

## Lab 8

## Lab Completed Remotely

## Unicast Routing

The screenshot displays two Cisco IOS Command Line Interface (CLI) windows, labeled R1 and R2, showing the configuration of unicast routing.

**R1 Configuration:**

```
no ip cef
ip6e unicast-routing
!
no ip6e cef
!
!
R1#
R1#show running-config | include ip6e unicast-routing
ip6e unicast-routing
R1#show ip6e interface brief
GigabitEthernet0/0      [up/down]
FE80::260:5CFF:FE2C:6601
GigabitEthernet0/1      [administratively down/down]
unassigned
Serial1/0/0             [up/up]
FE80::260:5CFF:FE2C:6601
2001:C16C:0:1::1        [administratively down/down]
Serial1/1/1              [administratively down/down]
unassigned
Vlan1                    [administratively down/down]
R1#ping ip6e FE80::2D0:FFFF:FE72:8601 %Serial0/0/0
% Invalid input detected at '^' marker.
R1#ping ip6e FE80::2D0:FFFF:FE72:8601
Output Interface: Serial0/0/0
% Invalid interface. Use full interface name without spaces (e.g. Serial0/1)
Output Interface: Serial0/1/0
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echoes to FE80::2D0:FFFF:FE72:8601, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 3/3/4 ms
R1#show running-config | include ip6e unicast-routing
ip6e unicast-routing
R1#
```

**R2 Configuration:**

```
2001:C16C:0:1::/64 [0/0]
via Serial0/1/1, directly connected
1 2001:C16C:0:1::/128 [0/0]
via Serial0/1/1, receive
1 FF02::1/8 [0/0]
via Null0, receive
R2#show ip6e interface brief
GigabitEthernet0/0      [up/down]
FE80::2D0:FFFF:FE72:8601
GigabitEthernet0/1      [administratively down/down]
unassigned
Serial1/0/0             [administratively down/down]
unassigned
Serial1/1/1              [up/up]
FE80::2D0:FFFF:FE72:8601
2001:C16C:0:1::2        [administratively down/down]
Vlan1                    [administratively down/down]
unassigned
R2#show ip6e FE80::260:5CFF:FE2C:6601
Output Interface: d
% Invalid interface. Use full interface name without spaces (e.g. Serial0/1)
Output Interface: Serial0/1/0
% IPv6 isn't enabled on this interface
Output Interface: Serial0/1
% Invalid interface. Use full interface name without spaces (e.g. Serial0/1)
Output Interface: Serial0/1/1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echoes to FE80::260:5CFF:FE2C:6601, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 3/4/6 ms
R2#show running-config | include ip6e unicast-routing
ip6e unicast-routing
R2#
```

## Interfaces Config

The screenshot displays two Cisco IOS Command Line Interface (CLI) windows, labeled R1 and R2, showing the configuration of interfaces for IPv6 unicast routing.

**R1 Configuration:**

```
unassigned
R1#ping ip6e FE80::2D0:FFFF:FE72:8601 %Serial0/0/0
% Invalid input detected at '^' marker.
R1#ping ip6e FE80::2D0:FFFF:FE72:8601
Output Interface: Serial0/0/0
% Invalid interface. Use full interface name without spaces (e.g. Serial0/1)
Output Interface: Serial0/1/0
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echoes to FE80::2D0:FFFF:FE72:8601, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 3/3/4 ms
R1#show running-config | include ip6e unicast-routing
ip6e unicast-routing
R1#show ip6e interface Serial0/1/0
Serial0/1/0 is up, line protocol is up
IPv6 is enabled, link-local address is FE80::260:5CFF:FE2C:6601
No Virtual link-local address(es):
Global unicast address(es):
  2001:C16C:0:1::1, subnet is 2001:C16C:0:1::/64
Joined group address(es):
  FF02::1
  FF02::2
  FF02::1:FF00:1
  FF02::1:FF2C:6601
MTU is 1500 bytes
ICMP error messages limited to one every 100 milliseconds
ICMP redirects are enabled
ICMP unreachable are sent
ND DAD is enabled, number of DAD attempts: 1
ND reachable time is 30000 milliseconds
ND advertised reachable time is 0 (unspecified)
ND advertised retransmit interval is 0 (unspecified)
ND router advertisements are sent every 200 seconds
ND router advertisements live for 1800 seconds
ND advertised default router preference is Medium
Hosts use stateless autoconfig for addresses.
R1#
```

