer: 6.6.6.6 AS 200          Local: 5.5.5.5 AS 200
  Type: Internal   State: Active   Flags: <>
  Last State: Idle       Last Event: Start
  Last Error: None
  Export: [ send-direct ]
  Options: <Preference LocalAddress Refresh>
  Local Address: 5.5.5.5 Holdtime: 90 Preference: 170
  Number of flaps: 0

Peer: 7.7.7.7 AS 200          Local: 5.5.5.5 AS 200
  Type: Internal   State: Active   Flags: <>
  Last State: Idle       Last Event: Start
  Last Error: None
  Export: [ send-direct ]
  Options: <Preference LocalAddress Refresh>
  Local Address: 5.5.5.5 Holdtime: 90 Preference: 170
  Number of flaps: 0

```

J2

```
Peer: 5.5.5.5+179 AS 200      Local: 6.6.6.6+51214 AS 200
  Type: Internal    State: Established   Flags: <Sync>
  Last State: OpenConfirm   Last Event: RecvKeepAlive
  Last Error: None
  Export: [ send-direct ]
  Options: <Preference LocalAddress Refresh>
  Local Address: 6.6.6.6 Holdtime: 90 Preference: 170
  Number of flaps: 0
  Peer ID: 5.5.5.5          Local ID: 6.6.6.6          Active Holdtime: 90
  Keepalive Interval: 30      Group index: 0      Peer index: 0
  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
  Peer does not support Restarter functionality
  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 supports 4 byte AS extension (peer-as 200)
  Peer does not support Addpath
  Table inet.0 Bit: 10000
    RIB State: BGP restart is complete
    Send state: in sync
    Active prefixes: 0
    Received prefixes: 3
    Accepted prefixes: 3
    Suppressed due to damping: 0
    Advertised prefixes: 3
  Last traffic (seconds): Received 4    Sent 24    Checked 31
  Input messages: Total 15    Updates 2    Refreshes 0    Octets 329
  Output messages: Total 11    Updates 1    Refreshes 0    Octets 312
  Output Queue[0]: 0
```

```
Peer: 7.7.7.7+60357 AS 200      Local: 6.6.6.6+179 AS 200
  Type: Internal    State: Established   Flags: <Sync>
  Last State: OpenConfirm   Last Event: RecvKeepAlive
  Last Error: None
  Export: [ send-direct ]
  Options: <Preference LocalAddress Refresh>
  Local Address: 6.6.6.6 Holdtime: 90 Preference: 170
  Number of flaps: 0
  Peer ID: 7.7.7.7          Local ID: 6.6.6.6          Active Holdtime: 90
  Keepalive Interval: 30          Group index: 0          Peer index: 1
  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
  Peer does not support Restarter functionality
  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 supports 4 byte AS extension (peer-as 200)
  Peer does not support Addpath
  Table inet.0 Bit: 10000
    RIB State: BGP restart is complete
    Send state: in sync
    Active prefixes:           1
    Received prefixes:         4
    Accepted prefixes:         4
    Suppressed due to damping: 0
    Advertised prefixes:       3
  Last traffic (seconds): Received 15  Sent 15  Checked 71
  Input messages: Total 7      Updates 2      Refreshes 0      Octets 222
  Output messages: Total 5     Updates 1      Refreshes 0      Octets 198
  Output Queue[0]: 0
```

```
Peer: 5.5.5.5+179 AS 200          Local: 7.7.7.7+59019 AS 200
  Type: Internal    State: Established    Flags: <Sync>
  Last State: OpenConfirm   Last Event: RecvKeepAlive
  Last Error: None
  Export: [ send-direct ]
  Options: <Preference LocalAddress Refresh>
  Local Address: 7.7.7.7 Holdtime: 90 Preference: 170
  Number of flaps: 0
  Peer ID: 5.5.5.5          Local ID: 7.7.7.7          Active Holdtime: 90
  Keepalive Interval: 30          Group index: 0          Peer index: 1
  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
  Peer does not support Restarter functionality
  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 supports 4 byte AS extension (peer-as 200)
  Peer does not support Addpath
  Table inet.0 Bit: 10000
    RIB State: BGP restart is complete
    Send state: in sync
    Active prefixes: 0
    Received prefixes: 3
    Accepted prefixes: 3
    Suppressed due to damping: 0
    Advertised prefixes: 4
  Last traffic (seconds): Received 0    Sent 19    Checked 44
  Input messages: Total 10    Updates 2    Refreshes 0    Octets 234
  Output messages: Total 10    Updates 1    Refreshes 0    Octets 298
  Output Queue[0]: 0
```

```

Peer: 7.7.7.7+60357 AS 200      Local: 6.6.6.6+179 AS 200
  Type: Internal    State: Established   Flags: <Sync>
  Last State: OpenConfirm   Last Event: RecvKeepAlive
  Last Error: None
  Export: [ send-direct ]
  Options: <Preference LocalAddress Refresh>
  Local Address: 6.6.6.6 Holdtime: 90 Preference: 170
  Number of flaps: 0
  Peer ID: 7.7.7.7          Local ID: 6.6.6.6          Active Holdtime: 90
  Keepalive Interval: 30          Group index: 0          Peer index: 1
  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
  Peer does not support Restarter functionality
  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 supports 4 byte AS extension (peer-as 200)
  Peer does not support Addpath
  Table inet.0 Bit: 10000
    RIB State: BGP restart is complete
    Send state: in sync
    Active prefixes:           1
    Received prefixes:         4
    Accepted prefixes:         4
    Suppressed due to damping: 0
    Advertised prefixes:       3
  Last traffic (seconds): Received 15  Sent 15  Checked 71
  Input messages: Total 7      Updates 2      Refreshes 0      Octets 222
  Output messages: Total 5     Updates 1      Refreshes 0      Octets 198
  Output Queue[0]: 0

```

C3

```

Router>en
Router#config ter
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#router bgp 100
Router(config-router)#neighbor 7.7.7.7 remote-as 200
Router(config-router)#neighbor 7.7.7.7 upd
Router(config-router)#neighbor 7.7.7.7 update-source loo
Router(config-router)#neighbor 7.7.7.7 update-source loopback 0
Router(config-router)#neigh
Router(config-router)#neighbor 7.7.7.7 eb
Router(config-router)#neighbor 7.7.7.7 ebgp-multipath 2
Router(config-router)#end
Router#

```

9. Configure E-BGP neighborship between C3 and J3. Before that we need to configure Static Route on C3 and J3, so that they can reach each other's Loopback 0. and paste screenshot of the static route configured on C3 and J3 as well as the configuration summary.

