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RIP for IPv6 Configuration

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Laboratory Exercise:  *RIP for IPv6 configuration*

**Objectives**

In this laboratory exercise you will complete the following tasks:

- *Enable RIP for IPv6 on a Cisco router*
- *Gather information regarding RIPng protocol*
- *Debug RIP for IPv6*
Visual Objective

The following figure shows the configuration of the RIPng laboratory:

**LAB Address Space**

- 2001:DB8:CAFE::/48
- 192.168.0.0/16

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**Figure 1:** Scenario topology
Setup/Scenario

In this scenario there are six Cisco 1800 routers. Each router has 2 Fast Ethernet layer 3 capable ports (FE0 and FE1) and 8 Fast Ethernet Switch ports (FE2 to FE9). As Routers 3 and 4 will have three layer 3 connections to other routers, the FastEthernet Port 2 must be configured as a *no switchport* in order to connect to other router.

Preparing the LAB

There will be 2 groups per router.

<table>
<thead>
<tr>
<th>Groups</th>
<th>Routers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1</td>
<td>Router 1</td>
</tr>
<tr>
<td>Group 2</td>
<td></td>
</tr>
<tr>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>Group 11</td>
<td>Router 6</td>
</tr>
<tr>
<td>Group 12</td>
<td></td>
</tr>
</tbody>
</table>

Table 1: Groups per Routers

The routers must already have IPv6 enabled. If your router does not have this configuration, load it from the flash:

```
Router# copy flash:initv6-config running-config
```

```
Router# wr
```

Bellow you’ll find one table per router with the addresses for each of the router’s interfaces:

**Router 1:**

<table>
<thead>
<tr>
<th>Interface</th>
<th>IPv6 Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>FastEthernet 0</td>
<td>2001:DB8:CAFE:12::1 /64</td>
</tr>
<tr>
<td>FastEthernet 1</td>
<td>2001:DB8:CAFE:13::1 /64</td>
</tr>
<tr>
<td>FastEthernet 5</td>
<td>2001:DB8:CAFE:A::1 /64</td>
</tr>
</tbody>
</table>

Table 2: Addresses for each interface on router 1

**Router 2:**
### RIPng Configuration

<table>
<thead>
<tr>
<th>Interface</th>
<th>IPv6 Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>FastEthernet 0</td>
<td>2001:DB8:CAFE:12::2 /64</td>
</tr>
<tr>
<td>FastEthernet 1</td>
<td>2001:DB8:CAFE:23::2 /64</td>
</tr>
<tr>
<td>FastEthernet 5</td>
<td>2001:DB8:CAFE:B::2 /64</td>
</tr>
</tbody>
</table>

**Table 3:** Addresses for each interface on router 2

<table>
<thead>
<tr>
<th>Interface</th>
<th>IPv6 Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>FastEthernet 0</td>
<td>2001:DB8:CAFE:13::3 /64</td>
</tr>
<tr>
<td>FastEthernet 1</td>
<td>2001:DB8:CAFE:23::3 /64</td>
</tr>
<tr>
<td>FastEthernet 2</td>
<td>2001:DB8:CAFE:34::3 /64</td>
</tr>
<tr>
<td>FastEthernet 5</td>
<td>2001:DB8:CAFE:C::3 /64</td>
</tr>
</tbody>
</table>

**Table 4:** Addresses for each interface on router 3

<table>
<thead>
<tr>
<th>Interface</th>
<th>IPv6 Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>FastEthernet 0</td>
<td>2001:DB8:CAFÉ:34::4 /64</td>
</tr>
<tr>
<td>FastEthernet 1</td>
<td>2001:DB8:CAFÉ:45::4 /64</td>
</tr>
<tr>
<td>FastEthernet 2</td>
<td>2001:DB8:CAFÉ:46::4 /64</td>
</tr>
<tr>
<td>FastEthernet 5</td>
<td>2001:DB8:CAFE:D::4 /64</td>
</tr>
</tbody>
</table>

**Table 5:** Addresses for each interface on router 4

<table>
<thead>
<tr>
<th>Interface</th>
<th>IPv6 Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>FastEthernet 0</td>
<td>2001:DB8:CAFE:45::5 /64</td>
</tr>
<tr>
<td>FastEthernet 1</td>
<td>2001:DB8:CAFE:56::5 /64</td>
</tr>
<tr>
<td>FastEthernet 5</td>
<td>2001:DB8:CAFE:E::5 /64</td>
</tr>
</tbody>
</table>

