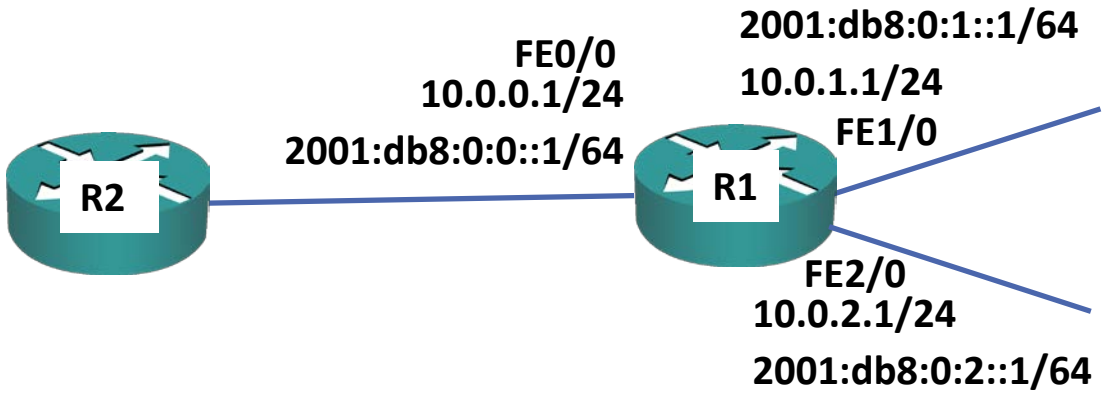
OSPF Verification



OSPFv2 Verification – show ip protocols

```
R1#show ip protocols
*** IP Routing is NSF aware ***

Routing Protocol is "ospf 1"
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Router ID 10.0.2.1
  Number of areas in this router is 1. 1 normal 0 stub 0 nssa
  Maximum path: 4
  Routing for Networks:
    10.0.0.0 0.255.255.255 area 0
  Routing Information Sources:
    Gateway         Distance      Last Update
  Distance: (default is 110)
```

OSPFv3 Verification – show ipv6 protocols

```
R1#show ipv6 protocols
IPv6 Routing Protocol is "connected"
IPv6 Routing Protocol is "ND"
IPv6 Routing Protocol is "ospf 1"
  Router ID 10.0.2.1
  Number of areas: 1 normal, 0 stub, 0 nssa
  Interfaces (Area 0):
    FastEthernet2/0
    FastEthernet1/0
    FastEthernet0/0
  Redistribution:
    None
```

OSPFv3 Verification – show ipv6 ospf

```
R2#show ipv6 ospf
 Routing Process "ospfv3 1" with ID 10.0.0.2
 Supports NSSA (compatible with RFC 3101)
 Event-log enabled, Maximum number of events: 1000, Mode: cyclic
 Router is not originating router-LSAs with maximum metric
 Initial SPF schedule delay 5000 msecs
 Minimum hold time between two consecutive SPFs 10000 msecs
 Maximum wait time between two consecutive SPFs 10000 msecs
 Minimum LSA interval 5 secs
 Minimum LSA arrival 1000 msecs
 LSA group pacing timer 240 secs
 Interface flood pacing timer 33 msecs
 Retransmission pacing timer 66 msecs
 Retransmission limit dc 24 non-dc 24
 Number of external LSA 0. Checksum Sum 0x000000
 Number of areas in this router is 1. 1 normal 0 stub 0 nssa
 Graceful restart helper support enabled
 Reference bandwidth unit is 100 mbps
 RFC1583 compatibility enabled
    Area BACKBONE(0)
        Number of interfaces in this area is 1
        SPF algorithm executed 2 times
        Number of LSA 7. Checksum Sum 0x03C7D7
        Number of DCbitless LSA 0
        Number of indication LSA 0
        Number of DoNotAge LSA 0
        Flood list length 0
```