```

Peer: 5.5.5.5+179 AS 200      Local: 7.7.7.7+59019 AS 200
Type: Internal    State: Established    Flags: <Sync>
Last State: OpenConfirm   Last Event: RecvKeepAlive
Last Error: None
Export: [ send-direct ]
Options: <Preference LocalAddress Refresh>
Local Address: 7.7.7.7 Holdtime: 90 Preference: 170
Number of flaps: 0
Peer ID: 5.5.5.5          Local ID: 7.7.7.7          Active Holdtime: 90
Keepalive Interval: 30      Group index: 0      Peer index: 1
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
Peer does not support Restarter functionality
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 supports 4 byte AS extension (peer-as 200)
Peer does not support Addpath
Table inet.0 Bit: 10000
  RIB State: BGP restart is complete
  Send state: in sync
  Active prefixes: 0
  Received prefixes: 3
  Accepted prefixes: 3
  Suppressed due to damping: 0
  Advertised prefixes: 4
Last traffic (seconds): Received 0    Sent 19    Checked 44
Input messages: Total 10    Updates 2    Refreshes 0    Octets 234
Output messages: Total 10    Updates 1    Refreshes 0    Octets 298
Output Queue[0]: 0

```

10. Verify E-BGP neighborship between above configured Routers. and paste screenshots of the appropriate show command on the routers given below.

J3

```

Peer: 3.3.3.3 AS 200          Local: 7.7.7.7 AS 200
Type: Internal    State: Active      Flags: <>
Last State: Idle        Last Event: Start
Last Error: None
Export: [ send-direct ]
Options: <Preference LocalAddress Refresh>
Local Address: 7.7.7.7 Holdtime: 90 Preference: 170
Number of flaps: 0

```

C3

```
BGP neighbor is 7.7.7.7, remote AS 200, external link
BGP version 4, remote router ID 0.0.0.0
BGP state = Active
Last read 00:00:32, last write 00:00:32, hold time is 180, keepalive interval
is 60 seconds
Message statistics:
  InQ depth is 0
  OutQ depth is 0
          Sent      Rcvd
  Opens:          0          0
  Notifications: 0          0
  Updates:        0          0
  Keepalives:     0          0
  Route Refresh: 0          0
  Total:          0          0
Default minimum time between advertisement runs is 30 seconds

For address family: IPv4 Unicast
  BGP table version 14, neighbor version 0/0
  Output queue size : 0
    Index 2, Offset 0, Mask 0x4
  2 update-group member
          Sent      Rcvd
  Prefix activity:  ----  -----
    Prefixes Current:   0          0
    Prefixes Total:     0          0
    Implicit Withdraw: 0          0
    Explicit Withdraw: 0          0
    Used as bestpath:   n/a        0
    Used as multipath:  n/a        0
          Outbound    Inbound
  Local Policy Denied Prefixes:  -----  -----
    Total:                0          0
  Number of NLRI's in the update sent: max 0, min 0

  Connections established 0; dropped 0
  Last reset never
  External BGP neighbor may be up to 2 hops away.
  No active TCP connection.
```

12. Verify routes in the routing Table for C1, C3, C4 and J1, J3, J4 routers. and paste screenshots of the appropriate show command on EACH router.

C1

```
Router#sh ip route
Codes: C - connected, S - static, R - RIP, M - mobile, B - BGP
      D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
      N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
      E1 - OSPF external type 1, E2 - OSPF external type 2
      i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
      ia - IS-IS inter area, * - candidate default, U - per-user static route
      o - ODR, P - periodic downloaded static route

Gateway of last resort is not set

      1.0.0.0/32 is subnetted, 1 subnets
C        1.1.1.1 is directly connected, Loopback0
      2.0.0.0/32 is subnetted, 1 subnets
O          2.2.2.2 [110/21] via 10.0.1.6, 02:02:57, FastEthernet0/0
                  [110/21] via 10.0.1.2, 02:02:57, FastEthernet0/1
      3.0.0.0/32 is subnetted, 1 subnets
O          3.3.3.3 [110/11] via 10.0.1.6, 02:02:57, FastEthernet0/0
      4.0.0.0/32 is subnetted, 1 subnets
O          4.4.4.4 [110/11] via 10.0.1.2, 02:02:57, FastEthernet0/1
      5.0.0.0/32 is subnetted, 1 subnets
B          5.5.5.5 [200/1] via 3.3.3.3, 01:30:05
      6.0.0.0/32 is subnetted, 1 subnets
B          6.6.6.6 [200/1] via 3.3.3.3, 01:30:05
      7.0.0.0/32 is subnetted, 1 subnets
B          7.7.7.7 [200/0] via 3.3.3.3, 01:30:06
      10.0.0.0/30 is subnetted, 8 subnets
B            10.0.2.8 [200/0] via 3.3.3.3, 01:30:06
O            10.0.1.8 [110/20] via 10.0.1.6, 02:03:00, FastEthernet0/0
B            10.0.2.12 [200/2] via 3.3.3.3, 01:30:06
O            10.0.1.12 [110/20] via 10.0.1.2, 02:03:00, FastEthernet0/1
B            10.0.2.0 [200/2] via 3.3.3.3, 01:30:06
C            10.0.1.0 is directly connected, FastEthernet0/1
B            10.0.2.4 [200/0] via 3.3.3.3, 01:30:06
C            10.0.1.4 is directly connected, FastEthernet0/0
      150.0.0.0/30 is subnetted, 1 subnets
B            150.0.1.0 [200/0] via 3.3.3.3, 01:30:06
```

C2

```
Router>en
Router#sh ip route
Codes: C - connected, S - static, R - RIP, M - mobile, B - BGP
      D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
      N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
      E1 - OSPF external type 1, E2 - OSPF external type 2
      i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level
      ia - IS-IS inter area, * - candidate default, U - per-user static r
      o - ODR, P - periodic downloaded static route

Gateway of last resort is not set

      1.0.0.0/32 is subnetted, 1 subnets
0          1.1.1.1 [110/21] via 10.0.1.13, 02:03:14, FastEthernet0/1
                  [110/21] via 10.0.1.10, 02:03:14, FastEthernet0/0
      2.0.0.0/32 is subnetted, 1 subnets
C          2.2.2.2 is directly connected, Loopback0
      3.0.0.0/32 is subnetted, 1 subnets
0          3.3.3.3 [110/11] via 10.0.1.10, 02:03:14, FastEthernet0/0
      4.0.0.0/32 is subnetted, 1 subnets
0          4.4.4.4 [110/11] via 10.0.1.13, 02:03:14, FastEthernet0/1
      5.0.0.0/32 is subnetted, 1 subnets
B          5.5.5.5 [200/1] via 3.3.3.3, 00:33:01
      6.0.0.0/32 is subnetted, 1 subnets
B          6.6.6.6 [200/1] via 3.3.3.3, 00:33:01
      7.0.0.0/32 is subnetted, 1 subnets
B          7.7.7.7 [200/0] via 3.3.3.3, 00:33:01
      10.0.0.0/30 is subnetted, 8 subnets
B          10.0.2.8 [200/0] via 3.3.3.3, 00:33:01
C          10.0.1.8 is directly connected, FastEthernet0/0
B          10.0.2.12 [200/2] via 3.3.3.3, 00:33:01
C          10.0.1.12 is directly connected, FastEthernet0/1
B          10.0.2.0 [200/2] via 3.3.3.3, 00:33:01
0          10.0.1.0 [110/20] via 10.0.1.13, 02:03:15, FastEthernet0/1
B          10.0.2.4 [200/0] via 3.3.3.3, 00:33:01
0          10.0.1.4 [110/20] via 10.0.1.10, 02:03:15, FastEthernet0/0
      150.0.0.0/30 is subnetted, 1 subnets
B          150.0.1.0 [200/0] via 3.3.3.3, 00:33:01
Router#ping 5.5.5.5

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 5.5.5.5, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 20/20/24 ms
Router#ping 5.5.5.5 r 100
```

