Lawton Pittenger
CNT 4703
Lab 8 and 9
LAB COMPLETED REMOTELY

```
Router#sh ipv6 interface
Serial0/3/0 is up, line protocol is up
  IPv6 is enabled, link-local address is FE80::290:CFF:FEBA:3C01
  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:FFBA:3C01
  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
  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#
```

```
Router#show running-config
Building configuration...

Current configuration : 770 bytes
!
version 15.1
no service timestamps log datetime msec
no service timestamps debug datetime msec
no service password-encryption
!
hostname Router
!
!
!
!
!
!
!
!
no ip cef
ipv6 unicast-routing
!
no ipv6 cef
!
!
!
!
license udi pid CISCO2811/K9 sn FTX10175084-
!
!
!
!
!
!
!
!
!
!
!
spanning-tree mode pvst
!
!
!
!
!
!
interface FastEthernet0/0
 no ip address
 duplex auto
 speed auto
 shutdown
!
interface FastEthernet0/1
 no ip address
 duplex auto
 speed auto
 shutdown
!
interface Serial0/3/0
 no ip address
 ipv6 address 2001:C16C:0:1::1/64
```

```
interface Serial0/3/0
 no ip address
 ipv6 address 2001:C16C:0:1::1/64
!
interface Serial0/3/1
 no ip address
 clock rate 2000000
 shutdown
!
interface Vlan1
 no ip address
 shutdown
!
ip classless
!
ip flow-export version 9
!
!
!
!
!
!
!
line con 0
!
line aux 0
!
line vty 0 4
 login
!
!
!
end


Router#
Router#
```

```
Router#show ipv6 interface brief
FastEthernet0/0            [administratively down/down]
    unassigned
FastEthernet0/1            [administratively down/down]
    unassigned
Serial0/3/0                [up/up]
    FE80::290:CFF:FEBA:3C01
    2001:C16C:0:1::1
Serial0/3/1                [administratively down/down]
    unassigned
Vlan1                      [administratively down/down]
    unassigned
Router#
```

```
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, 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:C16C:0:1::/64 [0/0]
     via Serial0/3/1, directly connected
L   2001:C16C:0:1::2/128 [0/0]
     via Serial0/3/1, receive
L   FF00::/8 [0/0]
     via Null0, receive
Router#
```

```
Router#ping ipv6 2001:C16C:0:1::1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2001:C16C:0:1::1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/24/93 ms

Router#
```

```
Router#ping R1-WAN

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2001:C16C:0:1::1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

Router#
```

```
Router#sh ipv6 interface brief
FastEthernet0/0            [up/up]
    FE80::201:C7FF:FE14:5701
    2001:C16C:0:3:201:C7FF:FE14:5701
FastEthernet0/1            [administratively down/down]
    unassigned
Serial0/3/0                [administratively down/down]
    unassigned
Serial0/3/1                [up/up]
    FE80::201:C7FF:FE14:5701
    2001:C16C:0:1::2
Vlan1                      [administratively down/down]
    unassigned
Router#
```

```
Router#sh 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:C16C:0:1::/64 [0/0]
     via Serial0/3/1, directly connected
L   2001:C16C:0:1::2/128 [0/0]
     via Serial0/3/1, receive
C   2001:C16C:0:3::/64 [0/0]
     via FastEthernet0/0, directly connected
L   2001:C16C:0:3:201:C7FF:FE14:5701/128 [0/0]
     via FastEthernet0/0, receive
L   FF00::/8 [0/0]
     via Null0, receive
Router#
```

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

   The three classes of IPv4 addresses are:

   Class A:

   - Range of addresses: 1.0.0.0 to 126.255.255.255
   - Default subnet mask: 255.0.0.0

   Class B:

   - Range of addresses: 128.0.0.0 to 191.255.255.255

   Default subnet mask: 255.255.0.0

   Class C:

   - Range of addresses: 192.0.0.0 to 223.255.255.255
   - Default subnet mask: 255.255.255.0