**Table 6:** Addresses for each interface on router 5

**Router 6:**

<table>
<thead>
<tr>
<th>Interface</th>
<th>IPv6 Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interface</td>
<td>Address</td>
</tr>
<tr>
<td>------------</td>
<td>--------------------</td>
</tr>
<tr>
<td>FastEthernet 0</td>
<td>2001:DB8:CAFE:46::6 /64</td>
</tr>
<tr>
<td>FastEthernet 1</td>
<td>2001:DB8:CAFE:56::6 /64</td>
</tr>
<tr>
<td>FastEthernet 5</td>
<td>2001:DB8:CAFE:F::6 /64</td>
</tr>
</tbody>
</table>

*Table 7: Addresses for each interface on router 6*
Task 1: Enabling RIPng

Step 1: Testing connectivity
Connect to your router. Use the IPv6 auto configuration and plug your PC to a FastEthernet port on the router and telnet to it using the following authentication data:

   Login: ipv6
   Password: is
   Enable secret: great

The first step is to check if your router has IPv6 routing enabled. The global `ipv6 unicast-routing` command should appear in the running configuration.

Try to ping another router that is not directly connected to yours. Did you succeed?

Step 2: Enable protocol on the interface
Now, configure the RIP protocol on the interfaces in which you want to enable IPv6.

(Tip: `routerX(config-if)# ipv6 ...`)

- Routers 1, 2, 5 and 6 should enable RIPng on the FastEthernet0 interface;
- Routers 3 and 4 should enable RIPng on interfaces FastEthernet0, FastEthernet1 and FastEthernet2.

Step 3: Enabling RIPng process
Create a RIP process, named `quitorip` on your router.

(Tip: `routerX(config)# ipv6 ...`)

Step 4: Defining maximum number of paths
Enter into your RIPng process, and configure it so that two paths are available for each destination.

(Tip1: `RouterX(config)# ipv6 router`)

(Tip2: `routerX(config-rtr)# maximum...`)
**Step 5: Redistributing routes**

Now that the process is running, try again to ping another router not directly connected. Did you get a reply? Why?

On the RIPng process configuration, redistribute the connected and static routes.

(Tip: `routerX(config-rtr)# redistribute ...`)

**Step 6: Check your connectivity**

Try to ping again the routers and PCs.

**Step 7: Originate the default Route (only for router 4)**

Consider that the router is the gateway for your entire network. This router should originate the default gateway.

(Tip: `routerX(config-rtr)# ipv6 rip <name> default-information ...`)

**Task 2: Verifying RIP configuration**

On Task 1 you’ve configured the RIPng protocol, now you will gather information in order to debug any problem.

**Step 1: Using the show command**

The RIPng process is now running on all routers, but are you receiving the information from all of them?

- Collect the information from the RIP process you are running and see if all routers are participating by looking at the RIP database. Also see the next-hop information.
- Check the routing table from RIP
- Now disconnect router 3 and 4. What changes do you see in the database?
- Look again at the RIP process information and routing table. What differences do you see?

(Tip: `routerX# show ipv6 rip ...`)

**Step 2: Debug the RIPng process**
RIPng also has debugging facilities on the IOS software. This provides more detailed information than the delivered by the `show` command.

- Initiate the debugging process of RIPng process
- Debug RIPng on one interface in which you are running the protocol

(Tip: `router# debug ipv6 rip ...`)

What do you see?

Change the *maximum paths* value in your router. What do you see?

**Summary**

After completing these exercises, you should be able to:

- *Configure RIPng*
- *Debug and analyze information from the RIPng*
Appendix A

Task 1: Enabling RIPng

Step 2: Enable protocol on the interface
To configure RIPng on the interfaces you want to run the protocol, you can use the following command lines:

```
RouterX# enable
RouterX# configure terminal
RouterX(config)# interface fastethernet[X]
RouterX(config-if)# ipv6 rip process_name enable
```

Where `process_name` is the specific name of the RIPng process you will configure.