```
Router#  
Router#sh ip route  
Codes: C - connected, S - static, R - RIP, M - mobile, B - BGP  
      D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area  
      N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2  
      E1 - OSPF external type 1, E2 - OSPF external type 2  
      i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2  
      ia - IS-IS inter area, * - candidate default, U - per-user static route  
      o - ODR, P - periodic downloaded static route  
  
Gateway of last resort is not set  
  
      1.0.0.0/32 is subnetted, 1 subnets  
O         1.1.1.1 [110/11] via 10.0.1.5, 02:11:51, FastEthernet0/0  
      2.0.0.0/32 is subnetted, 1 subnets  
O         2.2.2.2 [110/11] via 10.0.1.9, 02:11:51, FastEthernet0/1  
      3.0.0.0/32 is subnetted, 1 subnets  
C         3.3.3.3 is directly connected, Loopback0  
      4.0.0.0/32 is subnetted, 1 subnets  
O         4.4.4.4 [110/21] via 10.0.1.9, 02:11:51, FastEthernet0/1  
                  [110/21] via 10.0.1.5, 02:11:51, FastEthernet0/0  
      5.0.0.0/32 is subnetted, 1 subnets  
B         5.5.5.5 [20/1] via 7.7.7.7, 01:38:58  
      6.0.0.0/32 is subnetted, 1 subnets  
B         6.6.6.6 [20/1] via 7.7.7.7, 01:38:58  
      7.0.0.0/32 is subnetted, 1 subnets  
S         7.7.7.7 [1/0] via 150.0.1.2  
      10.0.0.0/30 is subnetted, 8 subnets  
B         10.0.2.8 [20/0] via 7.7.7.7, 01:38:59  
C         10.0.1.8 is directly connected, FastEthernet0/1  
B         10.0.2.12 [20/2] via 7.7.7.7, 01:38:59  
O         10.0.1.12 [110/20] via 10.0.1.9, 02:11:53, FastEthernet0/1  
B         10.0.2.0 [20/2] via 7.7.7.7, 01:38:59  
O         10.0.1.0 [110/20] via 10.0.1.5, 02:11:53, FastEthernet0/0  
B         10.0.2.4 [20/0] via 7.7.7.7, 01:38:59  
C         10.0.1.4 is directly connected, FastEthernet0/0  
      150.0.0.0/30 is subnetted, 1 subnets  
C         150.0.1.0 is directly connected, FastEthernet1/0  
Router#
```

J1

```
inet.0: 16 destinations, 26 routes (16 active, 0 holddown, 2 hidden)
+ = Active Route, - = Last Active, * = Both

2.2.2.2/32      *[BGP/170] 00:09:16, localpref 100, from 7.7.7.7
                  AS path: 100 I, validation-state: unverified
                  > to 10.0.2.6 via ge-0/0/0.0
3.3.3.3/32      *[BGP/170] 00:09:16, localpref 100, from 7.7.7.7
                  AS path: I, validation-state: unverified
                  > to 10.0.2.6 via ge-0/0/0.0
5.5.5.5/32      *[Direct/0] 01:52:49
                  > via lo0.0
6.6.6.6/32      *[OSPF/10] 01:50:22, metric 2
                  > to 10.0.2.6 via ge-0/0/0.0
                  to 10.0.2.2 via ge-0/0/1.0
                  [BGP/170] 01:49:41, localpref 100, from 6.6.6.6
                  AS path: I, validation-state: unverified
                  > to 10.0.2.6 via ge-0/0/0.0
                  to 10.0.2.2 via ge-0/0/1.0
                  [BGP/170] 00:09:16, MED 1, localpref 100, from 7.7.7.7
                  AS path: I, validation-state: unverified
                  > to 10.0.2.6 via ge-0/0/0.0
7.7.7.7/32      *[OSPF/10] 01:50:22, metric 1
                  > to 10.0.2.6 via ge-0/0/0.0
                  [BGP/170] 00:09:16, localpref 100, from 7.7.7.7
                  AS path: I, validation-state: unverified
                  > to 10.0.2.6 via ge-0/0/0.0
10.0.1.4/30     *[BGP/170] 00:09:16, MED 0, localpref 100, from 7.7.7.7
                  AS path: 100 I, validation-state: unverified
                  > to 10.0.2.6 via ge-0/0/0.0
10.0.1.8/30     *[BGP/170] 00:09:16, MED 0, localpref 100, from 7.7.7.7
                  AS path: 100 I, validation-state: unverified
                  > to 10.0.2.6 via ge-0/0/0.0
10.0.1.12/30    *[BGP/170] 00:09:16, localpref 100, from 7.7.7.7
                  AS path: 100 I, validation-state: unverified
                  > to 10.0.2.6 via ge-0/0/0.0
10.0.2.0/30     *[Direct/0] 01:51:14
                  > via ge-0/0/1.0
10.0.2.1/32     *[Local/0] 01:51:15
                  Local via ge-0/0/1.0
10.0.2.4/30     *[Direct/0] 01:51:14
                  > via ge-0/0/0.0
                  [BGP/170] 00:09:16, localpref 100, from 7.7.7.7
                  AS path: I, validation-state: unverified
                  > to 10.0.2.6 via ge-0/0/0.0
10.0.2.5/32     *[Local/0] 01:51:15
                  Local via ge-0/0/0.0
```

```
      Local via ge-0/0/1.0
10.0.2.4/30      *[Direct/0] 01:51:14
                  > via ge-0/0/0.0
                  [BGP/170] 00:09:16, localpref 100, from 7.7.7.7
                      AS path: I, validation-state: unverified
                  > to 10.0.2.6 via ge-0/0/0.0
10.0.2.5/32      *[Local/0] 01:51:15
                  Local via ge-0/0/0.0
10.0.2.8/30      *[OSPF/10] 01:50:22, metric 2
                  > to 10.0.2.6 via ge-0/0/0.0
                  [BGP/170] 00:09:16, localpref 100, from 7.7.7.7
                      AS path: I, validation-state: unverified
                  > to 10.0.2.6 via ge-0/0/0.0
                  [BGP/170] 01:49:41, localpref 100, from 6.6.6.6
                      AS path: I, validation-state: unverified
                  > to 10.0.2.6 via ge-0/0/0.0
                  to 10.0.2.2 via ge-0/0/1.0
10.0.2.12/30     *[OSPF/10] 01:50:27, metric 2
                  > to 10.0.2.2 via ge-0/0/1.0
                  [BGP/170] 01:49:41, localpref 100, from 6.6.6.6
                      AS path: I, validation-state: unverified
                  > to 10.0.2.6 via ge-0/0/0.0
                  to 10.0.2.2 via ge-0/0/1.0
                  [BGP/170] 00:09:16, MED 2, localpref 100, from 7.7.7.7
                      AS path: I, validation-state: unverified
                  > to 10.0.2.6 via ge-0/0/0.0
150.0.1.0/30     *[BGP/170] 00:09:16, localpref 100, from 7.7.7.7
                  AS path: I, validation-state: unverified
                  > to 10.0.2.6 via ge-0/0/0.0
224.0.0.5/32     *[OSPF/10] 01:52:53, metric 1
                  MultiRecv
```

```
inet.0: 16 destinations, 30 routes (16 active, 0 holddown, 2 hidden)
+ = Active Route, - = Last Active, * = Both

