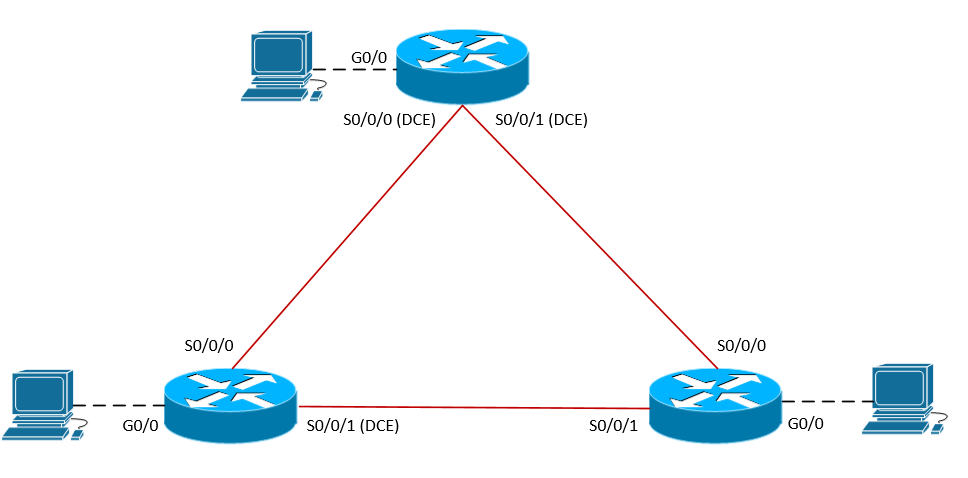
Packet Tracer – IPv6 Basic addressing, static routing, and host configuration

(Instructor Version)

**Instructor Note**: Red font color indicate text that appears in the instructor copy only.

Topology



1. Scenario

NetVise Corporation has decided that their new network infrastructure will be built from the ground up using IPv6. As the network administrator you have been given instructions on how to configure the network for basic IPv6 addressing as well as static routing to allow traffic to pass between sites. Your manager has requested that the IPv6 implementation is fully documented and verified.   
  
Prior to starting this lab, your manager provided you with some supporting training material. You are expected to review the provided material thoroughly before starting this lab.

1. Addressing Table

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Device | Interface | Type | IP Address | Prefix | Default Gateway |
| S1-RTR | S0/0/0 | Global Unicast | 2001:db8:0:12::1 | /64 | N/A |
| S0/0/0 | Link Local | FE80::12 | /64 | N/A |
| S0/0/1 | Global Unicast | 2001:db8:0:13::1 | /64 | N/A |
| S0/0/1 | Link Local | FE80::13 | /64 | N/A |
| G0/0 | Global Unicast | 2001:db8:0:1::1 | /64 | N/A |
| G0/0 | Link Local | FE80::1 | /64 | N/A |
| S1-PC | NIC | EUI-64 |  |  |  |
| S2-RTR | S0/0/0 | Global Unicast | 2001:db8:0:12::2 | /64 | N/A |
| S0/0/1 | Global Unicast | 2001:db8:0:23::2 | /64 | N/A |
| G0/0 | Global Unicast | 2001:db8:0:2::1 | /64 | N/A |
| S2-PC | NIC | Global Unicast | 2001:db8:0:2::100 | /64 | 2001:db8:0:2::1 |
| S3-RTR | S0/0/0 | Global Unicast | 2001:db8:0:13::3 | /64 | N/A |
| S0/0/1 | Global Unicast | 2001:db8:0:23::3 | /64 | N/A |
| G0/0 | Global Unicast | 2001:db8:0:3::1 | /64 | N/A |
| S3-PC | NIC | Global Unicast | 2001:db8:0:3::100 | /64 | 2001:db8:0:3::1 |

1. Objectives

* Enable IPv6 routing.
* Configure IPv6 Link-Local and Global Unicast Addresses according to the address table.
* Assign IPv6 addresses to hosts, statically and statefully using EUI-64.
* Configure static routing
  + Directly attached (interface)
  + Recursive (next-hop)
  + Fully Specified (interface and next-hop)
  + Default
  + Floating
* Perform route summarization.