OSPFv2 Verification – show ip ospf interface brief

```
R1#show ip ospf interface brief
Interface    PID   Area            IP Address/Mask    Cost  State Nbrs
F/C
Fa2/0        1     0               10.0.2.1/24        1     DR    0/0
Fa1/0        1     0               10.0.1.1/24        1     DR    0/0
Fa0/0        1     0               10.0.0.1/24        1     BDR   1/1
```

OSPFv3 Verification – show ipv6 ospf interface brief

```
R1#show ipv6 ospf interface brief
Interface    PID   Area            Intf ID    Cost  State Nbrs F/C
Fa2/0        1     0               4          1     DR    0/0
Fa1/0        1     0               3          1     DR    0/0
Fa0/0        1     0               2          1     DR    1/1
```

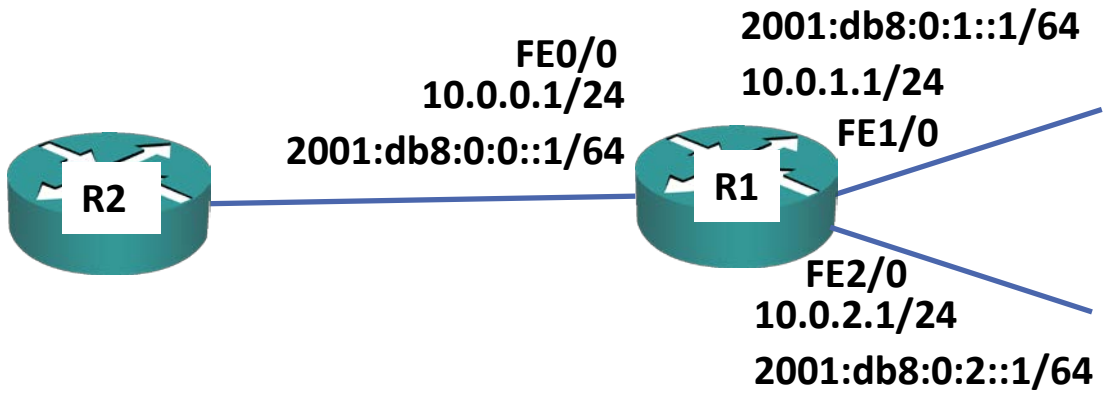
OSPF Operations

1. **Discover neighbours**
2. **Form adjacencies**
3. Flood Link State Database (LSDB)
4. Compute Shortest Path
5. Install best routes in routing table
6. Respond to network changes

OSPFv2 Verification - show ip ospf neighbor

```
R2#show ip ospf neighbor

Neighbor ID     Pri   State           Dead Time   Address         Interface
10.0.2.1          1   FULL/BDR        00:00:32    10.0.0.1        FastEthernet0/0
```