2.2.2.2/32      *[BGP/170] 00:15:42, localpref 100, from 7.7.7.7
                  AS path: 100 I, validation-state: unverified
                  > to 10.0.2.10 via ge-0/0/0.0
3.3.3.3/32      *[BGP/170] 00:15:42, localpref 100, from 7.7.7.7
                  AS path: I, validation-state: unverified
                  > to 10.0.2.10 via ge-0/0/0.0
5.5.5.5/32      *[OSPF/10] 02:42:27, metric 2
                  to 10.0.2.10 via ge-0/0/0.0
                  > to 10.0.2.13 via ge-0/0/1.0
                  [BGP/170] 02:41:33, localpref 100, from 5.5.5.5
                  AS path: I, validation-state: unverified
                  > to 10.0.2.10 via ge-0/0/0.0
                  to 10.0.2.13 via ge-0/0/1.0
                  [BGP/170] 00:15:42, MED 1, localpref 100, from 7.7.7.7
                  AS path: I, validation-state: unverified
                  > to 10.0.2.10 via ge-0/0/0.0
5.6.6.6/32      *[Direct/0] 02:45:59
                  > via lo0.0
                  [BGP/170] 01:12:44, MED 2, localpref 100, from 5.5.5.5
                  AS path: I, validation-state: unverified
                  > to 10.0.2.10 via ge-0/0/0.0
7.7.7.7/32      *[OSPF/10] 02:43:17, metric 1
                  > to 10.0.2.10 via ge-0/0/0.0
                  [BGP/170] 00:15:42, localpref 100, from 7.7.7.7
                  AS path: I, validation-state: unverified
                  > to 10.0.2.10 via ge-0/0/0.0
                  [BGP/170] 01:12:44, MED 1, localpref 100, from 5.5.5.5
                  AS path: I, validation-state: unverified
                  > to 10.0.2.10 via ge-0/0/0.0
10.0.1.4/30     *[BGP/170] 00:15:42, MED 0, localpref 100, from 7.7.7.7
                  AS path: 100 I, validation-state: unverified
                  > to 10.0.2.10 via ge-0/0/0.0
10.0.1.8/30     *[BGP/170] 00:15:42, MED 0, localpref 100, from 7.7.7.7
                  AS path: 100 I, validation-state: unverified
                  > to 10.0.2.10 via ge-0/0/0.0
10.0.1.12/30    *[BGP/170] 00:15:42, localpref 100, from 7.7.7.7
                  AS path: 100 I, validation-state: unverified
                  > to 10.0.2.10 via ge-0/0/0.0
10.0.2.0/30     *[OSPF/10] 02:43:17, metric 2
                  > to 10.0.2.13 via ge-0/0/1.0
                  [BGP/170] 02:41:33, localpref 100, from 5.5.5.5
                  AS path: I, validation-state: unverified
                  to 10.0.2.10 via ge-0/0/0.0
```

```
> to 10.0.2.10 via ge-0/0/0.0
10.0.1.12/30  *[BGP/170] 00:15:42, localpref 100, from 7.7.7.7
                AS path: 100 I, validation-state: unverified
                > to 10.0.2.10 via ge-0/0/0.0
10.0.2.0/30   *[OSPF/10] 02:43:17, metric 2
                > to 10.0.2.13 via ge-0/0/1.0
                [BGP/170] 02:41:33, localpref 100, from 5.5.5.5
                AS path: I, validation-state: unverified
                to 10.0.2.10 via ge-0/0/0.0
                > to 10.0.2.13 via ge-0/0/1.0
                [BGP/170] 00:15:42, MED 2, localpref 100, from 7.7.7.7
                AS path: I, validation-state: unverified
                > to 10.0.2.10 via ge-0/0/0.0
10.0.2.4/30   *[OSPF/10] 02:43:17, metric 2
                > to 10.0.2.10 via ge-0/0/0.0
                [BGP/170] 00:15:42, localpref 100, from 7.7.7.7
                AS path: I, validation-state: unverified
                > to 10.0.2.10 via ge-0/0/0.0
                [BGP/170] 02:41:33, localpref 100, from 5.5.5.5
                AS path: I, validation-state: unverified
                to 10.0.2.10 via ge-0/0/0.0
                > to 10.0.2.13 via ge-0/0/1.0
10.0.2.8/30   *[Direct/0] 02:44:04
                > via ge-0/0/0.0
                [BGP/170] 00:15:42, localpref 100, from 7.7.7.7
                AS path: I, validation-state: unverified
                > to 10.0.2.10 via ge-0/0/0.0
                [BGP/170] 01:12:44, MED 2, localpref 100, from 5.5.5.5
                AS path: I, validation-state: unverified
                > to 10.0.2.10 via ge-0/0/0.0
10.0.2.9/32   *[Local/0] 02:44:06
                Local via ge-0/0/0.0
10.0.2.12/30  *[Direct/0] 02:44:04
                > via ge-0/0/1.0
                [BGP/170] 01:12:44, MED 2, localpref 100, from 5.5.5.5
                AS path: I, validation-state: unverified
                > to 10.0.2.13 via ge-0/0/1.0
10.0.2.14/32  *[Local/0] 02:44:06
                Local via ge-0/0/1.0
150.0.1.0/30  *[BGP/170] 00:15:42, localpref 100, from 7.7.7.7
                AS path: I, validation-state: unverified
                > to 10.0.2.10 via ge-0/0/0.0
224.0.0.5/32  *[OSPF/10] 02:46:02, metric 1
                MultiRecv
```

```
net.0: 16 destinations, 30 routes (16 active, 0 holddown, 2 hidden)
  = Active Route, - = Last Active, * = Both

.2.2.2/32          *[BGP/170] 00:15:42, localpref 100, from 7.7.7.7
                    AS path: 100 I, validation-state: unverified
                    > to 10.0.2.10 via ge-0/0/0.0
.3.3.3/32          *[BGP/170] 00:15:42, localpref 100, from 7.7.7.7
                    AS path: I, validation-state: unverified
                    > to 10.0.2.10 via ge-0/0/0.0
.5.5.5/32          *[OSPF/10] 02:42:27, metric 2
                    to 10.0.2.10 via ge-0/0/0.0
                    > to 10.0.2.13 via ge-0/0/1.0
                    [BGP/170] 02:41:33, localpref 100, from 5.5.5.5
                    AS path: I, validation-state: unverified
                    > to 10.0.2.10 via ge-0/0/0.0
                    to 10.0.2.13 via ge-0/0/1.0
                    [BGP/170] 00:15:42, MED 1, localpref 100, from 7.7.7.7
                    AS path: I, validation-state: unverified
                    > to 10.0.2.10 via ge-0/0/0.0
.6.6.6/32          *[Direct/0] 02:45:59
                    > via lo0.0
                    [BGP/170] 01:12:44, MED 2, localpref 100, from 5.5.5.5
                    AS path: I, validation-state: unverified
                    > to 10.0.2.10 via ge-0/0/0.0
.7.7.7/32          *[OSPF/10] 02:43:17, metric 1
                    > to 10.0.2.10 via ge-0/0/0.0
                    [BGP/170] 00:15:42, localpref 100, from 7.7.7.7
                    AS path: I, validation-state: unverified
                    > to 10.0.2.10 via ge-0/0/0.0
                    [BGP/170] 01:12:44, MED 1, localpref 100, from 5.5.5.5
                    AS path: I, validation-state: unverified
                    > to 10.0.2.10 via ge-0/0/0.0
.0.0.1.4/30        *[BGP/170] 00:15:42, MED 0, localpref 100, from 7.7.7.7
                    AS path: 100 I, validation-state: unverified
                    > to 10.0.2.10 via ge-0/0/0.0
.0.0.1.8/30        *[BGP/170] 00:15:42, MED 0, localpref 100, from 7.7.7.7
                    AS path: 100 I, validation-state: unverified
                    > to 10.0.2.10 via ge-0/0/0.0
.0.0.1.12/30       *[BGP/170] 00:15:42, localpref 100, from 7.7.7.7
                    AS path: 100 I, validation-state: unverified
                    > to 10.0.2.10 via ge-0/0/0.0
.0.0.2.0/30        *[OSPF/10] 02:43:17, metric 2
                    > to 10.0.2.13 via ge-0/0/1.0
                    [BGP/170] 02:41:33, localpref 100, from 5.5.5.5
                    AS path: I, validation-state: unverified
```

