



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.

```
vMX1
login: admin
Password:

--- JUNOS 14.1R1.10 built 2014-06-07 09:37:07 UTC
admin@Juniper-Router> en
^
unknown command.

admin@Juniper-Router> configure
Entering configuration mode

[edit]
admin@Juniper-Router# ... unit 0 family inet address 192.168.1.17/30

[edit]
admin@Juniper-Router# ... unit 0 family inet address 192.168.1.22/30

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

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

[edit]
admin@Juniper-Router# show interfaces
ge-0/0/0 {
    unit 0 {
        family inet {
            address 192.168.1.17/30;
        }
    }
}
ge-0/0/1 {
    unit 0 {
        family inet {
            address 192.168.1.22/30;
        }
    }
}
lo0 {
    unit 0 {
        family inet {
            address 6.6.6.6/32;
        }
    }
}

[edit]
```

```
vMX2
Entering configuration mode

[edit]
admin@Juniper-Router# ... unit 0 family inet address 192.168.1.26/30

[edit]
admin@Juniper-Router# ... unit 0 family inet address 192.168.1.18/30

[edit]
admin@Juniper-Router# ... unit 0 family inet address 192.168.1.13/30

[edit]
admin@Juniper-Router# ... 0 family inet address 5.5.5.5/32

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

[edit]
admin@Juniper-Router# show interfaces
ge-0/0/0 {
    unit 0 {
        family inet {
            address 192.168.1.18/30;
        }
    }
}
ge-0/0/1 {
    unit 0 {
        family inet {
            address 192.168.1.13/30;
        }
    }
}
ge-0/0/2 {
    unit 0 {
        family inet {
            address 192.168.1.26/30;
        }
    }
}
lo0 {
    unit 0 {
        family inet {
            address 5.5.5.5/32;
        }
    }
}
```



```
Juniper-Router (ttyd0)

login: admin
Password:

--- JUNOS 14.1R1.10 built 2014-06-07 09:37:07 UTC
admin@Juniper-Router> configure
Entering configuration mode

[edit]
admin@Juniper-Router# ... unit 0 family inet address 192.168.1.10/30

[edit]
admin@Juniper-Router# ... unit 0 family inet address 192.168.1.14/30

[edit]
admin@Juniper-Router# ... 0 family inet address 4.4.4.4/32

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

[edit]
admin@Juniper-Router# show interfaces
ge-0/0/0 {
    unit 0 {
        family inet {
            address 192.168.1.10/30;
        }
    }
}
ge-0/0/1 {
    unit 0 {
        family inet {
            address 192.168.1.14/30;
        }
    }
}
lo0 {
    unit 0 {
        family inet {
            address 4.4.4.4/32;
        }
    }
}

[edit]
```

```
37251
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 192.168.1.1 255.255.255.252
Router(config-if)#no shut
Router(config-if)#no shutdown
Router(config-if)#exit
Router(config)#
*Mar 1 00:52:19.479: %LINK-3-UPDOWN: Interface FastEthernet0/0, changed state to up
*Mar 1 00:52:20.479: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
Router(config)#in
Router(config)#interface fas
Router(config)#interface fastEthernet0/1
Router(config-if)#ip add
Router(config-if)#ip address 192.168.1.21 255.255.255.252
Router(config-if)#no shut
Router(config-if)#no shutdown
Router(config-if)#exit
Router(config)#exit
Router#
Router(config)#interface loopback0
Router(config-if)#interface loopback
*Mar 1 00:53:16.595: %LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback0, changed state to up 0
Router(config-if)#interface loopback 0
Router(config-if)#ip add
Router(config-if)#ip address 1.1.1.1 255.255.255.255
Router(config-if)#no sut
Router(config-if)#no sut
^
% Invalid input detected at '^' marker.

Router(config-if)#no shut
Router(config-if)#exit
Router(config)#
Router#
*Mar 1 00:53:54.735: %SYS-5-CONFIG_I: Configured from console by console
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     192.168.1.1    YES manual up        up
FastEthernet0/1     192.168.1.21   YES manual up        up
FastEthernet1/0     unassigned     YES unset administratively down down
Loopback0           1.1.1.1       YES manual up        up
Router#
```

```

Router#config terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#in
Router(config)#interface 1
Router(config)#interface loo
Router(config)#interface loopback 0
Router(config-if)#net
Router(config-if)#netbi
*Mar 1 00:47:06.163: %LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback0,
changed state to
% Incomplete command.

Router(config-if)#
Router(config-if)#ip add
Router(config-if)#ip address 2.2.2.2 255.255.255.255
Router(config-if)#no shut
Router(config-if)#no shutdown
Router(config-if)#exit
Router(config)#exit
Router#
*Mar 1 00:47:36.903: %SYS-5-CONFIG_I: Configured from console by console
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    192.168.1.2    YES manual up        up
FastEthernet0/1    192.168.1.5    YES manual up        up
FastEthernet1/0    192.168.1.25   YES manual up        up
Loopback0          2.2.2.2       YES manual up        up

```

```

Router(config)#in
Router(config)#interface lo
Router(config)#interface loopback
Router(config)#interface loopback 0
Router(config-if)#ip ad
*Mar 1 01:03:10.183: %LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback0,
changed state to up
Router(config-if)#ip add
Router(config-if)#ip address 3.3.3.3 255.255.255.255
Router(config-if)#no shut
Router(config-if)#exit
Router(config)#exit
Router#
*Mar 1 01:03:28.003: %SYS-5-CONFIG_I: Configured from console by console
Router#sh ip int bri
Router#sh ip int brief
Interface          IP-Address      OK? Method Status       Prot
ocol
FastEthernet0/0    192.168.1.9    YES manual up        up
FastEthernet0/1    192.168.1.6    YES manual up        up
FastEthernet1/0    unassigned     YES unset administratively down down
Loopback0          3.3.3.3       YES manual up        up
Router#[]

```

2. Verify using the show command that all the interfaces are configured correctly and paste screenshot of the command along with the result for EACH router.

