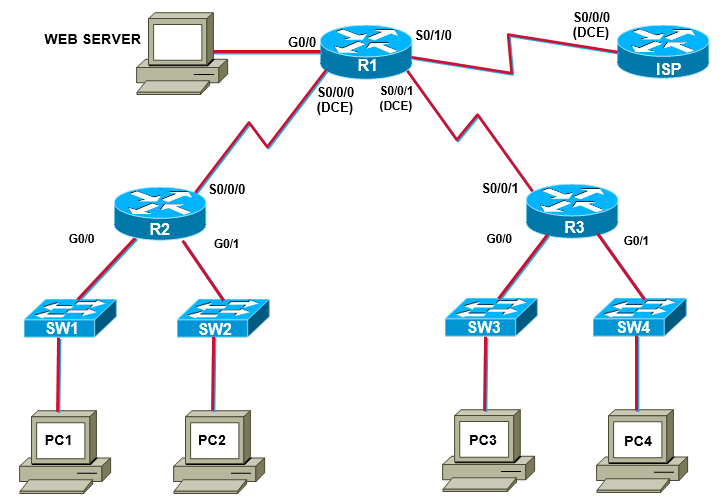
Packet Tracer – IPv6 - Skills Integration Challenge

(Instructor Version)

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

Topology



1. Scenario

NetVise Corporation has agreed to allow the network engineering team to design and integrate an IPv6 network based on their previous pilot configurations. However, the network must go into production immediately in order to resume business operations. You should complete this skills integration challenge within a 1 hour timespan.   
  
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.  
  
  
  
  
  
  
**Addressing Table**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Device | Interface | Type | IP Address | Prefix | Default Gateway |
| ISP | S0/0/0 | Global Unicast | 2001:acad:0:1::1 | /64 | N/A |
| R1 | S0/0/0 | Global Unicast | 2001:acad:0:12::1 | /64 | N/A |
| S0/0/1 | Global Unicast | 2001:acad:0:13::1 | /64 | N/A |
| S0/1/0 | Global Unicast | 2001:acad:0:1::2 | /64 | N/A |
| G0/0 | Global Unicast | 2001:acad:0:99::1 | /64 | N/A |
| R2 | S0/0/0 | Global Unicast | 2001:acad:0:12::2 | /64 | N/A |
| G0/0 | Global Unicast | 2001:acad:0:21::1 | /64 | N/A |
| G0/1 | Global Unicast | 2001:acad:0:22::1 | /64 | N/A |
| R3 | S0/0/0 | Global Unicast | 2001:acad:0:13::2 | /64 | N/A |
| G0/0 | Global Unicast | 2001:acad:0:31::1 | /64 | N/A |
| G0/1 | Global Unicast | 2001:acad:0:32::1 | /64 | N/A |
| PC1 | NIC | Static | 2001:acad:0:21::100 | /64 | 2001:acad:0:21::1 |
| PC2 | NIC | Static | 2001:acad:0:22::100 | /64 | 2001:acad:0:22::1 |
| PC3 | NIC | EUI-64 | Varies | /64 | 2001:acad:0:31::1 |
| PC4 | NIC | DHCPv6 | Varies | /64 | 2001:acad:0:32::1 |
| Web Server | NIC | Static | 2001:acad:0:99::100 | /64 | 2001:acad:0:99::1 |

1. Objectives

* Develop hierarchical IPv6 addressing scheme
* Assign interfaces and hosts IPv6 addresses
  + Static
  + EUI-64
  + DHCPv6
* Configure IPv6 dynamic routing using EIGRPv6
* Configure static and default routing to support the network requirements
* Utilize access control lists to restrict web server access

**Task 1: Develop hierarchical IPv6 addressing scheme and assign interfaces and hosts IPv6 address appropriately.**

**Step 1:** Your ISP has assigned the global prefix of 2001:acad::/64, given this information you must develop an IPv6 addressing scheme to meet the network requirements. Document all IPv6 address information in the address table provided.

Reference address table

**Step 2:** Assign network infrastructure interfaces with IPv6 addresses according to the address table and enable IPv6 unicast routing.