**R2 Configuration:**

```
% IPv6 isn't enabled on this interface
Output Interface: Serial0/1
% Invalid interface. Use full interface name without spaces (e.g. Serial0/1)
Output Interface: Serial0/1/1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echoes to FE80::260:5CFF:FE2C:6601, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 3/4/6 ms
R2#show running-config | include ip6e unicast-routing
ip6e unicast-routing
R2#show ip6e interfaces Serial0/1/1
% Invalid input detected at '^' marker.
R2#show ip6e interface Serial0/1/1
Serial0/1/1 is up, line protocol is up
IPv6 is enabled, link-local address is FE80::2D0:FFFF:FE72:8601
No Virtual link-local address(es):
Global unicast address(es):
  2001:C16C:0:1::2, subnet is 2001:C16C:0:1::/64
Joined group address(es):
  FF02::1
  FF02::2
  FF02::1:FF00:2
  FF02::1:FF72:8601
MTU is 1500 bytes
ICMP error messages limited to one every 100 milliseconds
ICMP redirects are enabled
ICMP unreachable are sent
ND DAD is enabled, number of DAD attempts: 1
ND reachable time is 30000 milliseconds
ND advertised reachable time is 0 (unspecified)
ND advertised retransmit interval is 0 (unspecified)
ND router advertisements are sent every 200 seconds
ND router advertisements live for 1800 seconds
ND advertised default router preference is Medium
Hosts use stateless autoconfig for addresses.
R2#
```

## LANs Interfaces

Physical

Config

CLI

Attributes

IOS Command Line Interface

```
2001::16C:0:1::/64
Joined group address(es):
  FE02::1
  FE02::2
  FE02::1:FF00:1
  FE02::1:FE2C:6601
MTU is 1500 bytes
ICMP error messages limited to one every 100 milliseconds
ICMP redirects are enabled
ICMP unreachable are sent
ND DAD is enabled, number of DAD attempts: 1
ND reachable time is 30000 milliseconds
ND advertised reachable time is 0 (unspecified)
ND advertised retransmit interval is 0 (unspecified)
ND router advertisements are sent every 200 seconds
ND router advertisements live for 1800 seconds
ND advertised default router preference is Medium
Hosts use stateless autoconfig for addresses.
R1#
R1#show ipv6 interface gigabitEthernet0/0
GigabitEthernet0/0 is up, line protocol is down
IPv6 is tentative, link-local address is FE80::260:5CFF:FE2C:6601 [TEN]
No Virtual link-local address(es):
Global unicast address(es):
  2001::16C:0:2:260:5CFF:FE2C:6601, subnet is 2001::16C:0:1::/64 [EUI/64]
Joined group address(es):
  FE02::1
  FE02::2
  FE02::1:FF00:2
  FE02::1:FE72:8601
MTU is 1500 bytes
ICMP error messages limited to one every 100 milliseconds
ICMP redirects are enabled
ICMP unreachable are sent
ND DAD is enabled, number of DAD attempts: 1
ND reachable time is 30000 milliseconds
ND advertised reachable time is 0 (unspecified)
ND advertised retransmit interval is 0 (unspecified)
ND router advertisements are sent every 200 seconds
ND router advertisements live for 1800 seconds
ND advertised default router preference is Medium
Hosts use stateless autoconfig for addresses.
R1#
```