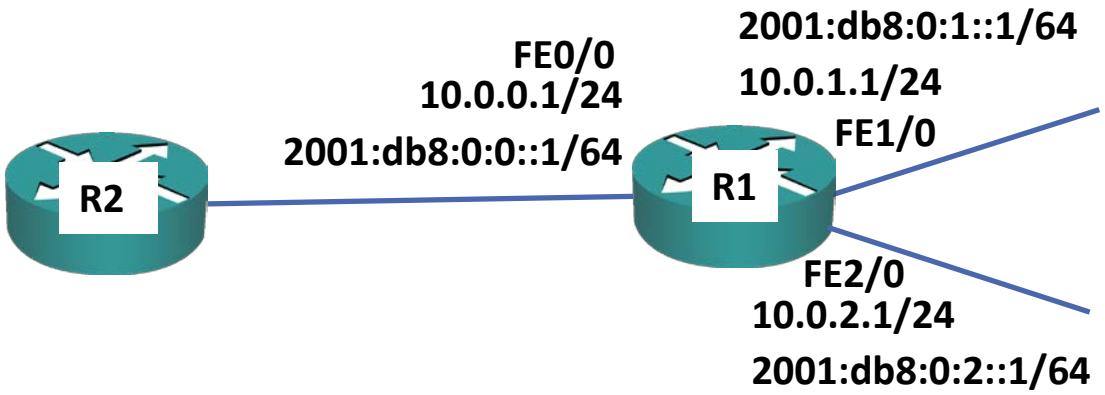


OSPFv3 Verification - show ipv6 ospf neighbor

```
R2#show ipv6 ospf neighbor

            OSPFv3 Router with ID (10.0.0.2) (Process ID 1)

Neighbor ID     Pri   State           Dead Time   Interface ID    Interface
10.0.2.1          1   FULL/DR         00:00:38    2               FastEthernet0/0
```



OSPF Operations

1. Discover neighbours
2. Form adjacencies
3. **Flood Link State Database (LSDB)**
4. Compute Shortest Path
5. Install best routes in routing table
6. Respond to network changes

OSPFv2 Verification - show ip ospf database

```
R2#show ip ospf database

            OSPF Router with ID (10.0.0.2) (Process ID 1)

                Router Link States (Area 0)

Link ID         ADV Router      Age         Seq#       Checksum Link count
10.0.0.2        10.0.0.2        438         0x80000003 0x00CF31 1
10.0.2.1        10.0.2.1        476         0x80000001 0x003B8D 3

                Net Link States (Area 0)

Link ID         ADV Router      Age         Seq#       Checksum
10.0.0.2        10.0.0.2        438         0x80000001 0x009375
```

OSPFv3 Verification - show ipv6 ospf database

```
R2#show ipv6 ospf database

            OSPFv3 Router with ID (10.0.0.2) (Process ID 1)

                Router Link States (Area 0)

ADV Router       Age         Seq#       Fragment ID  Link count  Bits
 10.0.0.2        332         0x80000002  0            1           None
 10.0.2.1        333         0x80000002  0            1           None

                Net Link States (Area 0)

ADV Router       Age         Seq#       Link ID    Rtr count
 10.0.2.1        333         0x80000001  2          2

                Link (Type-8) Link States (Area 0)

ADV Router       Age         Seq#       Link ID    Interface
 10.0.0.2        374         0x80000001  2          Fa0/0
 10.0.2.1        420         0x80000001  2          Fa0/0

                Intra Area Prefix Link States (Area 0)

ADV Router       Age         Seq#       Link ID    Ref-lstype  Ref-LSID
 10.0.2.1        333         0x80000004  0          0x2001      0
 10.0.2.1        333         0x80000001  2048       0x2002      2
```

OSPF Operations

1. Discover neighbours
2. Form adjacencies
3. Flood Link State Database (LSDB)
4. **Compute Shortest Path**
5. **Install best routes in routing table**
6. Respond to network changes

OSPFv2 Verification - show ip route

```
R2#show ip route
Codes: L - local, 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, H - NHRP, l - LISP
       + - replicated route, % - next hop override

Gateway of last resort is not set

      10.0.0.0/8 is variably subnetted, 4 subnets, 2 masks
C        10.0.0.0/24 is directly connected, FastEthernet0/0
L        10.0.0.2/32 is directly connected, FastEthernet0/0
O        10.0.1.0/24 [110/2] via 10.0.0.1, 00:08:29, FastEthernet0/0
O        10.0.2.0/24 [110/2] via 10.0.0.1, 00:08:29, FastEthernet0/0
```