ISP(config)# ipv6 unicast-routing  
R1(config)# ipv6 unicast-routing  
R2(config)# ipv6 unicast-routing

R3(config)# ipv6 unicast-routing

**ISP(config)# interface s0/0/0**  
ISP(config-if)# ipv6 address 2001:acad:0:1::1/64  
ISP(config-if)# clock rate 64000  
ISP(config-if)# no shutdown  
 **R1(config)# interface s0/1/0**

R1(config-if)# ipv6 address 2001:acad:0:1::2/64

R1(config-if)# no shutdown  
!  
R1(config-if)# interface g0/0

R1(config-if)# ipv6 address 2001:acad:0:99::1/64

R1(config-if)# no shutdown  
!

R1(config-if)# interface s0/0/0

R1(config-if)# ipv6 address 2001:acad:0:12::1/64

R1(config-if)# clock rate 64000  
R1(config-if)# no shutdown  
!

R1(config-if)# interface s0/0/1

R1(config-if)# ipv6 address 2001:acad:0:13::1/64

R1(config-if)# clock rate 64000

R1(config-if)# no shutdown

**R2(config)# interface s0/0/0**

R2(config-if)# ipv6 address 2001:acad:0:12::2/64

R2(config-if)# no shutdown  
!

R2(config-if)# interface g0/0

R2(config-if)# ipv6 address 2001:acad:0:21::1/64

R2(config-if)# no shutdown

!

R2(config-if)# interface g0/1

R2(config-if)# ipv6 address 2001:acad:0:22::1/64

R2(config-if)# no shutdown

**R3(config)# interface s0/0/0**

R3(config-if)# ipv6 address 2001:acad:0:13::2/64

R3(config-if)# no shutdown

!

R3(config)# interface g0/0

R3(config-if)# ipv6 address 2001:acad:0:31::1/64

R3(config-if)# no shutdown  
!  
R3(config-if)# inteface g0/1

R3(config-if)# ipv6 address 2001:acad:0:32::1/64

R3(config-if)# no shutdown

R1# show ipv6 interface brief

GigabitEthernet0/0 [up/up]

FE80::2E0:F7FF:FE8D:2201

2001:ACAD:0:99::1

GigabitEthernet0/1 [administratively down/down]

Serial0/0/0 [up/up]

FE80::290:21FF:FE12:AA01

2001:ACAD:0:12::1

Serial0/0/1 [up/up]

FE80::290:21FF:FE12:AA02

2001:ACAD:0:13::1

Serial0/1/0 [up/up]

FE80::2E0:B0FF:FEC1:DC01

2001:ACAD:0:1::2

R2#show ipv6 interface brief

GigabitEthernet0/0 [up/up]

FE80::20A:F3FF:FE6C:D201

2001:ACAD:0:21::1

GigabitEthernet0/1 [up/up]

FE80::20A:F3FF:FE6C:D202

2001:ACAD:0:22::1

Serial0/0/0 [up/up]

FE80::201:97FF:FE6C:4D01

2001:ACAD:0:12::2

R3#show ipv6 interface brief

GigabitEthernet0/0 [up/up]

FE80::2D0:FFFF:FECE:8401

2001:ACAD:0:31::1

GigabitEthernet0/1 [up/up]

FE80::2D0:FFFF:FECE:8402

2001:ACAD:0:32::1

Serial0/0/0 [up/up]

FE80::202:4AFF:FE9E:3201

2001:ACAD:0:13::2

**Step 3:** Assign hosts with IPv6 addresses according to the address table.

* Web server, PC1, and PC2 are all assigned statically, no additional configuration is required besides manually entering the IPv6 address and default gateway in the GUI.  
    
  No required network configuration
* PC3 should be enabled for stateless autoconfiguration, by selecting “auto-config” for the IPv6 address and default gateway.

IPv6 unicast routing must be enabled.