37251

```
Router#  
Router#sh ip in  
Router#sh ip inter  
Router#sh ip interface brief  
Interface IP-Address OK? Method Status Protocol  
FastEthernet0/0 192.168.1.1 YES manual up up  
FastEthernet0/1 192.168.1.21 YES manual up up  
FastEthernet1/0 unassigned YES unset administratively down down  
Loopback0 1.1.1.1 YES manual up up  
Router#
```

37252

```
Router>en  
Router#sh ip int  
Router#sh ip interface brief  
Interface IP-Address OK? Method Status Protocol  
FastEthernet0/0 192.168.1.2 YES manual up up  
FastEthernet0/1 192.168.1.5 YES manual up up  
FastEthernet1/0 192.168.1.25 YES manual up up  
Loopback0 2.2.2.2 YES manual up up
```

37253

```
Router>en  
Router#sh ip int  
Router#sh ip interface brief  
Interface IP-Address OK? Method Status Protocol  
FastEthernet0/0 192.168.1.9 YES manual up up  
FastEthernet0/1 192.168.1.6 YES manual up up  
FastEthernet1/0 unassigned YES unset administratively down down  
Loopback0 3.3.3.3 YES manual up up
```

vMX4

```
admin@Juniper-Router# show interfaces
ge-0/0/0 {
    unit 0 {
        family inet {
            address 192.168.1.17/30;
        }
    }
}
ge-0/0/1 {
    unit 0 {
        family inet {
            address 192.168.1.22/30;
        }
    }
}
lo0 {
    unit 0 {
        family inet {
            address 6.6.6.6/32;
        }
    }
}
```

vMX6

```
Entering configuration mode

[edit]
admin@Juniper-Router# show interfaces
ge-0/0/0 {
    unit 0 {
        family inet {
            address 192.168.1.10/30;
        }
    }
}
ge-0/0/1 {
    unit 0 {
        family inet {
            address 192.168.1.14/30;
        }
    }
}
lo0 {
    unit 0 {
        family inet {
            address 4.4.4.4/32;
        }
    }
}
```

 vMX5

```
admin@Juniper-Router> configure
Entering configuration mode

[edit]
admin@Juniper-Router# show interfaces
ge-0/0/0 {
    unit 0 {
        family inet {
            address 192.168.1.18/30;
        }
    }
}
ge-0/0/1 {
    unit 0 {
        family inet {
            address 192.168.1.13/30;
        }
    }
}
ge-0/0/2 {
    unit 0 {
        family inet {
            address 192.168.1.26/30;
        }
    }
}
lo0 {
    unit 0 {
        family inet {
            address 5.5.5.5/32;
        }
    }
}
```

3. Configure OSPF on all the Cisco Routers & advertise loopback 0 as Router ID. Paste screenshots which show configuration of OSPF on all routers.

```
37252
Router>
Router>en
Router#router ospf 1
^
% Invalid input detected at '^' marker.

Router#config ter
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#router ospf 1
Router(config-router)#net
Router(config-router)#network 192.168.1.4 0.0.0.3 area 0
Router(config-router)#network 192.168.1.24 0.0.0.3 area 0
Router(config-router)#net
Router(config-router)#network 2.2.2.2 00
*Mar 1 01:08:57.275: %OSPF-5-ADJCHG: Process 1, Nbr 5.5.5.5 on FastEthernet0/
from LOADING to
Router(config-router)#network 2.2.2.2 0.0.0.0 area 0
Router(config-router)#en
% Ambiguous command: "en"
Router(config)#end
Router#w
*Mar 1 01:09:30.459: %SYS-5-CONFIG_I: Configured from console by console
% No connections open
Router#wr
```

```
37251
Router#config ter
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#router ospf 1
Router(config-router)#net
Router(config-router)#network 192.168.1.20 0.0.0.3 area 1
Router(config-router)#net
Router(config-router)#network 192.168.1.
*Mar 1 01:07:05.787: %OSPF-5-ADJCHG: Process 1, Nbr 6.6.6.6 on FastEthernet0/
from LOADING to FULL, Loading Done0
% Incomplete command.

Router(config-router)#network 192.168.1.0 0.0.0.3 area 0
Router(config-router)#end
Router#
*Mar 1 01:07:22.587: %SYS-5-CONFIG_I: Configured from console by console
Router#un
```

```
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 192.168.1.4 0.0.0.3 area 0
Router(config-router)#
*Mar  1 01:10:55.631: %OSPF-5-ADJCHG: Process 1, Nbr 2.2.2.2 on FastEthernet0/
from LOADING to FULL, Loading Done
Router(config-router)#network 192.168.1.8 0.0.0.3 area 2
Router(config-router)#
*Mar  1 01:11:31.775: %OSPF-5-ADJCHG: Process 1, Nbr 4.4.4.4 on FastEthernet0/
from LOADING to FULL, Loading Done
Router(config-router)#net
Router(config-router)#network 3.3.3.3 0.0.0.0 area 2
Router(config-router)#end
Router#
```