OSPFv3 Verification - show ipv6 route

```
R2#show ipv6 route
IPv6 Routing Table - default - 5 entries
Codes: C - Connected, L - Local, S - Static, U - Per-user Static route
       B - BGP, R - RIP, H - NHRP, I1 - ISIS L1
       I2 - ISIS L2, IA - ISIS interarea, IS - ISIS summary, D - EIGRP
       EX - EIGRP external, ND - ND Default, NDp - ND Prefix, DCE - Destination
       NDr - Redirect, O - OSPF Intra, OI - OSPF Inter, OE1 - OSPF ext 1
       OE2 - OSPF ext 2, ON1 - OSPF NSSA ext 1, ON2 - OSPF NSSA ext 2, l - LISP
C    2001:DB8::/64 [0/0]
      via FastEthernet0/0, directly connected
L    2001:DB8::2/128 [0/0]
      via FastEthernet0/0, receive
O    2001:DB8:0:1::/64 [110/2]
      via FE80::C801:3FFF:FE30:0, FastEthernet0/0
O    2001:DB8:0:2::/64 [110/2]
      via FE80::C801:3FFF:FE30:0, FastEthernet0/0
L    FF00::/8 [0/0]
      via Null0, receive
```

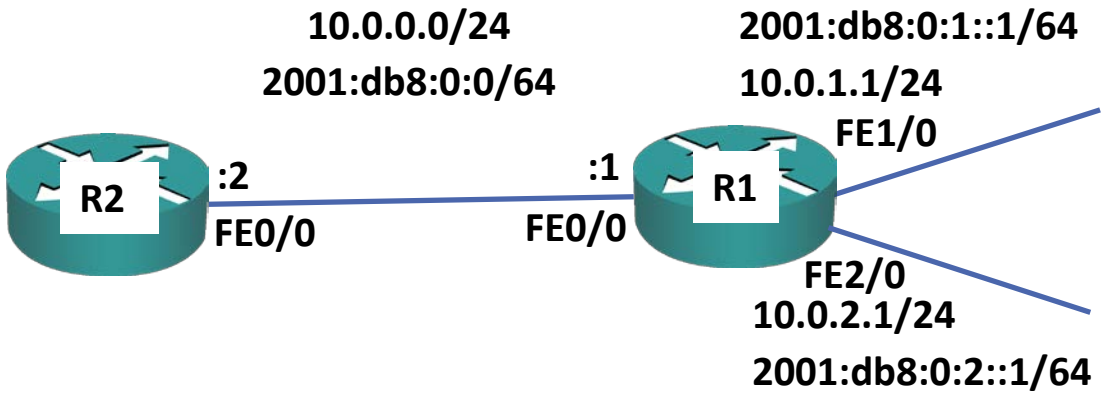
OSPFv3 – Link Local Addresses

- OSPFv3 next hop addresses in the IPv6 routing table use link local addresses
- It is recommended to configure your routers manually with memorable link local addresses to make verification and troubleshooting easier

OSPFv3 Verification - show ipv6 route

```
R2#show ipv6 route
IPv6 Routing Table - default - 5 entries
Codes: C - Connected, L - Local, S - Static, U - Per-user Static route
       B - BGP, R - RIP, H - NHRP, I1 - ISIS L1
       I2 - ISIS L2, IA - ISIS interarea, IS - ISIS summary, D - EIGRP
       EX - EIGRP external, ND - ND Default, NDp - ND Prefix, DCE - Destination
       NDr - Redirect, O - OSPF Intra, OI - OSPF Inter, OE1 - OSPF ext 1
       OE2 - OSPF ext 2, ON1 - OSPF NSSA ext 1, ON2 - OSPF NSSA ext 2, l - LISP
C    2001:DB8::/64 [0/0]
      via FastEthernet0/0, directly connected
L    2001:DB8::2/128 [0/0]
      via FastEthernet0/0, receive
O    2001:DB8:0:1::/64 [110/2]
      via FE80::C801:3FFF:FE30:0, FastEthernet0/0
O    2001:DB8:0:2::/64 [110/2]
      via FE80::C801:3FFF:FE30:0, FastEthernet0/0
L    FF00::/8 [0/0]
      via Null0, receive
```

Lab



R2 Loopback 0
192.168.0.2/32
2001:db8:1:0::2/128

R1 Loopback 0
192.168.0.1/32
2001:db8:1:0::1/128