* R3 should be configured as a DHCPv6 server to issue IPv6 address information to PC4.
  + Address Prefix: 2001:acad:0:32::/64
  + Domain Name: netspace.com
  + DNS Server: 2001:4860:4860::8888

R3(config)# ipv6 local pool PC4 2001:ACAD:0:32::/64 64  
!  
R3(config)# ipv6 dhcp pool DHCPv6  
R3(config-dhcp)# prefix-delegation pool PC4  
R3(config-dhcp)# dns-server 2001:4860:4860::8888  
R3(config-dhcp)# domain-name netspace.com  
!  
R3(config)# interface g0/1  
R3(config-if)# ipv6 dhcp server DHCPv6

R3#show ipv6 dhcp pool

DHCPv6 pool: DHCPv6

Prefix pool: PC4

preferred lifetime 604800, valid lifetime 2592000

DNS server: 2001:4860:4860::8888

Domain name: netspace.com

Active clients: 1

PC4>ipv6config

FastEthernet0 Connection:(default port)

Link-local IPv6 Address.........: FE80::200:CFF:FE26:DA52

IPv6 Address....................: 2001:ACAD:0:32:200:CFF:FE26:DA52/64

Default Gateway.................: FE80::2D0:FFFF:FECE:8402

**Task 2: Configure IPv6 dynamic routing using EIGRPv6**

**Step 1:** Enable EIGRPv6 and assign router-ids, use an autonomous system number of your choosing.

* R1 – 1.1.1.1/32 Lo0
* R2 – 2.2.2.2/32 Lo0
* R3 – 3.3.3.3/32 Lo0

**R1(config-if)# interface lo0**  
R1(config-if)# ip address 1.1.1.1 255.255.255.255

R1(config)# ipv6 router eigrp 100

R1(config-rtr)# router-id 1.1.1.1

R1(config-rtr)# no shutdown  
  
**R2(config-if)# interface lo0**  
R2(config-if)# ip address 2.2.2.2 255.255.255.255  
!  
R2(config)# ipv6 router eigrp 100

R2(config-rtr)# router-id 2.2.2.2

R2(config-rtr)# no shutdown  
  
**R3(config-if)# interface lo0**  
R3(config-if)# ip address 3.3.3.3 255.255.255.255  
!  
R3(config)# ipv6 router eigrp 100

R3(config-rtr)# router-id 3.3.3.3

R3(config-rtr)# no shutdown

**Step 2:** Enable the appropriate interfaces for EIGRPv6 to allow for full reachability.

**R1(config-if)# interface s0/0/0**  
R1(config-if)# ipv6 eigrp 100  
!  
R1(config-if)# interface s0/0/1  
R1(config-if)# ipv6 eigrp 100  
!

R1(config-if)# interface g0/0  
R1(config-if)# ipv6 eigrp 100

**R2(config-if)# interface s0/0/0**  
R2(config-if)# ipv6 eigrp 100  
!  
R2(config-if)# interface g0/0  
R2(config-if)# ipv6 eigrp 100  
!  
R2(config-if)# interface g0/1  
R2(config-if)# ipv6 eigrp 100  
  
**R3(config-if)# interface s0/0/0**  
R3(config-if)# ipv6 eigrp 100  
!  
R3(config-if)# interface g0/0  
R3(config-if)# ipv6 eigrp 100  
!  
R3(config-if)# interface g0/1  
R3(config-if)# ipv6 eigrp 100  
  
R1# show ipv6 eigrp neighbors

IPv6-EIGRP neighbors for process 100

H Address Interface Hold Uptime SRTT RTO Q Seq

(sec) (ms) Cnt Num

0 Link-local address: Se0/0/0 13 00:01:55 40 1000 0 11

FE80::201:97FF:FE6C:4D01

1 Link-local address: Se0/0/1 12 00:00:29 40 1000 0 9

FE80::202:4AFF:FE9E:3201

R1#show ipv6 protocols

IPv6 Routing Protocol is "connected"

IPv6 Routing Protocol is "static

IPv6 Routing Protocol is "eigrp 100 "

EIGRP metric weight K1=1, K2=0, K3=1, K4=0, K5=0

EIGRP maximum hopcount 100

EIGRP maximum metric variance 1

Interfaces:

GigabitEthernet0/0

Serial0/0/0

Serial0/0/1

Redistributing: eigrp 100

Maximum path: 16

Distance: internal 90 external 170

R2#show ipv6 protocols

IPv6 Routing Protocol is "connected"

IPv6 Routing Protocol is "static

IPv6 Routing Protocol is "eigrp 100 "

EIGRP metric weight K1=1, K2=0, K3=1, K4=0, K5=0

EIGRP maximum hopcount 100

EIGRP maximum metric variance 1

Interfaces:

Serial0/0/0

GigabitEthernet0/0

GigabitEthernet0/1

Redistributing: eigrp 100

Maximum path: 16

Distance: internal 90 external 170  
  
R3#show ipv6 protocols

IPv6 Routing Protocol is "connected"

IPv6 Routing Protocol is "static

IPv6 Routing Protocol is "eigrp 100 "

EIGRP metric weight K1=1, K2=0, K3=1, K4=0, K5=0

EIGRP maximum hopcount 100

EIGRP maximum metric variance 1

Interfaces:

GigabitEthernet0/0

Serial0/0/0

Serial0/0/1

Redistributing: eigrp 100

Maximum path: 16

Distance: internal 90 external 170

**Step 3:** Summarize networks coming from R2 LAN interfaces.

**Prior to summarization**

R1# show ipv6 route

D 2001:ACAD:0:21::/64 [90/2170112]

via FE80::201:97FF:FE6C:4D01, Serial0/0/0

D 2001:ACAD:0:22::/64 [90/2170112]

via FE80::201:97FF:FE6C:4D01, Serial0/0/0

D 2001:ACAD:0:31::/64 [90/2170112]

via FE80::202:4AFF:FE9E:3201, Serial0/0/1

D 2001:ACAD:0:32::/64 [90/2170112]

via FE80::202:4AFF:FE9E:3201, Serial0/0/1

R2(config)# interface s0/0/0  
R2(config-if)# ipv6 summary-address eigrp 100 2001:ACAD::/58 5  
  
**After summarization**

R1# show ipv6 route

IPv6 Routing Table - 12 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

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

D 2001:ACAD::/58 [90/2681856]

via FE80::201:97FF:FE6C:4D01, Serial0/0/0

D 2001:ACAD:0:31::/64 [90/2170112]

via FE80::202:4AFF:FE9E:3201, Serial0/0/1

D 2001:ACAD:0:32::/64 [90/2170112]

via FE80::202:4AFF:FE9E:3201, Serial0/0/1

**Task 3: Configure static and default routing to support the network requirements**

**Step 1:** Redistribute default route into the EIGRP process for R2 and R3 to reach the internet (ISP).

R1(config)# ipv6 route ::/0 s0/1/0  
!

R1(config)# ipv6 router eigrp 100  
R2(config-rtr)# redistribute static  
  
**NOTE:** A bug occurs when you attempt create a loopback address for the static default route, it will not show up in the routing table, in this case a physical interface is used, but is against best practice.

R2# show ipv6 route

IPv6 Routing Table - 13 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

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

EX ::/0 [170/7289856]

via FE80::290:21FF:FE12:AA01, Serial0/0/0

**Step 2:** Configure a default static route on the ISP Router to allow full reachability.

ISP(config)# ipv6 route ::/0 serial 0/0/0

ISP# 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

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 ::, Serial0/0/0

**Task 4: Utilize access control lists to restrict web server access**

**Step 1:** Create an ACL that blocks HTTP and FTP traffic sourcing from PC1 and PC2 and permits all other traffic from any sources.

**R1(config)# ipv6 access-list BLOCK\_ACL**

R1(config-ipv6-acl)# deny tcp 2001:ACAD:0:21::/64 host 2001:ACAD:0:99::100 eq www

R1(config-ipv6-acl)# deny tcp 2001:ACAD:0:21::/64 host 2001:ACAD:0:99::100 eq ftp

R1(config-ipv6-acl)# deny tcp 2001:ACAD:0:22::/64 host 2001:ACAD:0:99::100 eq www

R1(config-ipv6-acl)# deny tcp 2001:ACAD:0:22::/64 host 2001:ACAD:0:99::100 eq ftp  
!

R1(config-ipv6-acl)# permit ipv6 any any  
!

R1(config)# interface g0/0

R1(config-if)# ipv6 traffic-filter BLOCK\_ACL out

**R1#show access-lists**

IPv6 access list BLOCK\_ACL

deny tcp 2001:ACAD:0:21::/64 host 2001:ACAD:0:99::100 eq www (26 match(es))

deny tcp 2001:ACAD:0:21::/64 host 2001:ACAD:0:99::100 eq ftp

deny tcp 2001:ACAD:0:22::/64 host 2001:ACAD:0:99::100 eq ftp

deny tcp 2001:ACAD:0:22::/64 host 2001:ACAD:0:99::100 eq www

permit ipv6 any any