4. Configure OSPF on all the Juniper Routers. Paste screenshots of the commands used on all routers to complete this task.

```
[edit]
admin@Juniper-Router# set routing-options router-id 6.6.6.6

[edit]
admin@Juniper-Router# set protocols ospf area 0.0.0.1 interface ge-0/0/1

[edit]
admin@Juniper-Router# set protocols ospf area 0.0.0.0 interface ge-0/0/0

[edit]
admin@Juniper-Router# set protocols ospf area 0.0.0.0 interface lo0

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

```
[edit]
admin@Juniper-Router# set routing-options router-id 4.4.4.4

[edit]
admin@Juniper-Router# set protocols ospf area 0.0.0.2 interface ge-0/0/0

[edit]
admin@Juniper-Router# set protocols ospf area 0.0.0.0 interface ge-0/0/1

[edit]
admin@Juniper-Router# set protocols ospf area 0.0.0.0 interface lo0

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

```
admin@Juniper-Router# set routing-options router-id 5.5.5.5
[edit]
admin@Juniper-Router# set protocols ospf area 0.0.0.0 interface ge-0/0/2
[edit]
admin@Juniper-Router# set protocols ospf area 0.0.0.0 interface ge-0/0/0
[edit]
admin@Juniper-Router# set protocols ospf area 0.0.0.0 interface ge-0/0/1
[edit]
admin@Juniper-Router# set protocols ospf area 0.0.0.0 interface lo0
[edit]
admin@Juniper-Router# commit
commit complete
```

5. Verify OSPF neighborship is formed. Paste screenshots of the commands used on all routers to complete this task.

 vMX4

```
[edit]
admin@Juniper-Router# show ospf
^
syntax error.
admin@Juniper-Router# show ospfne
^
syntax error.
admin@Juniper-Router# exit
Exiting configuration mode

admin@Juniper-Router> show ospf neighbor
Address      Interface      State      ID          Pri  Dead
192.168.1.18  ge-0/0/0.0   Full       5.5.5.5    128   35
192.168.1.21  ge-0/0/1.0   Full       1.1.1.1    1     38

admin@Juniper-Router> 
```

 vMX5

```
[edit]
admin@Juniper-Router# exit
Exiting configuration mode

admin@Juniper-Router> show ospf neighbor
Address      Interface      State      ID          Pri  Dead
192.168.1.17  ge-0/0/0.0   Full       6.6.6.6    128   35
192.168.1.14  ge-0/0/1.0   Full       4.4.4.4    128   39
192.168.1.25  ge-0/0/2.0   Full       2.2.2.2    1     33

admin@Juniper-Router> 
```

 vMX6

```
[edit]
admin@Juniper-Router# exit
Exiting configuration mode

admin@Juniper-Router> show ospf neighbor
Address      Interface      State      ID          Pri  Dead
192.168.1.13  ge-0/0/1.0   Full       5.5.5.5    128   3
192.168.1.9   ge-0/0/0.0   Full       3.3.3.3    1     3

admin@Juniper-Router> 
```

```
37251
Router>conf
Router>conf
Translating "conf"...domain server (255.255.255.255)
(255.255.255.255)
Translating "conf"...domain server (255.255.255.255)
% Unknown command or computer name, or unable to find computer address
Router>en
Router#show os
Router#show ospf ne
Router#sh ip
Router#sh ip os
Router#sh ip ospf ne
Router#sh ip ospf neighbor
```

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

Neighbor ID      Pri  State            Dead Time    Address          Interface
192.168.1.26    128   FULL/DR        00:00:37     192.168.1.26  FastEthernet1
192.168.1.6     1     FULL/BDR       00:00:32     192.168.1.6   FastEthernet0
```

```
37253
Router con0 is now available

Press RETURN to get started.

Router>en
Router#sh ip ospf ne
Router#sh ip ospf neighbor
*Mar  1 02:30:55.531: %OSPF-5-ADJCHG: Process 1, Nbr 2.2.2.2 on FastEthernet0/1
from FULL to DOWN, Neighbor Down: Dead timer expired

Neighbor ID      Pri   State          Dead Time     Address          Interface
4.4.4.4          128   FULL/DR       00:00:39     192.168.1.10    FastEthernet0/1
```

6. Verify using the show command on both the Cisco & Juniper routers whether Routes learnt from OSPF is seen or not in the routing table. Paste screenshots of the commands used on a Cisco as well as Juniper router to complete this task under appropriate symbols below.

 vMX4
admin@Juniper-Router> show route

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

1.1.1.1/32 *[OSPF/10] 01:16:40, metric 2
 > to 192.168.1.21 via ge-0/0/1.0
4.4.4.4/32 *[OSPF/10] 01:53:47, metric 2
 > to 192.168.1.18 via ge-0/0/0.0
5.5.5.5/32 *[OSPF/10] 01:57:35, metric 1
 > to 192.168.1.18 via ge-0/0/0.0
6.6.6.6/32 *[Direct/0] 02:12:37
 > via lo0.0
192.168.1.8/30 *[OSPF/10] 01:53:47, metric 3
 > to 192.168.1.18 via ge-0/0/0.0
192.168.1.12/30 *[OSPF/10] 01:57:35, metric 2
 > to 192.168.1.18 via ge-0/0/0.0
192.168.1.16/30 *[Direct/0] 02:12:12
 > via ge-0/0/0.0
192.168.1.17/32 *[Local/0] 02:12:13
 Local via ge-0/0/0.0
192.168.1.20/30 *[Direct/0] 02:12:12
 > via ge-0/0/1.0
192.168.1.22/32 *[Local/0] 02:12:13
 Local via ge-0/0/1.0
192.168.1.24/30 *[OSPF/10] 01:57:35, metric 2
 > to 192.168.1.18 via ge-0/0/0.0
224.0.0.5/32 *[OSPF/10] 02:11:51, metric 1
 > to 192.168.1.18 via ge-0/0/0.0