```

10.0.1.8/30      > to 10.0.2.10 via ge-0/0/0.0
                  *[BGP/170] 00:15:42, MED 0, localpref 100, from 7.7.7.7
                           AS path: 100 I, validation-state: unverified
                           > to 10.0.2.10 via ge-0/0/0.0
10.0.1.12/30     *[BGP/170] 00:15:42, localpref 100, from 7.7.7.7
                           AS path: 100 I, validation-state: unverified
                           > to 10.0.2.10 via ge-0/0/0.0
10.0.2.0/30      *[OSPF/10] 02:43:17, metric 2
                           > to 10.0.2.13 via ge-0/0/1.0
                           [BGP/170] 02:41:33, localpref 100, from 5.5.5.5
                           AS path: I, validation-state: unverified
                           to 10.0.2.10 via ge-0/0/0.0
                           > to 10.0.2.13 via ge-0/0/1.0
                           [BGP/170] 00:15:42, MED 2, localpref 100, from 7.7.7.7
                           AS path: I, validation-state: unverified
                           > to 10.0.2.10 via ge-0/0/0.0
10.0.2.4/30      *[OSPF/10] 02:43:17, metric 2
                           > to 10.0.2.10 via ge-0/0/0.0
                           [BGP/170] 00:15:42, localpref 100, from 7.7.7.7
                           AS path: I, validation-state: unverified
                           > to 10.0.2.10 via ge-0/0/0.0
                           [BGP/170] 02:41:33, localpref 100, from 5.5.5.5
                           AS path: I, validation-state: unverified
                           to 10.0.2.10 via ge-0/0/0.0
                           > to 10.0.2.13 via ge-0/0/1.0
10.0.2.8/30      *[Direct/0] 02:44:04
                           > via ge-0/0/0.0
                           [BGP/170] 00:15:42, localpref 100, from 7.7.7.7
                           AS path: I, validation-state: unverified
                           > to 10.0.2.10 via ge-0/0/0.0
                           [BGP/170] 01:12:44, MED 2, localpref 100, from 5.5.5.5
                           AS path: I, validation-state: unverified
                           > to 10.0.2.10 via ge-0/0/0.0
10.0.2.9/32      *[Local/0] 02:44:06
                           Local via ge-0/0/0.0
10.0.2.12/30     *[Direct/0] 02:44:04
                           > via ge-0/0/1.0
                           [BGP/170] 01:12:44, MED 2, localpref 100, from 5.5.5.5
                           AS path: I, validation-state: unverified
                           > to 10.0.2.13 via ge-0/0/1.0
10.0.2.14/32     *[Local/0] 02:44:06
                           Local via ge-0/0/1.0
150.0.1.0/30     *[BGP/170] 00:15:42, localpref 100, from 7.7.7.7
                           AS path: I, validation-state: unverified
                           > to 10.0.2.10 via ge-0/0/0.0
224.0.0.5/32    *[OSPF/10] 02:46:02, metric 1
                           MultiRecv

```

13. Verifying connectivity between Cisco and Juniper Routers across the AS. Paste screenshots.

```

PING 2.2.2.2 (2.2.2.2): 56 data bytes
64 bytes from 2.2.2.2: icmp_seq=0 ttl=253 time=34.531 ms
64 bytes from 2.2.2.2: icmp_seq=1 ttl=253 time=21.452 ms
64 bytes from 2.2.2.2: icmp_seq=2 ttl=253 time=15.226 ms
64 bytes from 2.2.2.2: icmp_seq=3 ttl=253 time=22.292 ms
64 bytes from 2.2.2.2: icmp_seq=4 ttl=253 time=27.770 ms
64 bytes from 2.2.2.2: icmp_seq=5 ttl=253 time=33.242 ms

```

```
Type escape sequence to abort.
Tracing the route to 5.5.5.5

 1 10.0.1.6 8 msec 12 msec 8 msec
 2 150.0.1.2 [AS 200] 20 msec 28 msec 32 msec
 3 5.5.5.5 [AS 200] 36 msec 20 msec 20 msec
Router#ping 5.5.5.5

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 5.5.5.5, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 16/20/24 ms
Router#ping 5.5.5.5 r 500

Type escape sequence to abort.
Sending 500, 100-byte ICMP Echos to 5.5.5.5, timeout is 2 seconds:
!!!!!
!!!!!
!!!!!
!!!!!
!!!!!
!!!!!
!!!!!
!!!!!
!!!!!
!!!!!
Success rate is 100 percent (500/500), round-trip min/avg/max = 16/21/60 ms
```

14. Show the entire configuration for Juniper routers. (Paste the screenshot of the show display set command)

J1

```
root-authentication {
    encrypted-password "$1$gD/uBrEh$V80uVxAFBj0dBfZ91Slc10"; ## SECRET-DATA-1
}
login {
    user admin {
        uid 2001;
        class super-user;
        authentication {
            encrypted-password "$1$2xzyEjHG$1Y2Ytp6LkrgUHt0ESNP1/."; ## SECRET-DATA-2
        }
    }
}
syslog {
    user * {
        any emergency;
    }
    file messages {
        any notice;
        authorization info;
    }
    file interactive-commands {
        interactive-commands any;
    }
}

interfaces {
    ge-0/0/0 {
        unit 0 {
            family inet {
                address 10.0.2.5/30;
            }
        }
    }
    ge-0/0/1 {
        unit 0 {
            family inet {
                address 10.0.2.1/30;
            }
        }
    }
    lo0 {
```

```
        }
    }
lo0 {
    unit 0 {
        family inet {
            address 5.5.5.5/32;
        }
    }
}
routing-options {
    router-id 5.5.5.5;
    autonomous-system 200;
}
protocols {
    bgp {
        group internal-peers {
            type internal;
            local-address 5.5.5.5;
            export send-direct;
            neighbor 7.7.7.7;
            neighbor 6.6.6.6;
        }
    }
    ospf {
        area 0.0.0.0 {
            interface ge-0/0/0.0;
            interface ge-0/0/1.0;
            interface lo0.0;
        }
    }
}
policy-options {
    policy-statement local_routes {
        term 1 {
            from {
                route-filter 8.8.8.8/32 exact reject;
                route-filter 10.0.2.0/24 orlonger {
                    default-action reject;
                    reject;
                }
            }
        }
    }
    policy-statement send-direct {
        term 2 {
            from protocol direct;
            then accept;
```

