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## IPv6 Introduction

### Verify IPv4 Connectivity

1. Verify R1, R2, R3, PC1 and PC2 have been configured with IPv4 addresses as shown in the topology diagram.

PC1		PC2	
Physical	Config	Physical	Config
<b>FastEthernet0/0</b>		<b>FastEthernet0/0</b>	
Port Status	<input checked="" type="checkbox"/> On	Port Status	<input checked="" type="checkbox"/> On
Bandwidth	<input type="radio"/> 100 Mbps <input type="radio"/> 10 Mbps <input checked="" type="checkbox"/> Auto	Bandwidth	<input type="radio"/> 100 Mbps <input type="radio"/> 10 Mbps <input checked="" type="checkbox"/> Auto
Duplex	<input type="radio"/> Half Duplex <input checked="" type="radio"/> Full Duplex <input checked="" type="checkbox"/> Auto	Duplex	<input type="radio"/> Half Duplex <input checked="" type="radio"/> Full Duplex <input checked="" type="checkbox"/> Auto
MAC Address	0000.0C47.14C0	MAC Address	0001.C750.8E8A
IP Configuration		IP Configuration	
IPv4 Address	10.10.0.10	IPv4 Address	10.10.3.10
Subnet Mask	255.255.255.0	Subnet Mask	255.255.255.0

```
R1#show ip interface brief
```

Interface	IP-Address	OK?	Method	Status
Protocol				
FastEthernet0/0	10.10.1.1	YES	NVRAM	up
FastEthernet0/1	10.10.0.1	YES	NVRAM	up
FastEthernet1/0	unassigned	YES	NVRAM	administratively down
FastEthernet1/1	unassigned	YES	NVRAM	administratively down
Vlan1	unassigned	YES	unset	administratively down

```
R2#show ip interface brief
```

Interface	IP-Address	OK?	Method	Status
Protocol				
FastEthernet0/0	10.10.1.2	YES	NVRAM	up
FastEthernet0/1	10.10.2.2	YES	NVRAM	up
FastEthernet1/0	unassigned	YES	NVRAM	administratively down
FastEthernet1/1	unassigned	YES	NVRAM	administratively down

```

down
Vlan1                unassigned      YES unset  administratively down
down
R2#

```

```

R3# show ip int brief
Interface            IP-Address      OK? Method Status
Protocol
FastEthernet0/0      10.10.2.1       YES NVRAM  up
FastEthernet0/1      10.10.3.1       YES NVRAM  up
FastEthernet1/0      unassigned      YES NVRAM  administratively down
down
FastEthernet1/1      unassigned      YES NVRAM  administratively down
down
Vlan1                unassigned      YES unset  administratively down
down

```

Running the command show ip route on the routers also showed the other reachable routes, for example from R1:R1#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, E - EGP
       i - IS-IS, 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
  10.0.0.0/8 is variably subnetted, 6 subnets, 2 masks
C       10.10.0.0/24 is directly connected, FastEthernet0/1
L       10.10.0.1/32 is directly connected, FastEthernet0/1
C       10.10.1.0/24 is directly connected, FastEthernet0/0
L       10.10.1.1/32 is directly connected, FastEthernet0/0
D       10.10.2.0/24 [90/30720] via 10.10.1.2, 00:06:32, FastEthernet0/0
D       10.10.3.0/24 [90/33280] via 10.10.1.2, 00:06:32, FastEthernet0/0

```

**2. View the routing tables on R1, R2 and R3 to verify connectivity has been established between all networks. What routing protocol is being used?**

Using the command 'Show ip routes' lets us see the networks the router is connected to or in other words, it learns it can reach that network via a route. As shown below, the routes were created using the routing dynamic protocol EIGRP

```
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, E - EGP
       i - IS-IS, 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
    10.0.0.0/8 is variably subnetted, 6 subnets, 2 masks
C       10.10.0.0/24 is directly connected, FastEthernet0/1
L       10.10.0.1/32 is directly connected, FastEthernet0/1
C       10.10.1.0/24 is directly connected, FastEthernet0/0
L       10.10.1.1/32 is directly connected, FastEthernet0/0
D       10.10.2.0/24 [90/30720] via 10.10.1.2, 00:06:32, FastEthernet0/0
D       10.10.3.0/24 [90/33280] via 10.10.1.2, 00:06:32, FastEthernet0/0
```

**3. Verify PC1 and PC2 have been configured with the correct default gateway.**