```
vMX5
admin@Juniper-Router> show route

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

1.4.4.4/32      *[OSPF/10] 01:58:49, metric 1
                  > to 192.168.1.14 via ge-0/0/1.0
5.5.5.5/32      *[Direct/0] 02:03:37
                  > via lo0.0
5.6.6.6/32      *[OSPF/10] 02:02:49, metric 1
                  > to 192.168.1.17 via ge-0/0/0.0
192.168.1.8/30  *[OSPF/10] 01:58:49, metric 2
                  > to 192.168.1.14 via ge-0/0/1.0
192.168.1.12/30 *[Direct/0] 02:03:34
                  > via ge-0/0/1.0
192.168.1.13/32 *[Local/0] 02:03:35
                  Local via ge-0/0/1.0
192.168.1.16/30 *[Direct/0] 02:03:34
                  > via ge-0/0/0.0
192.168.1.18/32 *[Local/0] 02:03:35
                  Local via ge-0/0/0.0
192.168.1.20/30 *[OSPF/10] 02:02:49, metric 2
                  > to 192.168.1.17 via ge-0/0/0.0
192.168.1.24/30 *[Direct/0] 02:03:34
                  > via ge-0/0/2.0
192.168.1.26/32 *[Local/0] 02:03:35
                  Local via ge-0/0/2.0
224.0.0.5/32    *[OSPF/10] 02:02:54, metric 1
                  Multicast
```

vMX6

```
admin@Juniper-Router> show route

inet.0: 11 destinations, 11 routes (11 active, 0 holddown, 0 hidden)
+ = Active Route, - = Last Active, * = Both

4.4.4.4/32          *[Direct/0] 01:59:17
                      > via lo0.0
5.5.5.5/32          *[OSPF/10] 01:57:21, metric 1
                      > to 192.168.1.13 via ge-0/0/1.0
6.6.6.6/32          *[OSPF/10] 01:57:21, metric 2
                      > to 192.168.1.13 via ge-0/0/1.0
192.168.1.8/30     *[Direct/0] 01:59:17
                      > via ge-0/0/0.0
192.168.1.10/32    *[Local/0] 01:59:17
                      Local via ge-0/0/0.0
192.168.1.12/30    *[Direct/0] 01:59:17
                      > via ge-0/0/1.0
192.168.1.14/32    *[Local/0] 01:59:17
                      Local via ge-0/0/1.0
192.168.1.16/30    *[OSPF/10] 01:57:21, metric 2
                      > to 192.168.1.13 via ge-0/0/1.0
192.168.1.20/30    *[OSPF/10] 01:57:21, metric 3
                      > to 192.168.1.13 via ge-0/0/1.0
192.168.1.24/30    *[OSPF/10] 01:57:21, metric 2
                      > to 192.168.1.13 via ge-0/0/1.0
224.0.0.5/32        *[OSPF/10] 01:57:31, metric 1
                      Multi-Point
```

```
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 ro
      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
      4.0.0.0/32 is subnetted, 1 subnets
O IA    4.4.4.4 [110/12] via 192.168.1.22, 00:00:05, FastEthernet0/1
      5.0.0.0/32 is subnetted, 1 subnets
O IA    5.5.5.5 [110/11] via 192.168.1.22, 00:00:05, FastEthernet0/1
      6.0.0.0/32 is subnetted, 1 subnets
O IA    6.6.6.6 [110/10] via 192.168.1.22, 00:00:05, FastEthernet0/1
      192.168.1.0/30 is subnetted, 6 subnets
O IA    192.168.1.8 [110/13] via 192.168.1.22, 00:00:06, FastEthernet0/1
O IA    192.168.1.12 [110/12] via 192.168.1.22, 00:00:06, FastEthernet0/1
C      192.168.1.0 is directly connected, FastEthernet0/0
O IA    192.168.1.24 [110/12] via 192.168.1.22, 00:00:06, FastEthernet0/1
O IA    192.168.1.16 [110/11] via 192.168.1.22, 00:00:07, FastEthernet0/1
C      192.168.1.20 is directly connected, FastEthernet0/1
```

 37252

```
from LOADING to FULL, Loading Done
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 rou
      o - ODR, P - periodic downloaded static route

Gateway of last resort is not set

      1.0.0.0/32 is subnetted, 1 subnets
O IA    1.1.1.1 [110/4] via 192.168.1.26, 00:00:09, FastEthernet1/0
      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 IA    3.3.3.3 [110/4] via 192.168.1.26, 00:00:08, FastEthernet1/0
      4.0.0.0/32 is subnetted, 1 subnets
O       4.4.4.4 [110/2] via 192.168.1.26, 00:00:09, FastEthernet1/0
      5.0.0.0/32 is subnetted, 1 subnets
O       5.5.5.5 [110/1] via 192.168.1.26, 00:00:09, FastEthernet1/0
      6.0.0.0/32 is subnetted, 1 subnets
O       6.6.6.6 [110/2] via 192.168.1.26, 00:00:10, FastEthernet1/0
      192.168.1.0/30 is subnetted, 7 subnets
O IA    192.168.1.8 [110/3] via 192.168.1.26, 00:00:11, FastEthernet1/0
O       192.168.1.12 [110/2] via 192.168.1.26, 00:00:11, FastEthernet1/0
C       192.168.1.0 is directly connected, FastEthernet0/0
C       192.168.1.4 is directly connected, FastEthernet0/1
C       192.168.1.24 is directly connected, FastEthernet1/0
O       192.168.1.16 [110/2] via 192.168.1.26, 00:00:11, FastEthernet1/0
O IA    192.168.1.20 [110/3] via 192.168.1.26, 00:00:11, FastEthernet1/0
```