```

}
policy-options {
    policy-statement local_routes {
        term 1 {
            from {
                route-filter 8.8.8.8/32 exact reject;
                route-filter 10.0.2.0/24 orlonger {
                    default-action reject;
                    reject;
                }
            }
        }
    }
    policy-statement send-direct {
        term 2 {
            from protocol direct;
            then accept;
        }
        then accept;
    }
}

```

J2

```

root-authentication {
    encrypted-password "$1$a6/Vt4Sb$e667j5otSNfNRIPtiPB/x0"; ## SECRET-DATA
}
login {
    user admin {
        uid 2001;
        class super-user;
        authentication {
            encrypted-password "$1$db4f0R5A$yubfJYQu6IaH6o6JM9NOR/"; ## SECRET-DATA
        }
    }
}
syslog {
    user * {
        any emergency;
    }
    file messages {
        any notice;
        authorization info;
    }
    file interactive-commands {
        interactive-commands any;
    }
}

interfaces {
    ge-0/0/0 {
        unit 0 {
            family inet {
                address 10.0.2.9/30;
            }
        }
    }
    ge-0/0/1 {
        unit 0 {
            family inet {
                address 10.0.2.14/30;
            }
        }
    }
}

```

```
        }
    }
    ge-0/0/1 {
        unit 0 {
            family inet {
                address 10.0.2.14/30;
            }
        }
    }
    lo0 {
        unit 0 {
            family inet {
                address 6.6.6.6/32;
            }
        }
    }
}
routing-options {
    router-id 6.6.6.6;
    autonomous-system 200;
}
protocols {
    bgp {
        group internal-peers {
            type internal;
            local-address 6.6.6.6;
            export send-direct;
            neighbor 7.7.7.7;
            neighbor 5.5.5.5;
        }
    }
    ospf {
        area 0.0.0.0 {
            interface ge-0/0/0.0;
            interface ge-0/0/1.0;
            interface lo0.0;
        }
    }
}
policy-options {
    policy-statement send-direct {
        term 2 {
            from protocol direct;
            then accept;
        }
    }
}
```

```
root-authentication {
    encrypted-password "$1$VI2Ia0Hx$8tBrf15mwbPjbxtR4kSl/1"; ## SECRET-DATA
}
login {
    user admin {
        uid 2002;
        class super-user;
        authentication {
            encrypted-password "$1$FuJ7Fqxe$6kNvTlrhw1uKWDLRYZXkS0"; ## SECR
T-DATA
        }
    }
}
syslog {
    user * {
        any emergency;
    }
    file messages {
        any notice;
        authorization info;
    }
    file interactive-commands {
        interactive-commands any;
    }
}
interfaces {
    ge-0/0/0 {
        unit 0 {
            family inet {
                address 10.0.2.6/30;
            }
        }
    }
    ge-0/0/1 {
        unit 0 {
            family inet {
                address 10.0.2.10/30;
            }
        }
    }
}
```

```
        }
    }
}
ge-0/0/1 {
    unit 0 {
        family inet {
            address 10.0.2.10/30;
        }
    }
}
ge-0/0/2 {
    unit 0 {
        family inet {
            address 150.0.1.2/30;
        }
    }
}
lo0 {
    unit 0 {
        family inet {
            address 7.7.7.7/32;
        }
    }
}
}
routing-options {
    static {
        route 3.3.3.3/32 next-hop 150.0.1.1;
    }
    router-id 7.7.7.7;
    autonomous-system 200;
}
protocols {
    bgp {
        local-as 200;
        group external-peers {
            type external;
            multihop {
                ttl 2;
            }
            local-address 7.7.7.7;
            export send-direct;
            peer-as 100;
            neighbor 3.3.3.3;
        }
        group external {
            multihop {
                ttl 2;
            }
        }
    }
}
```

```
        }
        local-address 7.7.7.7;
        export send-direct;
        peer-as 100;
        neighbor 3.3.3.3;
    }
    group external {
        multihop {
            ttl 2;
        }
    }
    group internal-peers {
        type internal;
        local-address 7.7.7.7;
        export send-direct;
        neighbor 6.6.6.6;
        neighbor 5.5.5.5;
    }
}
ospf {
    area 0.0.0.0 {
        interface ge-0/0/0.0;
        interface ge-0/0/1.0;
        interface lo0.0;
    }
}
policy-options {
    policy-statement local_routes {
        term 1 {
            from {
                route-filter 8.8.8.8/32 exact reject;
                route-filter 10.0.2.0/24 orlonger {
                    default-action reject;
                    reject;
                }
            }
        }
    }
    policy-statement send-direct {
        term 2 {
            from protocol direct;
            then accept;
        }
        then accept;
    }
}
```

BGP Troubleshooting:

1. Form iBGP neighborship between R1 and R2?

```
R1
!
!
interface Loopback0
 ip address 1.1.1.1 255.255.255.0
!
interface FastEthernet0/0
 ip address 10.0.13.1 255.255.255.0
 duplex auto
 speed auto
!
interface FastEthernet0/1
 no ip address
 shutdown
 duplex auto
 speed auto
!
interface FastEthernet1/0
 no ip address
 shutdown
 duplex auto
 speed auto
!
interface FastEthernet2/0
 no switchport
 ip address 10.0.12.1 255.255.255.0
!
```

```
R2
interface Loopback0
 ip address 2.2.2.2 255.255.255.255
!
interface FastEthernet0/0
 no ip address
 shutdown
 duplex auto
 speed auto
!
interface FastEthernet0/1
 ip address 10.0.23.1 255.255.255.0
 duplex auto
 speed auto
!
interface FastEthernet1/0
 no ip address
 shutdown
 duplex auto
 speed auto
!
interface FastEthernet2/0
 no switchport
 ip address 10.0.12.2 255.255.255.0
!
```

```
R1#config ter
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#interf
R1(config)#interface loop
R1(config)#interface loopback0
R1(config-if)#ip add
R1(config-if)#ip address 1.1.1.1 255.255.255.255
R1(config-if)#no shut
R1(config-if)#end
R1#
*Mar 1 00:09:05.351: %SYS-5-CONFIG_I: Configured from console by console
R1#config ter
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#router ospf 12345
R1(config-router)#netw
R1(config-router)#network 1.1.1.1 0.0.0.0 area 0
R1(config-router)#end
R1#
*Mar 1 00:09:51.203: %SYS-5-CONFIG_I: Configured from console by console
R1#sh ip bgp
*Mar 1 00:10:02.123: %BGP-5-ADJCHANGE: neighbor 2.2.2.2 Up
```

```
R1#sh ip bgp nei
R1#sh ip bgp neighbors
BGP neighbor is 2.2.2.2, remote AS 12345, internal link
  BGP version 4, remote router ID 2.2.2.2
  BGP state = Established, up for 00:00:08
  Last read 00:00:08, last write 00:00:08, hold time is 180, keepalive interval is 60 seconds
  Neighbor capabilities:
    Route refresh: advertised and received(old & new)
    Address family IPv4 Unicast: advertised and received
  Message statistics:
    InQ depth is 0
    OutQ depth is 0
          Sent      Rcvd
  Opens:          1          1
  Notifications: 0          0
  Updates:        0          0
  Keepalives:     3          3
  Route Refresh: 0          0
  Total:         4          4
  Default minimum time between advertisement runs is 0 seconds

  For address family: IPv4 Unicast
    BGP table version 1, neighbor version 1/0
    Output queue size : 0
      Index 1, Offset 0, Mask 0x2
      1 update-group member
```

2. Form eBGP neighborship between R3 and R4?