**Task 1: Enable IPv6 routing and assign IPv6 addresses to the appropriate interfaces.**

**Step 1:** Although this step is not required to assign IPv6 addresses to the interfaces, you must enable IPv6 in order to forward IPv6 unicast datagrams (routing).

**S1-RTR(config)#** ipv6 unicast-routing  
!

**S2-RTR(config)#** ipv6 unicast-routing

**!  
S3-RTR(config)#** ipv6 unicast-routing

**Step 2:** Assign IPv6 addresses according to the table provided. For design purposes, the hub location requires manually configured link-local addresses on all interfaces. The following configuration is a sample of one of the configured interfaces.

**S1-RTR**(config)# interface s0/0/0  
S1-RTR(config-if)# ipv6 address FE80::12 link-local  
S1-RTR(config-if)# ipv6 address 2001:db8:0:12::1/64   
S1-RTR(config-if)# clock rate 64000  
S1-RTR(config-if)# no shutdown  
!S1-RTR(config-if)# interface s0/0/1  
S1-RTR(config-if)# ipv6 address FE80::13 link-local  
S1-RTR(config-if)# ipv6 address 2001:db8:0:13::1/64  
S1-RTR(config-if)# clock rate 64000  
S1-RTR(config-if)# no shutdown  
!  
S1-RTR(config-if)# interface g0/0  
S1-RTR(config-if)# ipv6 address FE80::1 link-local

S1-RTR(config-if)# ipv6 address 2001:db8:0:1::1/64  
S1-RTR(config-if)# no shutdown

**S2-RTR**(config)# interface s0/0/0  
S2-RTR(config-if)# ipv6 address 2001:db8:0:12::2/64  
S2-RTR(config-if)# no shutdown  
!

S2-RTR(config)# interface s0/0/1  
S2-RTR(config-if)# ipv6 address 2001:db8:0:23::2/64  
S2-RTR(config-if)# clock rate 64000  
S2-RTR(config-if)# no shutdown  
!  
S2-RTR(config-if)# interface g0/0  
S2-RTR(config-if)# ipv6 address 2001:db8:0:2::1/64  
S2-RTR(config-if)# no shutdown

**S3-RTR**(config)# interface s0/0/0  
S3-RTR(config-if)# ipv6 address 2001:db8:0:13::3/64  
S3-RTR(config-if)# no shutdown  
!

S3-RTR(config)# interface s0/0/1  
S3-RTR(config-if)# ipv6 address 2001:db8:0:23::3/64  
S3-RTR(config-if)# no shutdown  
!  
S3-RTR(config-if)# interface g0/0  
S3-RTR(config-if)# ipv6 address 2001:db8:0:3::1/64  
S3-RTR(config-if)# no shutdown

**S1-RTR# show ipv6 interface brief**

GigabitEthernet0/0 [up/up]

FE80::1

2001:DB8:0:1::1

Serial0/0/0 [up/up]

FE80::13

2001:DB8:0:12::1

Serial0/0/1 [up/up]

FE80::13

2001:DB8:0:13::1

**S1-RTR# show ipv6 interface s0/0/0**

Serial0/0/0 is up, line protocol is up

IPv6 is enabled, link-local address is FE80::13

No Virtual link-local address(es):

Global unicast address(es):

2001:DB8:0:12::1, subnet is 2001:DB8:0:12::/64

Joined group address(es):

FF02::1

FF02::2

FF02::1:FF00:1

FF02::1:FF00:13

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

Hosts use stateless autoconfig for addresses.

**Task 2: Assign IPv6 addresses to hosts**

**Step 1:** S1-PC should be configured using EUI-64 (stateful).

1. Open up S1-PC **>** Config **>** under IPv6 Configuration select “Auto Config”
2. Ensure IPv6 unicast routing is enabled on the directly connected router.
3. Document host configuration and ping the default gateway.