```
37253
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 rout
      o - ODR, P - periodic downloaded static route

Gateway of last resort is not set

      1.0.0.0/32 is subnetted, 1 subnets
O IA    1.1.1.1 [110/14] via 192.168.1.5, 00:00:51, FastEthernet0/1
      2.0.0.0/32 is subnetted, 1 subnets
O          2.2.2.2 [110/11] via 192.168.1.5, 00:00:51, 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 [110/12] via 192.168.1.5, 00:00:51, FastEthernet0/1
      5.0.0.0/32 is subnetted, 1 subnets
O          5.5.5.5 [110/11] via 192.168.1.5, 00:00:51, FastEthernet0/1
      6.0.0.0/32 is subnetted, 1 subnets
O          6.6.6.6 [110/12] via 192.168.1.5, 00:00:52, FastEthernet0/1
      192.168.1.0/30 is subnetted, 6 subnets
C          192.168.1.8 is directly connected, FastEthernet0/0
O          192.168.1.12 [110/12] via 192.168.1.5, 00:00:53, FastEthernet0/1
C          192.168.1.4 is directly connected, FastEthernet0/1
O          192.168.1.24 [110/11] via 192.168.1.5, 00:00:53, FastEthernet0/1
O          192.168.1.16 [110/12] via 192.168.1.5, 00:00:53, FastEthernet0/1
O IA    192.168.1.20 [110/13] via 192.168.1.5, 00:00:53, FastEthernet0/1
```

7. Paste a screenshot of the command showing all the respective configurations done on the Cisco as well as Juniper router. Paste screenshots of the commands used to complete this task.

```
37251
router#show conf
router#show configuration
using 941 out of 57336 bytes

version 12.4
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption

hostname Router
boot-start-marker
boot-end-marker

no aaa new-model
memory-size iomem 5
ip cef

ip auth-proxy max-nodata-conns 3
ip admission max-nodata-conns 3
```

```
37251
Interface Loopback0
 ip address 1.1.1.1 255.255.255.255
!
Interface FastEthernet0/0
 ip address 192.168.1.1 255.255.255.252
 duplex auto
 speed auto
!
Interface FastEthernet0/1
 ip address 192.168.1.21 255.255.255.252
 duplex auto
 speed auto
!
Interface FastEthernet1/0
 no ip address
 shutdown
 duplex auto
 speed auto
!
router ospf 1
 log-adjacency-changes
 network 192.168.1.0 0.0.0.3 area 0
 network 192.168.1.20 0.0.0.3 area 1
!
ip forward-protocol nd
!
!
ip http server
no ip http secure-server
!
!
control-plane
!
!
Line con 0
Line aux 0
Line vty 0 4
 login
```

8. Verify using the ping command to check the end-to-end connectivity from loopback of C1 to loopback of J3 & vice-versa. Paste screenshots of the commands used to complete this task

 vMX4

```
admin@Juniper-Router> ping 6.6.6.6
PING 6.6.6.6 (6.6.6.6): 56 data bytes
64 bytes from 6.6.6.6: icmp_seq=0 ttl=64 time=3.115 ms
64 bytes from 6.6.6.6: icmp_seq=1 ttl=64 time=0.402 ms
64 bytes from 6.6.6.6: icmp_seq=2 ttl=64 time=0.077 ms
64 bytes from 6.6.6.6: icmp_seq=3 ttl=64 time=0.264 ms
64 bytes from 6.6.6.6: icmp_seq=4 ttl=64 time=0.172 ms
64 bytes from 6.6.6.6: icmp_seq=5 ttl=64 time=0.300 ms
64 bytes from 6.6.6.6: icmp_seq=6 ttl=64 time=0.480 ms
64 bytes from 6.6.6.6: icmp_seq=7 ttl=64 time=0.484 ms
64 bytes from 6.6.6.6: icmp_seq=8 ttl=64 time=0.084 ms
64 bytes from 6.6.6.6: icmp_seq=9 ttl=64 time=1.872 ms
64 bytes from 6.6.6.6: icmp_seq=10 ttl=64 time=0.317 ms
64 bytes from 6.6.6.6: icmp_seq=11 ttl=64 time=0.098 ms
64 bytes from 6.6.6.6: icmp_seq=12 ttl=64 time=0.140 ms
64 bytes from 6.6.6.6: icmp_seq=13 ttl=64 time=0.130 ms
64 bytes from 6.6.6.6: icmp_seq=14 ttl=64 time=0.351 ms
64 bytes from 6.6.6.6: icmp_seq=15 ttl=64 time=0.594 ms
64 bytes from 6.6.6.6: icmp_seq=16 ttl=64 time=0.317 ms
^C64 bytes from 6.6.6.6: icmp_seq=17 ttl=64 time=0.204 ms
^R
64 bytes from 6.6.6.6: icmp_seq=18 ttl=64 time=0.707 ms
64 bytes from 6.6.6.6: icmp_seq=19 ttl=64 time=0.101 ms
^C
--- 6.6.6.6 ping statistics ---
20 packets transmitted, 20 packets received, 0% packet loss
round-trip min/avg/max/stddev = 0.077/0.510/3.115/0.711 ms
```

 37251

```
Router#ping 6.6.6.6 r 500
Type escape sequence to abort.
Sending 500, 100-byte ICMP Echos to 6.6.6.6, timeout is 2 seconds:
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
Success rate is 100 percent (500/500), round-trip min/avg/max = 4/10/28 ms
```

OSPF Troubleshooting

1. Troubleshoot between R1 and R2. Explain why the neighborship is down? Make sure the neighborship between R1 and R2 is up.