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Physical

Config

CLI

Attributes

IOS Command Line Interface

```
* IPv6 is enabled on this interface
Output Interface: Serial0/1/1
* Invalid interface. Use full interface name without spaces (e.g. Serial0/1)
Output Interface: Serial0/1/1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to FE80::260:5CFF:FE2C:6601, timeout is 2 seconds:
!!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 3/4/6 ms

Router#
Router#show running-config | include ipv6 unicast-routing
ipv6 unicast-routing
Router#show ipv6 interfaces Serial0/1/1
* Invalid input detected at '^' marker.

Router#show ipv6 interface Serial0/1/1
Serial0/1/1 is up, line protocol is up
IPv6 is enabled, link-local address is FE80::2D0:FFFF:FE72:8601
No Virtual link-local address(es):
Global unicast address(es):
  2001::16C:0:1::/64
Joined group address(es):
  FE02::1
  FE02::2
  FE02::1:FF00:2
  FE02::1:FE72:8601
MTU is 1500 bytes
ICMP error messages limited to one every 100 milliseconds
ICMP redirects are enabled
ICMP unreachable are sent
ND DAD is enabled, number of DAD attempts: 1
ND reachable time is 30000 milliseconds
ND advertised reachable time is 0 (unspecified)
ND advertised retransmit interval is 0 (unspecified)
ND router advertisements are sent every 200 seconds
ND router advertisements live for 1800 seconds
ND advertised default router preference is Medium
Hosts use stateless autoconfig for addresses.
Router#show ipv6 interface gigabitEthernet
```

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## Routing tables

Physical

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CLI

Attributes

IOS Command Line Interface

```
ND router advertisements live for 1800 seconds
ND advertised default router preference is Medium
Hosts use stateless autoconfig for addresses.
R1#
R1#show ipv6 interface gigabitEthernet0/0
GigabitEthernet0/0 is up, line protocol is down
IPv6 is tentative, link-local address is FE80::260:5CFF:FE2C:6601 [TEN]
No Virtual link-local address(es):
Global unicast address(es):
  2001::16C:0:2:260:5CFF:FE2C:6601, subnet is 2001::16C:0:1::/64 [EUI/64]
Joined group address(es):
  FE02::1
MTU is 1500 bytes
ICMP error messages limited to one every 100 milliseconds
ICMP redirects are enabled
ICMP unreachable are sent
ND DAD is enabled, number of DAD attempts: 1
ND reachable time is 30000 milliseconds
ND advertised reachable time is 0 (unspecified)
ND advertised retransmit interval is 0 (unspecified)
ND router advertisements are sent every 200 seconds
ND router advertisements live for 1800 seconds
ND advertised default router preference is Medium
Hosts use stateless autoconfig for addresses.
R1#show ipv6 route
IPv6 Routing Table - 3 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, ODR - 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::16C:0:1::/64 [0/0]
  via Serial0/1/0, directly connected
L 2001::16C:0:1::128 [0/0]
  via Serial0/1/0, receive
L FE00::/8 [0/0]
  via Null0, receive
R1#
```