```
PC1#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, E - EGP
       i - IS-IS, 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 10.10.0.1 to network 0.0.0.0
    10.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C       10.10.0.0/24 is directly connected, FastEthernet0/0
L       10.10.0.10/32 is directly connected, FastEthernet0/0
S*     0.0.0.0/0 [1/0] via 10.10.0.1
```

```

PC2#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, E - EGP
       i - IS-IS, 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 10.10.3.1 to network 0.0.0.0
 10.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C       10.10.3.0/24 is directly connected, FastEthernet0/0
L       10.10.3.10/32 is directly connected, FastEthernet0/0
S* 0.0.0.0/0 [1/0] via 10.10.3.1

```

#### 4. Ping PC2 from PC1 to verify end-to-end reachability.

Yes,

```

PC2#ping 10.10.0.10
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.10.0.10, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/0 ms
PC2#

```

## IPv6 Addressing

5. Configure global unicast IPv6 addresses on R1, R2, and R3, according to the network topology diagram. Do not enable ipv6 unicast-routing.

```

R1(config)#interface FastEthernet 0/0
R1(config-if)#ipv6 add 2001:DB8:0:1::1/64
R1(config-if)#exit
R1(config)#
R1(config)#interface FastEthernet 0/1
R1(config-if)#ipv6 add 2001:DB8:0:0::1/64
R1(config-if)#exit

```

```
R1(config)#end
```

```
R2(config)#interface F0/0
R2(config-if)#ipv6 add 2001:DB8:0:1::2/64
R2(config-if)#exit
R2(config)#inte
R2(config)#interface F0/1
R2(config-if)#ipv6 add 2001:DB8:0:2::2/64
R2(config-if)#exit
R2(config)#exit
```

```
R3(config)#interface F0/0
R3(config-if)#ipv6 address 2001:DB8:0:2::1/64
R3(config-if)#exit
R3(config)#int
R3(config)#interface FastEthernet 0/1
R3(config-if)#ipv6 address 2001:DB8:0:3::1/64
R3(config-if)#end
```

**6. Configure global unicast EUI-64 IPv6 addresses on the FastEthernet 0/0 interfaces on PC1 and PC2.**

```
PC1(config-if)#ipv6 address 2001:db8:0:0::10/64 ?
  anycast  Configure as an anycast
  eui-64   Use eui-64 interface identifier
  <cr>
PC1(config-if)#ipv6 address 2001:db8:0:0::10/64 eui-64
PC1(config-if)#end
```

```
PC2(config)#interface F0/0
PC2(config-if)#ipv6 address 2001:DB8:0:3::10/64 ?
  anycast  Configure as an anycast
  eui-64   Use eui-64 interface identifier
  <cr>
PC2(config-if)#ipv6 address 2001:DB8:0:3::10/64 eui-64
PC2(config-if)#end
```

**7. Will the routers have IPv6 link-local addresses on the interfaces where you just configured global unicast addresses? What about the other interfaces? Verify this.**

Yes, routers automatically generate IPv6 link-local addresses on all IPv6-enabled interfaces. This happens whether or not a global unicast address is configured, as link-local addresses are required for local communication and routing protocols. Since the other interfaces aren't enabled for ipv6 therefore they won't have a link-local address.

```
PC1#show ipv6 interface brief
FastEthernet0/0          [up/up]
    FE80::200:CFF:FE47:14C0
    2001:DB8::200:CFF:FE47:14C0
FastEthernet0/1          [administratively down/down]
    unassigned
FastEthernet1/0          [administratively down/down]
    unassigned
FastEthernet1/1          [administratively down/down]
    unassigned
Vlan1                    [administratively down/down]
    unassigned
PC1#
```

```
PC2#show ipv6 interface
FastEthernet0/0 is up, line protocol is up
IPv6 is enabled, link-local address is FE80::201:C7FF:FE50:8E8A
No Virtual link-local address(es):
Global unicast address(es):
    2001:DB8:0:3:201:C7FF:FE50:8E8A, subnet is 2001:DB8:0:3::/64 [EUI]
Joined group address(es):
    FF02::1
    FF02::1:FF50:8E8A
MTU is 1500 bytes
ICMP error messages limited to one every 100 milliseconds
```

```
ICMP redirects are enabled
ICMP unreachables are sent
ND DAD is enabled, number of DAD attempts: 1
ND reachable time is 30000 milliseconds
PC2#show ipv6 interface brief
FastEthernet0/0          [up/up]
    FE80::201:C7FF:FE50:8E8A
    2001:DB8:0:3:201:C7FF:FE50:8E8A
FastEthernet0/1          [administratively down/down]
    unassigned
FastEthernet1/0          [administratively down/down]
    unassigned
FastEthernet1/1          [administratively down/down]
    unassigned
Vlan1                    [administratively down/down]
    unassigned
PC2#
```

8. Note down the EUI-64 global unicast addresses on PC1 and PC2.