```
R1
R1#sh ip interf
R1#sh ip interface brief
Interface          IP-Address      OK? Method Status          Prot
oc0l
FastEthernet0/0    10.1.1.1       YES NVRAM administratively down down
FastEthernet0/1    unassigned     YES NVRAM administratively down down
Loopback0          1.1.1.1       YES NVRAM up             up

R1#config ter
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#in
R1(config)#interface fas
R1(config)#interface fastEthernet0/0
R1(config-if)#no shutdown
R1(config-if)#exit
R1(config)#exit
R1#
*Mar 1 00:05:11.371: %LINK-3-UPDOWN: Interface FastEthernet0/0, changed state to up
*Mar 1 00:05:12.131: %SYS-5-CONFIG_I: Configured from console by console
*Mar 1 00:05:12.371: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
R1#sh ip ospf nei
R1#sh ip ospf neighbor

R1#
*Mar 1 00:06:49.451: %OSPF-5-ADJCHG: Process 12345, Nbr 4.4.4.4 on FastEthernet0/0 from LOADING to FULL, Loading Done
R1#sh ip ospf neighbor

Neighbor ID      Pri  State        Dead Time   Address      Interface
4.4.4.4          1    FULL/BDR    00:00:35   10.1.1.2    FastEthernet0/0
0
```

```
R2
R2#sh ip interface bri
R2#sh ip interface brief
Interface          IP-Address      OK? Method Status          Prot
oc0l
FastEthernet0/0    10.1.1.5       YES NVRAM administratively down down
FastEthernet0/1    10.1.1.3       YES NVRAM administratively down down
Loopback0          2.2.2.2       YES NVRAM up             up

R2#config ter
R2#config terminal
Enter configuration commands, one per line. End with CNTL/Z.
R2(config)#in
R2(config)#interface fas
R2(config)#interface fastEthernet0/1
R2(config-if)#ip add
R2(config-if)#ip address 10.1.1.2 255.255.255.252
R2(config-if)#no shut
R2(config-if)#exit
R2(config)#
*Mar 1 00:06:49.695: %OSPF-5-ADJCHG: Process 12345, Nbr 1.1.1.1 on FastEthernet0/1 from LOADING to FULL, Loading Done
R2(config)#
*Mar 1 00:06:50.499: %LINK-3-UPDOWN: Interface FastEthernet0/1, changed state to up
*Mar 1 00:06:51.499: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up
R2(config)#exit
R2#
*Mar 1 00:06:55.375: %SYS-5-CONFIG_I: Configured from console by console
R2#sh ip int
R2#sh ip interface brie
Interface          IP-Address      OK? Method Status          Prot
oc0l
FastEthernet0/0    10.1.1.5       YES NVRAM administratively down down
FastEthernet0/1    10.1.1.2       YES manual up             up
Loopback0          2.2.2.2       YES NVRAM up             up

R2#sh ip ospf neig
R2#sh ip ospf neighbor

Neighbor ID      Pri  State        Dead Time   Address      Interface
1.1.1.1          1    FULL/DR     00:00:32   10.1.1.1    FastEthernet0/0
0
```

2. Troubleshoot between R2 and R3. Explain why the neighborship is down? Make sure the neighborship between R2 and R3 is up

```
R2#R2
R2(config-if)#no shutdown
R2(config-if)#no shutdown
R2(config-if)#exit
*Mar 1 00:31:49.547: %LINK-3-UPDOWN: Interface FastEthernet0/0, changed state to up
*Mar 1 00:31:50.547: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
R2(config)#exit
R2#
*Mar 1 00:31:55.315: %SYS-5-CONFIG_I: Configured from console by console
R2#sh ip os
R2#sh ip ospf in
R2#sh ip ospf interface
Loopback0 is up, line protocol is up
  Internet Address 2.2.2.2/32, Area 0
  Process ID 12345, Router ID 4.4.4.4, Network Type LOOPBACK, Cost: 1
  Loopback interface is treated as a stub Host
FastEthernet0/1 is up, line protocol is up
  Internet Address 10.1.1.2/30, Area 0
  Process ID 12345, Router ID 4.4.4.4, Network Type BROADCAST, Cost: 10
  Transmit Delay is 1 sec, State BDR, Priority 1
  Designated Router (ID) 1.1.1.1, Interface address 10.1.1.1
  Backup Designated router (ID) 4.4.4.4, Interface address 10.1.1.2
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    oob-resync timeout 40
    Hello due in 00:00:00
  Supports Link-local Signaling (LLS)
  Index 2/2, flood queue length 0
  Next 0x0(0)/0x0(0)
  Last flood scan length is 1, maximum is 1
  Last flood scan time is 0 msec, maximum is 0 msec
  Neighbor Count is 1, Adjacent neighbor count is 1
    Adjacent with neighbor 1.1.1.1 (Designated Router)
    Suppress hello for 0 neighbor(s)
FastEthernet0/0 is up, line protocol is up
  Internet Address 10.1.1.5/30, Area 0
  Process ID 12345, Router ID 4.4.4.4, Network Type BROADCAST, Cost: 10
  Transmit Delay is 1 sec, State DR, Priority 1
  Designated Router (ID) 4.4.4.4, Interface address 10.1.1.5
  No backup designated router on this network
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    oob-resync timeout 40
    Hello due in 00:00:07
  Supports Link-local Signaling (LLS)
  Index 3/3, flood queue length 0
  Next 0x0(0)/0x0(0)
  Last flood scan length is 0, maximum is 0
  Last flood scan time is 0 msec, maximum is 0 msec
  Neighbor Count is 0, Adjacent neighbor count is 0
    Suppress hello for 0 neighbor(s)
```