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IOS Command Line Interface

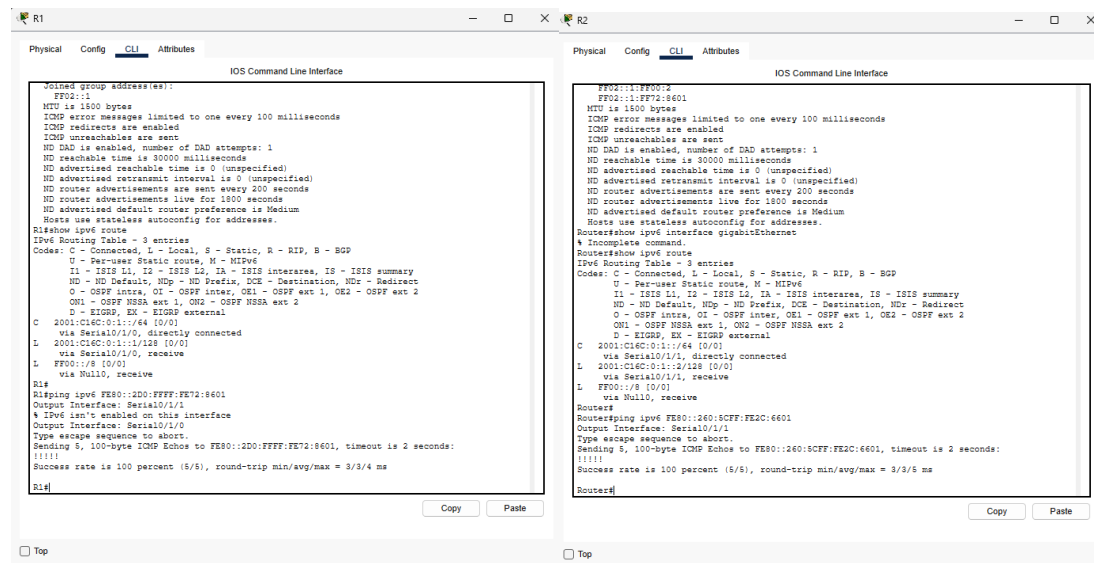
```
Serial0/1/1 is up, line protocol is up
IPv6 is enabled, link-local address is FE80::2D0:FFFF:FE72:8601
No Virtual link-local address(es):
Global unicast address(es):
  2001::16C:0:1::/64
Joined group address(es):
  FE02::1
  FE02::2
  FE02::1:FF00:2
  FE02::1:FE72:8601
MTU is 1500 bytes
ICMP error messages limited to one every 100 milliseconds
ICMP redirects are enabled
ICMP unreachable are sent
ND DAD is enabled, number of DAD attempts: 1
ND reachable time is 30000 milliseconds
ND advertised reachable time is 0 (unspecified)
ND advertised retransmit interval is 0 (unspecified)
ND router advertisements are sent every 200 seconds
ND router advertisements live for 1800 seconds
ND advertised default router preference is Medium
Hosts use stateless autoconfig for addresses.
Router#show ipv6 interface gigabitEthernet
* Incomplete command.
Router#show ipv6 route
IPv6 Routing Table - 3 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, ODR - 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::16C:0:1::/64 [0/0]
  via Serial0/1/1, directly connected
L 2001::16C:0:1::2/128 [0/0]
  via Serial0/1/1, receive
L FE00::/8 [0/0]
  via Null0, receive
Router#
```

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## Ping test



Questions – Answer the questions below and place in a word document.

1. List the 3 classes of IPv4 addresses that are used for assigning IP addresses and their default subnet masks.

Class A: 255.0.0.0 (/8)

Class B: 255.255.0.0 (/16)

Class C: 255.255.255.0 (/24)

2. How do IPv6 addresses differ from IPv4 addresses?

Longer address space (128 bits vs. 32 bits).

No need for NAT (designed for end-to-end connectivity).

Built-in security (IPsec) and auto-configuration (SLAAC).

3. How has the IETF come up with ways to extend the life of IPv4 addresses?

NAT (Network Address Translation).

CIDR (Classless Inter-Domain Routing).

DHCP (Dynamic Host Configuration Protocol).

4. How are IPv6 addresses abbreviated?

Leading zeros in each hextet can be omitted.

Consecutive hextets of zeros can be replaced with `::` (once per address).

5. Abbreviate the following IPv6 addresses:

- a. 3278:AB12:0000:000F:B147:0000:0000:000C

1. 3278:AB12:0:F:B147::C

- b. 141:0000:0000:0000:0015:0000:0000:1000

2. 141::15:0:0:1000

- c. 2001:0000:3238:DFE1:0063:0000:0000:FEFB

3. 2001:0:3238:DFE1:63::FFFF