```
PC1#show ipv6 interface brief
FastEthernet0/0          [up/up]
    FE80::200:CFF:FE47:14C0
    2001:DB8::200:CFF:FE47:14C0
```

```
PC2#show ipv6 interface brief
FastEthernet0/0          [up/up]
    FE80::201:C7FF:FE50:8E8A
    2001:DB8:0:3:201:C7FF:FE50:8E8A
```

9. Configure link-local addresses on R1, R2, and R3.

```
R1(config)#interface FastEthernet 0/0
R1(config-if)#ipv6 address FE80::1 link-local
R1(config-if)#exit
```

```
R1(config)#interface FastEthernet 0/1
R1(config-if)#ipv6 address fe80::1 ?
  link-local Use link-local address
R1(config-if)#ipv6 address fe80::1 link
R1(config-if)#ipv6 address fe80::1 link-local
```

```
R2(config)#interface FastEthernet 0/0
R2(config-if)#ipv6 address ?
WORD                               General prefix name
X:X:X:X::X                         IPv6 link-local address
X:X:X:X::X/<0-128>                 IPv6 prefix
autoconfig                        Obtain address using autoconfiguration
dhcp                              Obtain a ipv6 address using dhcp
R2(config-if)#ipv6 address fe80::2 ?
  link-local Use link-local address
R2(config-if)#ipv6 address fe80::2 link-local
R2(config-if)#exit

R2(config)#interface FastEthernet 0/1
R2(config-if)#ipv6 address fe80::2 link
R2(config-if)#ipv6 address fe80::2 link-local
R2(config-if)#exit
R2(config)#
```

```
R3(config)#interface FastEthernet 0/0
R3(config-if)#ipv6 address fe80::3 lin
R3(config-if)#ipv6 address fe80::3 link-local
R3(config-if)#exit
R3(config)#int
R3(config)#interface Fas
R3(config)#interface FastEthernet 0/1
R3(config-if)#ipv6 address fe80::3 link
R3(config-if)#ipv6 address fe80::3 link-local
R3(config-if)#end
```



10. Verify the global unicast and link-local addresses have been configured correctly on R1, R2 and R3.

```
R1#sh ipv6 interface brief
FastEthernet0/0      [up/up]
    FE80::1
    2001:DB8:0:1::1
FastEthernet0/1      [up/up]
    FE80::1
    2001:DB8::1
FastEthernet1/0      [administratively down/down]
    unassigned
FastEthernet1/1      [administratively down/down]
    unassigned
Vlan1                [administratively down/down]
    unassigned
```

```
R2#sh ipv6 interface brief
FastEthernet0/0      [up/up]
    FE80::2
    2001:DB8:0:1::2
FastEthernet0/1      [up/up]
    FE80::2
    2001:DB8:0:2::2
FastEthernet1/0      [administratively down/down]
    unassigned
FastEthernet1/1      [administratively down/down]
    unassigned
Vlan1                [administratively down/down]
    unassigned
```

```
R3#show ipv6 interface brief
FastEthernet0/0      [up/up]
    FE80::3
    2001:DB8:0:2::1
FastEthernet0/1      [up/up]
    FE80::3
    2001:DB8:0:3::1
FastEthernet1/0      [administratively down/down]
    unassigned
```

```
FastEthernet1/1      [administratively down/down]
  unassigned
Vlan1                [administratively down/down]
  unassigned
```

**11. Ping R1 and R3 on their link-local addresses from R2.**

NOTE: I configured fe80::1 on all the routers interfaces which caused an issue when running show ipv6 neighbors. Nothing would print out even tho the ping would be successful

```
R2#ping fe80::1
Output Interface: f0/0
% Invalid interface. Use full interface name without spaces (e.g.
Serial0/1)
Output Interface: ping fe80::1
% Invalid interface. Use full interface name without spaces (e.g.
Serial0/1)
Output Interface: FastEthernet0/0
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to FE80::1, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/2 ms
R2#ping fe80::3
Output Interface: FastEthernet0/1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to FE80::3, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/0 ms
```

## 12. View the IPv6 neighbors known by R2.