```
R3#R3
Loopback0      3.3.3.3      YES NVRAM  up
                                         up

R3#config ter
R3#config terminal
Enter configuration commands, one per line. End with CNTL/Z.
R3(config)#in
R3(config)#interface fas
R3(config)#interface fastEthernet0/0
R3(config-if)#no shu
R3(config-if)#no shutdown
R3(config-if)#exit
R3(config)#exit
R3#
*Mar 1 00:32:23.647: %LINK-3-UPDOWN: Interface FastEthernet0/0, changed state to up
*Mar 1 00:32:24.647: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
*Mar 1 00:32:24.795: %SYS-5-CONFIG_I: Configured from console by console
R3#sh ip os
R3#sh ip ospf in
R3#sh ip ospf interface
Loopback0 is up, line protocol is up
  Internet Address 3.3.3.3/32, Area 0
  Process ID 12345, Router ID 3.3.3.3, Network Type LOOPBACK, Cost: 1
  Loopback interface is treated as a stub Host
FastEthernet0/1 is administratively down, line protocol is down
  Internet Address 10.1.1.6/30, Area 0
  Process ID 12345, Router ID 3.3.3.3, Network Type BROADCAST, Cost: 10
  Transmit Delay is 1 sec, State DOWN, Priority 1
  No designated router on this network
  No backup designated router on this network
  Timer intervals configured, Hello 20, Dead 30, Wait 30, Retransmit 5
    oob-resync timeout 40
FastEthernet0/0 is up, line protocol is up
  Internet Address 10.1.1.9/30, Area 1
  Process ID 12345, Router ID 3.3.3.3, Network Type BROADCAST, Cost: 10
  Transmit Delay is 1 sec, State DR, Priority 1
  Designated Router (ID) 3.3.3.3, Interface address 10.1.1.9
  No backup designated router on this network
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    oob-resync timeout 40
    Hello due in 00:00:05
  Supports Link-local Signaling (LLS)
  Index 1/3, flood queue length 0
  Next 0x0(0)/0x0(0)
  Last flood scan length is 0, maximum is 0
  Last flood scan time is 0 msec, maximum is 0 msec
  Neighbor Count is 0, Adjacent neighbor count is 0
    Suppress hello for 0 neighbor(s)
```

3. Troubleshoot between R3 and R4. Explain why the neighborship is down? Make sure the neighborship between R3 and R4 is up.

```
R3
Neighbor Count is 0, Adjacent neighbor count is 0
Suppress hello for 0 neighbor(s)
R3#config ter
R3#config terminal
Enter configuration commands, one per line. End with CNTL/Z.
R3(config)#in
R3(config)#interface fas
R3(config)#interface fastEthernet0/0
R3(config-if)#ip ospf au
R3(config-if)#ip ospf authentication ?
  message-digest  Use message-digest authentication
  null          Use no authentication
<cr>
R3(config-if)#ip ospf authentication me
R3(config-if)#ip ospf authentication message-digest
R3(config-if)#ip os
R3(config-if)#ip ospf mes
R3(config-if)#ip ospf message-digest-key 3 md5 wxyz
R3(config-if)#end
R3#
*Mar 1 01:14:24.143: %SYS-5-CONFIG_I: Configured from console by console
R3#
*Mar 1 01:16:21.735: %OSPF-5-ADJCHG: Process 12345, Nbr 4.4.4.4 on FastEthernet
0/0 from LOADING to FULL, Loading Done
R3#sh ip ospf ne
R3#sh ip ospf neighbor

Neighbor ID      Pri  State        Dead Time   Address      Interface
4.4.4.4          1    FULL/DR     00:00:39   10.1.1.5    FastEthernet0/
1
4.4.4.4          1    FULL/DR     00:00:33   10.1.1.10   FastEthernet0/
0
```

```
R4#config ter
Enter configuration commands, one per line. End with CNTL/Z.
R4(config)#in
R4(config)#interface fas
R4(config)#interface fastEthernet1/
^
% Invalid input detected at '^' marker.

R4(config)#interface fastEthernet0/1
R4(config-if)#ip os
R4(config-if)#ip ospf mes
R4(config-if)#ip ospf message-digest-key
% Incomplete command.

R4(config-if)#ip ospf au
R4(config-if)#ip ospf authentication m
R4(config-if)#ip ospf authentication message-digest
R4(config-if)#ip os
R4(config-if)#ip ospf me
R4(config-if)#ip ospf message-digest-key 3 md5 wxyz
R4(config-if)#end
R4#
*Mar 1 01:16:17.175: %SYS-5-CONFIG_I: Configured from console by console
R4#sh ip odp
*Mar 1 01:16:21.739: %OSPF-5-ADJCHG: Process 12345, Nbr 3.3.3.3 on FastEthernet
0/1 from LOADING to FULL, Loading Done
^
% Invalid input detected at '^' marker.

R4#sh ip ospf ne
R4#sh ip ospf neighbor

Neighbor ID      Pri  State        Dead Time   Address      Interface
3.3.3.3          1    FULL/BDR   00:00:35   10.1.1.9    FastEthernet0/
1
R4#
```

4. Explain all the errors encountered while troubleshooting and attach screen show from R1 to R4. Also attach screenshot of routing table on R1.