```
R3#sh ip protocols
Routing Protocol is "ospf 12345"
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Router ID 3.3.3.3
  It is an autonomous system boundary router
  Redistributing External Routes from,
    bgp 12345
  Number of areas in this router is 1. 1 normal 0 stub 0 nssa
  Maximum path: 4
  Routing for Networks:
    10.0.13.0 0.0.0.255 area 0
    10.0.23.0 0.0.0.255 area 0
    10.0.34.0 0.0.0.255 area 0
  Reference bandwidth unit is 100 mbps
  Routing Information Sources:
    Gateway          Distance      Last Update
    1.1.1.1           110          00:05:43
    2.2.2.2           110          00:05:43
  Distance: (default is 110)

Routing Protocol is "bgp 12345"
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  IGP synchronization is disabled
  Automatic route summarization is disabled
  Redistributing: connected
  Neighbor(s):
    Address          FiltIn FiltOut DistIn DistOut Weight RouteMap
    1.1.1.1
    2.2.2.2
    4.4.4.4
  Maximum path: 1
  Routing Information Sources:
    Gateway          Distance      Last Update
    4.4.4.4           20          00:17:43
  Distance: external 20 internal 200 local 200
```

```
R4#sh ip protocols
Routing Protocol is "ospf 54321"
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Router ID 4.4.4.4
  It is an autonomous system boundary router
  Redistributing External Routes from,
    bgp 54321
  Number of areas in this router is 1. 1 normal 0 stub 0 nssa
  Maximum path: 4
  Routing for Networks:
    4.4.4.4 0.0.0.0 area 0
    10.0.45.0 0.0.0.255 area 0
    10.0.46.0 0.0.0.255 area 0
  Reference bandwidth unit is 100 mbps
  Routing Information Sources:
    Gateway          Distance      Last Update
    5.5.5.5           110          00:24:01
    6.6.6.6           110          00:24:01
  Distance: (default is 110)

Routing Protocol is "bgp 54321"
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  IGP synchronization is disabled
  Automatic route summarization is disabled
  Redistributing: connected
  Neighbor(s):
    Address          FiltIn FiltOut DistIn DistOut Weight RouteMap
    3.3.3.3
    5.5.5.5
    6.6.6.6
  Maximum path: 1
  Routing Information Sources:
    Gateway          Distance      Last Update
    3.3.3.3           20          00:11:36
  Distance: external 20 internal 200 local 200
```

```
R3#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R3(config)#router ospf 12345
R3(config-router)#network 3.3.3.3 0.0.0.0 area 0
R3(config-router)#end
R3#
*Mar  1 00:28:21.043: %SYS-5-CONFIG_I: Configured from console by console
```

```
R3#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R3(config)#router ospf 12345
R3(config-router)#network 3.3.3.3 0.0.0.0 area 0
R3(config-router)#end
R3#
*Mar 1 00:28:21.043: %SYS-5-CONFIG_I: Configured from console by console
R3#
*Mar 1 00:28:29.055: %BGP-5-ADJCHANGE: neighbor 2.2.2.2 Up
R3#
*Mar 1 00:28:31.843: %BGP-5-ADJCHANGE: neighbor 1.1.1.1 Up
R3#router bgp 12345
^
% Invalid input detected at '^' marker.

R3#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R3(config)#router bgp 12345
R3(config-router)#neighb
R3(config-router)#neighbor 4.4.4.4 remo
R3(config-router)#neighbor 4.4.4.4 remot
R3(config-router)#neighbor 4.4.4.4 remote-as 54321
R3(config-router)#neighbor 4.4.4.4 upda
R3(config-router)#neighbor 4.4.4.4 update-source loopback 0
R3(config-router)#neighbor 4.4.4.4 ebg
R3(config-router)#neighbor 4.4.4.4 ebgp-multihop 2
R3(config-router)#neighbor 4.4.4.4 nex
R3(config-router)#neighbor 4.4.4.4 next-hop-se
R3(config-router)#neighbor 4.4.4.4 next-hop-self
R3(config-router)#end
R3#
```

```
BGP neighbor is 4.4.4.4, remote AS 54321, external link
  BGP version 4, remote router ID 4.4.4.4
  BGP state = Established, up for 00:31:06
  Last read 00:00:06, last write 00:00:06, hold time is 180, keepalive interval
is 60 seconds
  Neighbor capabilities:
    Route refresh: advertised and received(old & new)
    Address family IPv4 Unicast: advertised and received
  Message statistics:
    InQ depth is 0
    OutQ depth is 0
          Sent      Rcvd
  Opens:          1          1
  Notifications: 0          0
  Updates:        6          2
  Keepalives:     33         33
  Route Refresh: 0          0
  Total:          40         36
  Default minimum time between advertisement runs is 30 seconds

  For address family: IPv4 Unicast
    BGP table version 9, neighbor version 9/0
```

3. Form iBGP neighborship between R5 and R6?

```
R5
!
!
!
!
interface Loopback0
 ip address 5.5.5.5 255.255.255.0
!
interface FastEthernet0/0
 ip address 10.0.45.2 255.255.255.0
 duplex auto
 speed auto
!
interface FastEthernet0/1
 no ip address
 shutdown
 duplex auto
 speed auto
!
interface FastEthernet1/0
 no ip address
 shutdown
 duplex auto
 speed auto
```

```
R6
!
!
!
!
interface Loopback0
 ip address 6.6.6.6 255.255.255.255
!
interface FastEthernet0/0
 no ip address
 shutdown
 duplex auto
 speed auto
!
interface FastEthernet0/1
 ip address 10.0.46.2 255.255.255.0
 duplex auto
 speed auto
!
interface FastEthernet1/0
 no ip address
 shutdown
 duplex auto
 speed auto
--More--
```

```
R5#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R5(config)#int loop
R5(config)#int loopback0
R5(config-if)#ip address 5.5.5.5 255.255.255.255
R5(config-if)#no shut
R5(config-if)#end
R5#
*Mar  1 00:40:22.079: %SYS-5-CONFIG_I: Configured from console by console
R5#
```

```
R6#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R6(config)#router bgp
R6(config)#router bgp 54321
R6(config-router)#netw
R6(config-router)#network 6.6.6.6 ma
R6(config-router)#network 6.6.6.6 mask 255.255.255.255
R6(config-router)#netw
R6(config-router)#network 10.0.46.0 mask 255.255.255.0
R6(config-router)#netw
R6(config-router)#network 10.0.56.0 mask 255.255.255.0
R6(config-router)#end
R6#
*Mar 1 00:57:51.879: %SYS-5-CONFIG_I: Configured from console by console
```

4. Ping from R6 loopback0 to R1 loopback0?

```
R6#ping 1.1.1.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 1.1.1.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 72/94/112 ms
```

5. Show ip route on R2 and R5?