```
R2#show ipv6 neighbors
```

IPv6 Address		Age	Link-layer Addr	State	
Interface					
FE80::1		0	000D.BD2D.27D4	REACH	Fa0/0
FE80::3		0	0030.F2BA.30E7	REACH	Fa0/1

# Static Routing

**13. Verify which IPv6 dynamic routing protocols are running on R1, R2, and R3. Do not use the 'show run' command.**

```
R1#show ipv6 route
IPv6 Routing Table - 5 entries
Codes: C - Connected, L - Local, S - Static, R - RIP, B - BGP
       U - Per-user Static route, M - MIPv6
       I1 - ISIS L1, I2 - ISIS L2, IA - ISIS interarea, IS - ISIS summary
       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
       D - EIGRP, EX - EIGRP external
C   2001:DB8::/64 [0/0]
    via FastEthernet0/1, directly connected
L   2001:DB8::1/128 [0/0]
    via FastEthernet0/1, receive
C   2001:DB8:0:1::/64 [0/0]
    via FastEthernet0/0, directly connected
L   2001:DB8:0:1::1/128 [0/0]
    via FastEthernet0/0, receive
L   FF00::/8 [0/0]
    via Null0, receive
R1#show ipv6 prot
R1#show ipv6 protocols
IPv6 Routing Protocol is "connected"
IPv6 Routing Protocol is "ND"
R1#
```

**14. Use the 'show run | include ipv6 route' command on R1, R2 and R3 to verify if they have been configured with IPv6 static routes.**

```
R1#show run | include ipv6 route
R1#
```

```
R2#show run | include ipv6 route
R2#
```

```
R3#show run | include ipv6 route
R3#
```

15. Do you expect to see any routes in the IPv6 routing tables? Why or why not? Verify this.

No, I didn't expect any routes to appear as we have configured any routes (including both dynamic and static) and not even a gateway either. Only the connected and local addresses will appear since they've been configured with an IPv6 address

```
R1#show ipv6 route
IPv6 Routing Table - 5 entries
Codes: C - Connected, L - Local, S - Static, R - RIP, B - BGP
       U - Per-user Static route, M - MIPv6
       I1 - ISIS L1, I2 - ISIS L2, IA - ISIS interarea, IS - ISIS summary
       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
       D - EIGRP, EX - EIGRP external
C    2001:DB8::/64 [0/0]
    via FastEthernet0/1, directly connected
L    2001:DB8::1/128 [0/0]
    via FastEthernet0/1, receive
C    2001:DB8:0:1::/64 [0/0]
    via FastEthernet0/0, directly connected
L    2001:DB8:0:1::1/128 [0/0]
    via FastEthernet0/0, receive
L    FF00::/8 [0/0]
    via Null0, receive
```

```
R2#show ipv6 route
IPv6 Routing Table - 5 entries
Codes: C - Connected, L - Local, S - Static, R - RIP, B - BGP
       U - Per-user Static route, M - MIPv6
       I1 - ISIS L1, I2 - ISIS L2, IA - ISIS interarea, IS - ISIS summary
       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
       D - EIGRP, EX - EIGRP external
C    2001:DB8:0:1::/64 [0/0]
    via FastEthernet0/0, directly connected
```

```
L 2001:DB8:0:1::2/128 [0/0]
  via FastEthernet0/0, receive
C 2001:DB8:0:2::/64 [0/0]
  via FastEthernet0/1, directly connected
L 2001:DB8:0:2::2/128 [0/0]
  via FastEthernet0/1, receive
```

```
L FF00::/8 [0/0]
  via Null0, receive
R2#
```

```
R3#show ipv6 route
IPv6 Routing Table - 5 entries
Codes: C - Connected, L - Local, S - Static, R - RIP, B - BGP
       U - Per-user Static route, M - MIPv6
       I1 - ISIS L1, I2 - ISIS L2, IA - ISIS interarea, IS - ISIS summary
       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
       D - EIGRP, EX - EIGRP external
C 2001:DB8:0:2::/64 [0/0]
  via FastEthernet0/0, directly connected
L 2001:DB8:0:2::1/128 [0/0]
  via FastEthernet0/0, receive
C 2001:DB8:0:3::/64 [0/0]
  via FastEthernet0/1, directly connected
L 2001:DB8:0:3::1/128 [0/0]
  via FastEthernet0/1, receive
L FF00::/8 [0/0]
  via Null0, receive
```

16. Do you expect PC1 to be able to ping PC2 on its IPv6 address? Why or why not? Verify this.