```
R1>en
R1#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 [110/11] via 10.1.1.2, 00:45:53, FastEthernet0/0
      3.0.0.0/32 is subnetted, 1 subnets
O        3.3.3.3 [110/21] via 10.1.1.2, 00:45:53, FastEthernet0/0
          10.0.0.0/30 is subnetted, 3 subnets
O IA      10.1.1.8 [110/30] via 10.1.1.2, 00:45:53, FastEthernet0/0
C        10.1.1.0 is directly connected, FastEthernet0/0
O        10.1.1.4 [110/20] via 10.1.1.2, 00:45:55, FastEthernet0/0
R1#ping 4.4.4.4
```

```
R1#ping 4.4.4.4 r 500

Type escape sequence to abort.
Sending 500, 100-byte ICMP Echos to 4.4.4.4, timeout is 2 seconds:
!!!!!! !!!!!!! !!!!!!! !!!!!!! !!!!!!! !!!!!!! !!!!!!! !!!!!!! !!!!!!! !!!!!!!
!!!!!! !!!!!!! !!!!!!! !!!!!!! !!!!!!! !!!!!!! !!!!!!! !!!!!!! !!!!!!! !!!!!!!
!!!!!! !!!!!!! !!!!!!! !!!!!!! !!!!!!! !!!!!!! !!!!!!! !!!!!!! !!!!!!! !!!!!!!
!!!!!! !!!!!!! !!!!!!! !!!!!!! !!!!!!! !!!!!!! !!!!!!! !!!!!!! !!!!!!! !!!!!!!
!!!!!! !!!!!!! !!!!!!! !!!!!!! !!!!!!! !!!!!!! !!!!!!! !!!!!!! !!!!!!! !!!!!!!
!!!!!! !!!!!!! !!!!!!! !!!!!!! !!!!!!! !!!!!!! !!!!!!! !!!!!!! !!!!!!! !!!!!!!
Success rate is 100 percent (500/500), round-trip min/avg/max = 28/31/56 ms
R1#
```

Lab report

To determine the optimum route between the source and the destination router using its own Shortest Path First, Open Shortest Path First (OSPF) is a link-state routing protocol. As one of the Interior Gateway Protocols (IGP), or the protocol that tries to move the packet within a sizable autonomous system or routing domain, OSPF is designed by the Internet Engineering Task Force (IETF). It is a network layer protocol that employs AD value 110 and operates on protocol number 89. OSPF employs the multicast addresses 224.0.0.5 and 224.0.0.6 for updates to designated routers and backup designated routers, respectively.

The OSPF procedure creates and keeps track of three different tables:

A neighbor table keeps a list of all routers that are close by.

A topology table - a list of every conceivable path to all identified networks in a region.

A routing table, which lists the optimum path for each recognized network.

A standardized Link-State routing protocol with the ability to expand well to accommodate bigger networks is OSPF.

The following Link State characteristics are observed by OSPF:

- Areas are used in a hierarchical network design by OSPF.
- OSPF will establish neighbor connections with neighboring routers in the same Area.
- OSPF uses Link-State Advertisements (LSAs) to announce the state of directly linked links rather than announcing the distance to related networks.
- When one of its links changes, OSPF sends updates (LSAs), and it only conveys the change in the update. Additionally, LSAs are updated every 30 minutes.
- The multicast address for OSPF traffic is either 224.0.0.5 (for all OSPF routers) or 224.0.0.6 (for all Designated Routers).
- The Dijkstra Shortest Path First algorithm is used by OSPF to find the shortest path.
- Since OSPF is a classless protocol, VLSMs are supported.

OSPF Terms

1.Router Id:

On the router, it is the highest active IP address. The highest loopback address is regarded initially. The highest active IP address on the router's interface is used if no loopback configuration is present.

2.Router priority:

In a broadcast network, it is an 8-bit value used to elect the DR and BDR that is assigned to a router that is running OSPF.

3.Designated Router (DR):

The decision is made to form as few adjacencies as possible. The LSAs are distributed by DR to all other routers. In a broadcast network where every router shares its DBD, the DR is chosen. In a broadcast network, the router will ask DR for an update, and DR will supply the update in response.

4. Backup Designated Router (BDR):

In a broadcast network, BDR serves as a backup to DR. BDR takes on the role of DR and executes its duties when DR is reduced.

5. DR and BDR election:

Election of DR and BDR occurs in the broadcast network or multi-access network. The following are the selection criteria:

The router designated as DR will be the one with the highest router priority.

The highest router would be taken into consideration if there is a tie in router priority. The highest loopback address is taken into account first. The highest active IP address on the router's interface is taken into account if loopback is not set.

OSPF's other features are the following: OSPF only supports IP routing, and OSPF routes have an administrative distance of 110.

The cost metric used by OSPF, which is based on the link's bandwidth, is used. There is no hop-count cap for OSPF.

OSPF States

- **Down:** No hello packets have been received on the interface as of this point.
- **INIT:** The hello packets from the other router have been received at this point.
- **2WAY:** Both routers have received hello packets from other routers and are in the 2WAY state. Connection in both directions has been achieved.
- **Exstart:** Exchanges of NULL DBD occur in this situation. Elections for the master and slave are held in this state. The router with the higher router ID would take control and make the other router the slave. In this election, routers who have created a neighborhood will vote to determine which router will send its DBD first.
- **Exchange:** the routers are exchanging Database Descriptors (DBDs), which is indicated. The Topology Database of the router is described in DBDs. In order to identify whether a neighbor has data to exchange, a router will look at its DBD.
- **Loading:** signifies that the routers are finally exchanging Link State Advertisements, which contain data on all links linked to each router. In essence, routers exchange topology tables with one another.
- **Full:** All of the information is synchronized in this condition. Only after reaching the Full state can OSPF routing start.