Eg:

```
Router1# enable
Router1# configure terminal
Router1(config)# interface fastethernet0
Router1(config-if)# ipv6 rip quitorip enable
```

Step 3: Enabling RIPng process

```
RouterX# configure terminal
RouterX(config)# ipv6 router rip quitorip
```

**Note:** on some models the command line might be `ipv6 rip quitorip`

Step 4: Defining maximum number of paths
Enter in the protocol configuration command line and type the appropriate commands:

```
RouterX(config)# ipv6 router rip quitorip
RouterX(config-rtr)# maximum-paths 2
```

Step 5: Redistributing routes
To redistribute the connected and static routes enter into the RIPng process and type the appropriate commands:

```
RouterX(config)# ipv6 router rip quitorip
```
Step 7: Originate the default Route

To originate the default route, in the interface where you want to send this advertisement, you must type the commands:

RouterX# configure terminal
RouterX(config)# interface fastethernet0
RouterX(config-if)# ipv6 rip quitorip default-information originate

The other way to do this is using the following command:

RouterX(config-if)# ipv6 rip quitorip default-information only

This will make the router to only announce the default route, and no other routes or updates. The originate option will announce the updates and routes, plus the default route. You can also have more than one default route and define a metric to choose between each other:

RouterX(config-if)# ipv6 rip quitorip default-information [only|originate] [metric value]

Task 2: Verifying RIP configuration

Step 1: Using the show command

- Collect the information from the RIP process

Router1# show ipv6 rip database
RIP process "quitorip", local RIB
  2001:DB8:CAFE:4::1/128, metric 3, installed
    FastEthernet1/FE80::216:C8FF:FE30:5FC4, expires in 170 secs
  2001:DB8:CAFE:4::/64, metric 3, installed
    FastEthernet1/FE80::216:C8FF:FE30:5FC4, expires in 170 secs
  2001:DB8:CAFE:D::/64, metric 3, installed
    FastEthernet1/FE80::216:C8FF:FE30:5FC4, expires in 170 secs
  2001:DB8:CAFE:13::/64, metric 2
    FastEthernet1/FE80::216:C8FF:FE30:5FC4, expires in 170 secs
  2001:DB8:CAFE:34::/64, metric 2, installed
    FastEthernet1/FE80::216:C8FF:FE30:5FC4, expires in 170 secs
    ::/0, metric 2, installed
    FastEthernet1/FE80::216:C8FF:FE30:5FC4, expires in 170 secs
Step 2: Debug the RIPng process

- Send the output from debug to your monitor:
  Router1# terminal monitor

- Debug the RIPng
  Router1# debug ipv6 rip

  *Jul 12 08:39:36.479: RIPng: response received from FE80::217:E0FF:FEDE:7D3 on FastEthernet0 for quitorip
  *Jul 12 08:39:36.479: src=FE80::217:E0FF:FEDE:7D3 (FastEthernet0)
  *Jul 12 08:39:36.479: dst=FF02::9
  *Jul 12 08:39:36.479: sport=521, dport=521, length=92
  *Jul 12 08:39:36.479: command=2, version=1, mbz=0, #rte=4
  *Jul 12 08:39:36.479: tag=0, metric=1, prefix=2001:DB8:CAFE:1::1/128
  *Jul 12 08:39:36.479: tag=0, metric=1, prefix=2001:DB8:CAFE:A::64
  *Jul 12 08:39:36.479: tag=0, metric=1, prefix=2001:DB8:CAFE:13::64
(…)

Router3# show ipv6 rip next-hops
RIP process "quitorip", Next Hops
  FE80::217:E0FF:FEDE:7D3/FastEthernet0 [4 paths]
  FE80::218:19FF:FE18:964C/Vlan32 [4 paths]

Check the routing table

Router1# show ipv6 route rip
IPv6 Routing Table - 13 entries
Codes: C - Connected, L - Local, S - Static, R - RIP, B - BGP
  U - Per-user Static route
  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
R   ::/0 [120/2]
  via FE80::216:C8FF:FE30:5FC4, FastEthernet1
R  2001:DB8:CAFE:4::/64 [120/3]
  via FE80::216:C8FF:FE30:5FC4, FastEthernet1
R  2001:DB8:CAFE:4::1/128 [120/3]
  via FE80::216:C8FF:FE30:5FC4, FastEthernet1
R  2001:DB8:CAFE:D::/64 [120/3]
  via FE80::216:C8FF:FE30:5FC4, FastEthernet1
R  2001:DB8:CAFE:34::/64 [120/2]
  via FE80::216:C8FF:FE30:5FC4, FastEthernet1
- Debug RIPng on an interface

  Router1# `debug ipv6 rip FastEthernet0`