```
PC1#ping 2001:DB8:0:3:201:C7FF:FE50:8E8A
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2001:DB8:0:3:201:C7FF:FE50:8E8A, timeout
is 2 seconds:
.....
```

Success rate is 0 percent (0/5)

17. Configure PC1 to use R1 as its IPv6 default gateway.

```
PC1(config)#ipv6 route ::/0 2001:DB8:0:0::1
PC1(config)#end
PC1#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, E - EGP
       i - IS-IS, 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 10.10.0.1 to network 0.0.0.0
 10.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C       10.10.0.0/24 is directly connected, FastEthernet0/0
L       10.10.0.10/32 is directly connected, FastEthernet0/0
S*     0.0.0.0/0 [1/0] via 10.10.0.1
```

18. Configure PC2 to use R3 as its IPv6 default gateway.

```
PC2#config
Configuring from terminal, memory, or network [terminal]?
Enter configuration commands, one per line. End with CNTL/Z.
PC2(config)#ipv6 route ::/0 2001:db8:0:3::1
PC2(config)#exit
```

```
PC2#
*Mar 01, 12:59:53.5959: SYS-5-CONFIG_I: Configured from console by console
PC2#show ipv6 route
IPv6 Routing Table - 4 entries
Codes: C - Connected, L - Local, S - Static, R - RIP, B - BGP
       U - Per-user Static route, M - MIPv6
       I1 - ISIS L1, I2 - ISIS L2, IA - ISIS interarea, IS - ISIS summary
```

```

    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
    D - EIGRP, EX - EIGRP external
S   ::/0 [1/0]
    via 2001:DB8:0:3::1
C   2001:DB8:0:3::/64 [0/0]
    via FastEthernet0/0, directly connected
L   2001:DB8:0:3:201:C7FF:FE50:8E8A/128 [0/0]
    via FastEthernet0/0, receive
L   FF00::/8 [0/0]
    via Null0, receive

```

#### 19. Verify PC1 and PC2 can ping their default gateways.

```

PC1#ping Fe80::1
Output Interface: FastEthernet 0/0
% Invalid interface. Use full interface name without spaces (e.g.
Serial0/1)
Output Interface: ping Fe80::1
% Invalid interface. Use full interface name without spaces (e.g.
Serial0/1)
Output Interface: FastEthernet0/0
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to FE80::1, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/3/16 ms

```

```

PC2#ping fe80::3
Output Interface: FastEthernet 0/0
% Invalid interface. Use full interface name without spaces (e.g.
Serial0/1)
Output Interface: ping fe80::3
% Invalid interface. Use full interface name without spaces (e.g.
Serial0/1)
Output Interface: FastEthernet0/0
Type escape sequence to abort.

```

```
Sending 5, 100-byte ICMP Echos to FE80::3, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/2 ms
```

20. Add a static route on R2 for the 2001:db8::/64 network.

21. PC1 has reachability to its default gateway R1, and R2 has a route to the 2001:db8::/64 network. Do you expect PC1 to be able to ping R2 on 2001:db8:0:1::2? Why or why not? Verify this.

No, because we haven't enabled ipv6 unicast-routing on the routers

```
PC1#ping 2001:db8:0:1::1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2001:db8:0:1::1, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/1 ms
PC1#ping 2001:db8:0:1::2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2001:db8:0:1::2, timeout is 2 seconds:
.....
Success rate is 0 percent (0/5)
PC1#
```

22. Fix the problem to allow PC1 to ping R2 on 2001:db8:0:1::2. Enter the command which will fix the problem on R1, R2 and R3.

```
R1(config)#ipv6 unicast routing
```

```
R2(config)#ipv6 unicast-routing
```

```
R3(config)#ipv6 unicast-routing
```

23. Verify PC1 can ping R2 on 2001:db8:0:1::2 now.



```
PC1#ping 2001:db8:0:1::2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2001:db8:0:1::2, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/0 ms
```

24. Will PC1 be able to ping PC2 by IPv6 address? Why or why not? Verify this.

No, as we haven't established static routes on R1 to reach the networks that's connected to R3. For example, we still to configure the route from R1 to get to network 2001:DB8:0:2::/64 and 2001:DB8:0:3/64 which is the network that PC2 is in

```
PC1#ping 2001:db8:0:3::10
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2001:db8:0:3::10, timeout is 2 seconds:
U.U.U
Success rate is 0 percent (0/5)
PC1#
```

25. Configure static routes to allow reachability between all IPv6 networks.