**PC>ipv6config**

FastEthernet0 Connection:(default port)

Link-local IPv6 Address.........: FE80::2E0:B0FF:FED8:71DA

IPv6 Address....................: 2001:DB8:0:1:2E0:B0FF:FED8:71DA/64

Default Gateway.................: FE80::1

**PC>ping FE80::1**

Pinging FE80::1 with 32 bytes of data:

Reply from FE80::1: bytes=32 time=0ms TTL=255

Reply from FE80::1: bytes=32 time=0ms TTL=255

Reply from FE80::1: bytes=32 time=0ms TTL=255

Reply from FE80::1: bytes=32 time=0ms TTL=255

Ping statistics for FE80::1:

Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),

Approximate round trip times in milli-seconds:

Minimum = 0ms, Maximum = 0ms, Average = 0ms

**Step 2:** S2-PC and S3-PC should be configured statically.

1. Open S2-PC and S3-PC **>** under Gateway/DNS IPv6 **>** enter the IPv6 address assigned to S2-RTR and S3-RTR G0/0 interface respectfully.
2. Next, under the FastEthernet0 interface **>** enter the static IPv6 address according to the table provided.
3. Verify connectivity by pinging the default gateway.

**PC>ipv6config**

FastEthernet0 Connection:(default port)

Link-local IPv6 Address.........: FE80::202:17FF:FE06:49A6

IPv6 Address....................: 2001:DB8:0:2::2/64

Default Gateway.................: 2001:DB8:0:2::1

**PC>ping 2001:db8:0:2::1**

Pinging 2001:db8:0:2::1 with 32 bytes of data:

Reply from 2001:DB8:0:2::1: bytes=32 time=0ms TTL=255

Reply from 2001:DB8:0:2::1: bytes=32 time=0ms TTL=255

Reply from 2001:DB8:0:2::1: bytes=32 time=0ms TTL=255

Reply from 2001:DB8:0:2::1: bytes=32 time=0ms TTL=255

Ping statistics for 2001:DB8:0:2::1:

Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),

Approximate round trip times in milli-seconds:

Minimum = 0ms, Maximum = 0ms, Average = 0ms

**Task 3: Configure static routing to allow all PCs to communicate**

**Step 1:** Configure directly attached static routes to allow for S1 and S2 LANs to communicate.

**S1-RTR(config)#** ipv6 route 2001:db8:0:2::/64 serial 0/0/0  
!  
**S2-RTR(config)#** ipv6 route 2001:db8:0:1::/64 serial0/0/0

**S1-RTR#** show ipv6 route

S 2001:DB8:0:2::/64 [1/0]

via ::, Serial0/0/0

**S2-RTR#** show ipv6 route

S 2001:DB8:0:1::/64 [1/0]

via ::, Serial0/0/0

**Step 2:** Configure recursive (next-hop) static routes to allow for S2 and S3 LANs to communicate.

**S2-RTR(config)#** ipv6 route 2001:db8:0:3::/64 2001:db8:0:23::3  
!

**S3-RTR(config)#** ipv6 route 2001:db8:0:2::/64 2001:db8:0:23::2

**S2-RTR#** show ipv6 route

S 2001:DB8:0:3::/64 [1/0]

via 2001:DB8:0:23::3

**S3-RTR#** show ipv6 route

S 2001:DB8:0:2::/64 [1/0]

via 2001:DB8:0:23::2

**Step 3:** Configure a fully specified (interface and next-hop) static route to allow for S3’s LAN to reach S1’s LAN.

**S3-RTR(config)#** ipv6 route 2001:db8:0:1::/64 serial0/0/0 2001:db8:0:13::1

**S3-RTR#** show ipv6 route

S 2001:DB8:0:1::/64 [1/0]

via 2001:DB8:0:13::1, Serial0/0/0

**Step 3:** Configure a static default route to allow for S1’s LAN to reach S3’s LAN.

**S1-RTR(config)#** ipv6 route 0::/0 s0/0/1

**S1-RTR#** show ipv6 route

S ::/0 [1/0]

via ::, Serial0/0/1

**Step 4:** Verify connectivity, at this point all hosts should be able to ping each other.

**S1-PC>**ping 2001:db8:0:2::100

Pinging 2001:db8:0:2::100 with 32 bytes of data:

Reply from 2001:DB8:0:2::100: bytes=32 time=7ms TTL=126

Reply from 2001:DB8:0:2::100: bytes=32 time=6ms TTL=126

Reply from 2001:DB8:0:2::100: bytes=32 time=7ms TTL=126

Reply from 2001:DB8:0:2::100: bytes=32 time=8ms TTL=126

Ping statistics for 2001:DB8:0:2::100:

Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),

Approximate round trip times in milli-seconds:

Minimum = 6ms, Maximum = 8ms, Average = 7ms

**S1-PC >**ping 2001:db8:0:3::100

Pinging 2001:db8:0:3::100 with 32 bytes of data:

Reply from 2001:DB8:0:3::100: bytes=32 time=1ms TTL=126

Reply from 2001:DB8:0:3::100: bytes=32 time=7ms TTL=126

Reply from 2001:DB8:0:3::100: bytes=32 time=8ms TTL=126

Reply from 2001:DB8:0:3::100: bytes=32 time=5ms TTL=126

Ping statistics for 2001:DB8:0:3::100:

Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),

Approximate round trip times in milli-seconds:

Minimum = 1ms, Maximum = 8ms, Average = 5ms

**Step 5:** Configure a floating static route on S3-RTR to allow for traffic to take an alternate path to S1’s LAN in the event of a link failure between S3-RTR and S1-RTR. Note that you will have to additionally configure a new static route on S1-RTR to allow return traffic to reach S3’s LAN. The default route will be removed from the table once the link goes down.

**S3-RTR(config)#** ipv6 route 2001:db8:0:1::/64 serial0/0/1 99

!  
**S1-RTR(config)#** ipv6 route 2001:db8:0:3::/64 serial0/0/0

**S3-RTR#** show ipv6 route

S 2001:DB8:0:1::/64 [99/0]

via ::, Serial0/0/1

**S1-RTR#** show ipv6 route

S 2001:DB8:0:3::/64 [99/0]

via ::, Serial0/0/0

**S3-PC>**tracert 2001:db8:0:1::1

Tracing route to 2001:db8:0:1::1 over a maximum of 30 hops:

1 1 ms 0 ms 0 ms 2001:DB8:0:3::1

2 3 ms 0 ms 1 ms 2001:DB8:0:23::2

3 0 ms 1 ms 4 ms 2001:DB8:0:1::1

Trace complete.

**Task 4: Route Summarization**

**Step 1:** Add the following IPv6 loopbacks on S2-RTR.

* 2001:db8:0:10::1/64
* 2001:db8:0:20::1/64
* 2001:db8:0:30::1/64

**S2-RTR#** show ipv6 int brief

Loopback10 [up/up]

FE80::201:63FF:FECE:9B2B

2001:DB8:0:10::1

Loopback20 [up/up]

FE80::20D:BDFF:FEC5:533

2001:DB8:0:20::1

Loopback30 [up/up]

FE80::205:5EFF:FE50:A761

2001:DB8:0:30::1

**Step 2:** Configure an IPv6 summary address on S3-RTR to reach the loopback addresses on S2-RTR.

**S3-RTR(config)#** ipv6 route 2001:DB8::/43 Serial0/0/1

**S3-RTR#** ping 2001:db8:0:10::1

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 2001:db8:0:10::1, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 4/5/6 ms

**S3-RTR#** ping 2001:db8:0:20::1

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 2001:db8:0:20::1, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 4/5/6 ms

**S3-RTR#** ping 2001:db8:0:30::1

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 2001:db8:0:30::1, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 5/5/7 ms