```
R2#sh ip rout
R2#sh ip route
Codes: C - connected, S - static, R - RIP, M - mobile, B - BGP
      D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
      N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
      E1 - OSPF external type 1, E2 - OSPF external type 2
      i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
      ia - IS-IS inter area, * - candidate default, U - per-user static route
      o - ODR, P - periodic downloaded static route

Gateway of last resort is not set

  1.0.0.0/32 is subnetted, 1 subnets
O    1.1.1.1 [110/2] via 10.0.12.1, 00:34:36, FastEthernet2/0
  2.0.0.0/32 is subnetted, 1 subnets
C      2.2.2.2 is directly connected, Loopback0
  3.0.0.0/32 is subnetted, 1 subnets
O    3.3.3.3 [110/11] via 10.0.23.2, 00:34:36, FastEthernet0/1
  5.0.0.0/32 is subnetted, 1 subnets
B      5.5.5.5 [200/0] via 3.3.3.3, 00:08:07
  6.0.0.0/32 is subnetted, 1 subnets
B      6.6.6.6 [200/0] via 3.3.3.3, 00:07:02
  10.0.0.0/24 is subnetted, 7 subnets
C      10.0.12.0 is directly connected, FastEthernet2/0
O    10.0.13.0 [110/11] via 10.0.12.1, 00:34:38, FastEthernet2/0
C      10.0.23.0 is directly connected, FastEthernet0/1
B      10.0.46.0 [200/0] via 3.3.3.3, 00:13:48
B      10.0.45.0 [200/0] via 3.3.3.3, 00:13:48
O    10.0.34.0 [110/11] via 10.0.23.2, 00:34:43, FastEthernet0/1
B      10.0.56.0 [200/0] via 3.3.3.3, 00:06:39
```

```
R5#sh ip rou
R5#sh ip route
Codes: C - connected, S - static, R - RIP, M - mobile, B - BGP
      D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
      N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
      E1 - OSPF external type 1, E2 - OSPF external type 2
      i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
      ia - IS-IS inter area, * - candidate default, U - per-user static route
      o - ODR, P - periodic downloaded static route

Gateway of last resort is not set

      1.0.0.0/32 is subnetted, 1 subnets
B          1.1.1.1 [200/11] via 4.4.4.4, 00:13:46
      3.0.0.0/32 is subnetted, 1 subnets
B          3.3.3.3 [200/0] via 4.4.4.4, 00:13:46
      4.0.0.0/32 is subnetted, 1 subnets
O          4.4.4.4 [110/11] via 10.0.45.1, 00:03:56, FastEthernet0/0
      5.0.0.0/32 is subnetted, 1 subnets
C          5.5.5.5 is directly connected, Loopback0
      6.0.0.0/32 is subnetted, 1 subnets
O          6.6.6.6 [110/2] via 10.0.56.2, 00:03:56, FastEthernet2/0
      10.0.0.0/24 is subnetted, 6 subnets
B            10.0.13.0 [200/0] via 4.4.4.4, 00:13:48
B            10.0.23.0 [200/0] via 4.4.4.4, 00:13:48
O            10.0.46.0 [110/11] via 10.0.56.2, 00:04:04, FastEthernet2/0
C            10.0.45.0 is directly connected, FastEthernet0/0
B            10.0.34.0 [200/0] via 4.4.4.4, 01:01:56
C            10.0.56.0 is directly connected, FastEthernet2/0
```

Lab Report

Border Gateway Protocol (BGP), which is utilized between ISPs that are distinct ASes, is the protocol used to exchange routing information for the internet.

The protocol can establish connections between any network of autonomous systems utilizing any topology, sole that each AS have at least one router that can run BGP and that is connected to at least one other AS's BGP router is the sole requirement. The primary purpose of BGP is to communicate information about network reachability with other BGP systems. Based on the data transferred between BGP routers, Border Gateway Protocol creates an autonomous systems graph. RIP, OSPF, and EIGRP are examples of internal gateway protocols (IGPs), whereas BGP is a standardized exterior gateway protocol (EGP). The current standard deployment is BGP Version 4 (BGPv4).

A "Path Vector" routing protocol is what BGP is known as. Instead of routing within an Autonomous System (AS), BGP was designed to route between ASs.

Unlike IGP measures like distance or cost, BGP has a separate routing table based on the shortest AS Path and several other factors. On the Internet, BGP is the preferred routing protocol. The Internet is essentially a network of connected Autonomous Systems. It uses the TCP port number 179.

Border Gateway Protocol (BGP) features include:

- Configuration of Inter-Autonomous Systems: The primary function of BGP is to facilitate communication between two autonomous systems.
- BGP is Next-Hop Paradigm compatible.
- Coordination between various BGP speakers inside the autonomous system.
- Path Information: In addition to the reachable destination and the following destination pair, BGP advertisements also contain path information.
- Support for Policies: The administrator can configure policies for BGP to implement. A router running BGP, for instance, can be set up to discriminate between routes known from within the AS and those known from outside the AS.
- Over TCP Runs.
- BGP helps networks save bandwidth.
- BGP accommodates CIDR.
- Moreover, BGP offers security.

BGP peers carry out the three tasks listed here:

Authentication and initial peer acquisition make up the first function. It is guaranteed that both parties have consented to communicate because both peers have established a TCP connection and exchange messages.

The second function largely focuses on sending reachability information that is either positive or negative.

The third function examines the peers and the network connection to ensure that everything is running smoothly.

Autonomous Systems (ASes): An AS is a network, or a collection of networks, that is run by a single business or service provider. BGP is made to share routing data between ASes so they can decide how to forward traffic with knowledge.

Path Vector Protocol: BGP is a path vector protocol, exchanging routing data in the form of path vectors and characteristics. These characteristics comprise details such as the AS path, the following hop, and other network policies that aid in choosing the optimal routing path.

BGP is categorized as an Exterior Gateway Protocol (EGP) since it communicates between many ASes. Interior Gateway Protocols (IGPs), in contrast, are utilized within an AS and include OSPF and RIP.

Routing decisions can be made using policies defined by network managers using BGP. Organizations can use this functionality to design intricate routing regulations based on things like network performance, cost, or agreements with other ASes regarding policy.

BGP is very scalable and reliable since it is made to accommodate the vast volume of the Internet. It is dependable and flexible to different network topologies and policies since it also has tools for route filtering, route aggregation, and path selection.

BGP uses the TCP (Transmission Control Protocol) as its transport protocol. By doing this, routing updates are delivered between BGP peers in an accurate and timely manner.

Path Selection: BGP employs a set of standards to choose the most effective path for routing. The BGP path selection process's criteria consider elements including the AS path's length, the route's starting point, regional preferences, and the availability of route filters.

BGP Peering: For exchanging routing data, BGP peers connect to one another through TCP. Peering can take place through direct physical connections, such as those made by Internet service providers (ISPs) interacting with one another, or over virtual private network (VPN) connections.

Functions for BGP Route Information Management:

Route Storage: Each BGP keeps track of the ways to connect to other networks.

Route Update: Special strategies are employed in this task to decide when and how to use the information received from peers to correctly update the routes.

The information contained in each BGP's route databases is used to choose the best routes to each network on the internet network.

Route advertisement: Every BGP speaker informs its neighbor on a regular basis of the various networks and ways available for contacting them.