```
R1(config)#ipv6 route 2001:db8:0:2::/64 2001:db8:0:1::2
R1(config)#ipv6 route 2001:db8:0:3::/64 2001:db8:0:1::2
R1(config)#end
```

```
R2(config)#ipv6 route 2001:db8::/64 2001:db8:0:1::1
R2(config)#ipv6 route 2001:db8:0:3::/64 2001:db8:0:2::1
R2(config)#exit
```

```
R3(config)#ipv6 route 2001:DB8:0:1::/64 2001:DB8:0:2::2
R3(config)#ipv6 route 2001:DB8::/64 2001:DB8:0:2::2
R3(config)#end
```

## 26. Verify the IPv6 routing tables on R1, R2 and R3.

```
R1#show ipv6 route
IPv6 Routing Table - 7 entries
Codes: C - Connected, L - Local, S - Static, R - RIP, B - BGP
       U - Per-user Static route, M - MIPv6
       I1 - ISIS L1, I2 - ISIS L2, IA - ISIS interarea, IS - ISIS summary
       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
       D - EIGRP, EX - EIGRP external
C    2001:DB8::/64 [0/0]
    via FastEthernet0/1, directly connected
L    2001:DB8::1/128 [0/0]
    via FastEthernet0/1, receive
C    2001:DB8:0:1::/64 [0/0]
    via FastEthernet0/0, directly connected
L    2001:DB8:0:1::1/128 [0/0]
    via FastEthernet0/0, receive
S    2001:DB8:0:2::/64 [1/0]
    via 2001:DB8:0:1::2
S    2001:DB8:0:3::/64 [1/0]
    via 2001:DB8:0:1::2
L    FF00::/8 [0/0]
    via Null0, receive
```

```
R2#show ipv6 route
IPv6 Routing Table - 7 entries
Codes: C - Connected, L - Local, S - Static, R - RIP, B - BGP
       U - Per-user Static route, M - MIPv6
       I1 - ISIS L1, I2 - ISIS L2, IA - ISIS interarea, IS - ISIS summary
       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
       D - EIGRP, EX - EIGRP external
S    2001:DB8::/64 [1/0]
    via 2001:DB8:0:1::1
C    2001:DB8:0:1::/64 [0/0]
    via FastEthernet0/0, directly connected
```

```
L  2001:DB8:0:1::2/128 [0/0]
   via FastEthernet0/0, receive
C  2001:DB8:0:2::/64 [0/0]
   via FastEthernet0/1, directly connected
L  2001:DB8:0:2::2/128 [0/0]
   via FastEthernet0/1, receive
S  2001:DB8:0:3::/64 [1/0]
   via 2001:DB8:0:2::1
L  FF00::/8 [0/0]
   via Null0, receive
```

```
R3#show ipv6 route
IPv6 Routing Table - 7 entries
Codes: C - Connected, L - Local, S - Static, R - RIP, B - BGP
       U - Per-user Static route, M - MIPv6
       I1 - ISIS L1, I2 - ISIS L2, IA - ISIS interarea, IS - ISIS summary
       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
       D - EIGRP, EX - EIGRP external
S  2001:DB8::/64 [1/0]
   via 2001:DB8:0:2::2
S  2001:DB8:0:1::/64 [1/0]
   via 2001:DB8:0:2::2
C  2001:DB8:0:2::/64 [0/0]
   via FastEthernet0/0, directly connected
L  2001:DB8:0:2::1/128 [0/0]
   via FastEthernet0/0, receive
C  2001:DB8:0:3::/64 [0/0]
   via FastEthernet0/1, directly connected
L  2001:DB8:0:3::1/128 [0/0]
   via FastEthernet0/1, receive
L  FF00::/8 [0/0]
   via Null0, receive
```

27. Verify PC1 can now ping PC2 by its IPv6 address.

```
PC1#ping 2001:DB8:0:3:201:C7FF:FE50:8E8A
```

```
Type escape sequence to abort.
```

```
Sending 5, 100-byte ICMP Echos to 2001:DB8:0:3:201:C7FF:FE50:8E8A, timeout  
is 2 seconds:
```

```
!!!!
```

```
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/10/51 ms
```