2. How do IPv6 addresses differ from IPv4 addresses?

   IPv6 addresses differ from IPv4 addresses in several ways:

   - Address length: IPv4 addresses are 32 bits long, while IPv6 addresses are 128 bits long. This means that IPv6 addresses can support a much larger number of devices and networks.
   - Address notation: IPv6 addresses are expressed using hexadecimal notation, while IPv4 addresses are expressed using decimal notation.
   - Address types: IPv6 has several types of addresses, including unicast, anycast, and multicast addresses. IPv4 has only unicast and multicast addresses.
   - Simplified header: The IPv6 header is simpler than the IPv4 header, which reduces overhead and improves routing efficiency.
   - Built-in security: IPv6 includes built-in security features such as IPsec, which provides authentication and encryption for network traffic.
   - Autoconfiguration: IPv6 includes features that allow devices to automatically configure their own addresses and obtain other network configuration information.

Overall, IPv6 addresses are designed to support the growing number of devices and networks on the internet, while also providing enhanced security and network management features.

3. How has the IETF come up with ways to extend the life of IPv4 addresses?
   The Internet Engineering Task Force (IETF) has come up with several ways to extend the life of IPv4 addresses. Some of these include:
   - Network Address Translation (NAT): NAT allows multiple devices on a private network to share a single public IP address. This helps conserve IPv4 addresses by allowing many devices to use a single public IP address.
   - Classless Inter-Domain Routing (CIDR): CIDR is a way to allocate IP addresses more efficiently by allowing variable-length subnet masks. This allows networks to use only the number of IP addresses they need, rather than being limited to a fixed number of addresses based on their class.
   - Dynamic Host Configuration Protocol (DHCP): DHCP allows devices on a network to automatically obtain IP addresses and other network configuration information. This helps reduce the number of IP addresses that are wasted or unused.
   - IPv6 transition technologies: The IETF has developed several technologies to help transition from IPv4 to IPv6, including tunneling, translation, and dual-stack technologies. These allow networks to support both IPv4 and IPv6 addresses during the transition period.

   Overall, these technologies help conserve IPv4 addresses and extend their lifespan, while also facilitating the transition to IPv6. However, IPv6 is ultimately necessary for the long-term growth and expansion of the internet.
4. How are IPv6 addresses abbreviated?
   IPv6 addresses are abbreviated using several techniques to make them more compact and easier to read.
   - One common technique is called zero compression or double colon (::). This technique allows the removal of consecutive blocks of zeroes in the address, replacing them with a double colon. For example, the address 2001:0db8:0000:0000:0000:ff00:0042:8329 can be abbreviated as 2001:db8::ff00:42:8329.
   - Another technique is to use the IPv4-mapped IPv6 address notation, which allows an IPv4 address to be expressed as an IPv6 address. This is done by taking the first 96 bits of the address and representing them in the standard IPv6 format, while the last 32 bits are represented as an IPv4 address in dotted decimal notation. For example, the IPv4 address 192.0.2.1 can be represented as ::ffff:192.0.2.1 in IPv6 notation.
   - Finally, IPv6 addresses can also be expressed using hexadecimal notation, with each block of 16 bits represented by four hexadecimal digits. For example, the address 2001:0db8:85a3:0000:0000:8a2e:0370:7334 can be expressed as 2001:db8:85a3::8a2e:370:7334 using zero compression or as 2001:0db8:85a3:0000:0000:8a2e:0370:7334 without zero compression, but in hexadecimal notation.
5. Abbreviate the following IPv6 addresses:
   a. 3278:AB12:0000:000F:B147:0000:0000:000C - 3278:AB12::F:B147::C
   b. 141:0000:0000:0000:0015:0000:0000:1000 - 141::15:0:0:1000
   c. 2001:0000:3238:DFE1:0063:0000:0000:FEFB - 2001:0:3238:DFE1:63::FEFB