IT 307- Exploring the Networks
Handout on Dynamic Routing
Routing Information Protocol (RIP)

Routing Information Protocol (RIP) is a distance-vector routing protocol that employs the hop count as a routing metric. RIP is widely used for routing within an Autonomous System and is classified into RIP Version 1 (RIPv1) and RIP Version 2 (RIPv2).

Basics of RIP
Algorithm: Distance-Vector
Metric: Hop Count
Administrative Distance: 120
Maximum Hop Count: 15

Timers Associated with RIP

Update Timer: 30 seconds (Time interval for sending routing updates)
Invalid Timer: 180 seconds (Time to mark a route as invalid)
Hold-Down Timer: 180 seconds (Time to remove the invalid route from the routing table)
Flush Timer: 240 seconds (Time to remove the route from the routing table)

Routing Information Protocol has undergone several iterations, with each version introducing enhancements over its predecessor. Below are the primary differences between RIPv1, RIPv2, and RIPng.

RIPv1 (Routing Information Protocol version 1)

- Classful Routing: RIPv1 is a classful routing protocol, meaning it doesn't support CIDR (Classless Inter-Domain Routing).
- Metric: Utilizes hop count as the routing metric, with a maximum limit of 15 hops.
- Routing Updates: Uses broadcast to send updates to every device in the network.
- No Authentication: Lacks the capability for route authentication.
- No Support for VLSM: Variable Length Subnet Masks (VLSM) are not supported.
- IPv4-Only: Designed for IPv4 networks.

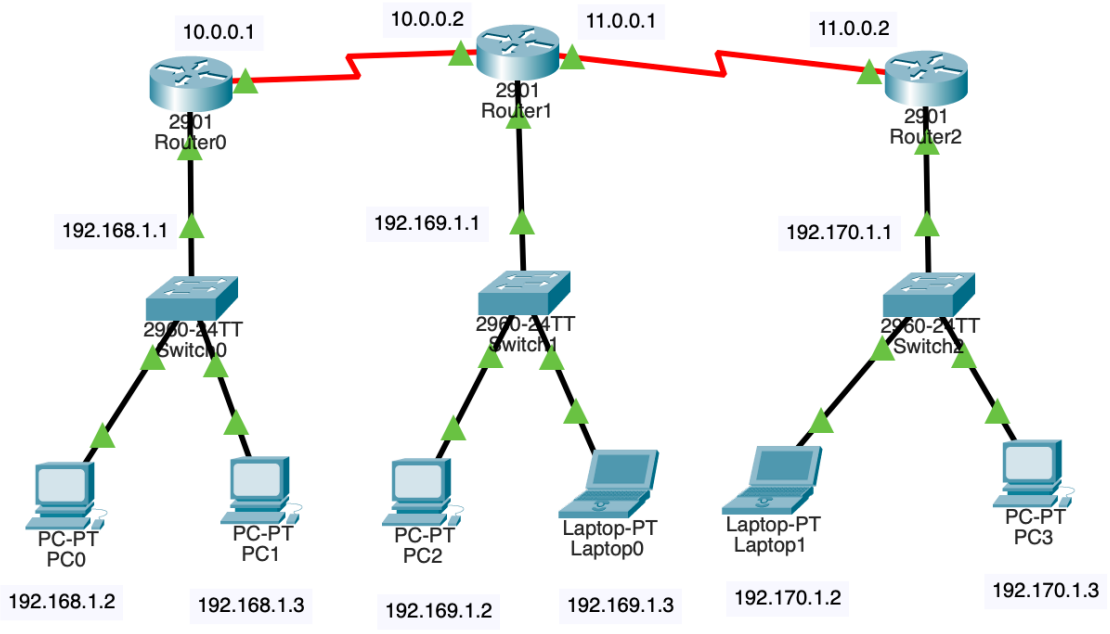
RIPv2 (Routing Information Protocol version 2)

- Classless Routing: RIPv2 supports CIDR, allowing for more flexible network design.
- Metric: Also uses hop count as the metric but allows for more modern routing techniques due to its classless nature.
- Routing Updates: Uses multicast rather than broadcast for sending updates, specifically to 224.0.0.9.
- Authentication: Supports MD5 authentication for enhanced security.
- Support for VLSM: Allows for network summarization and Variable Length Subnet Masks.
- IPv4-Only: Like RIPv1, RIPv2 is also confined to IPv4 networks.

RIPng (Routing Information Protocol next generation)-for IPv6

- IPv6 Support: Designed specifically for IPv6 networks.
- Classless Routing: Naturally supports CIDR due to its IPv6 design.
- Metric: Keeps the traditional hop count metric with a limit of 15 hops.
- Routing Updates: Uses IPv6 multicasting for updates.
- Authentication: Relies on IPv6's native IPsec for route authentication.
- No VLSM: IPv6 does not require VLSM, and hence it's not a consideration for RIPng.

Topology (IPv4 RIP)



Step 1: Configure the System and IP address on the PCs and routers.

Step 2: Go to Router 1

Router(config)# router rip
Router(config)# version 2
Router(config)# network 192.168.1.0
Router(config)# network 10.0.0.0
exit

Step 3: Go to Router 2

Router(config)# router rip
Router(config)# version 2
Router(config)# network 192.169.1.0
Router(config)# network 10.0.0.0
Router(config)# network 11.0.0.0

exit

Step 4: Go to Router 3

Router(config)# router rip
Router(config)# version 2
Router(config)# network 192.170.1.0
Router(config)# network 11.0.0.0
exit

Step 5: Check basic connectivity on all routers for RIP

Router# sh ip route

RIP using IPv6

Topology (same as in IPv4)

Serial Links between Routers

1. Router0 to Router1: `2001:db8:1::1/64` on Router1 and `2001:db8:1::2/64` on Router2
2. Router1 to Router2: `2001:db8:2::1/64` on Router2 and `2001:db8:2::2/64` on Router3

Local Area Networks (LANs)

1. Router0's LAN: IPv6 addresses ranging from `2001:db8:3::1/64` to `2001:db8:3::ff/64`
2. Router1's LAN: IPv6 addresses ranging from `2001:db8:4::1/64` to `2001:db8:4::ff/64`
3. Router2's LAN: IPv6 addresses ranging from `2001:db8:5::1/64` to `2001:db8:5::ff/64`

PCs

- PCs connected to Router0's LAN can have IPv6 addresses like `2001:db8:3::10`, `2001:db8:3::11`, and so on.
- PCs connected to Router1's LAN: `2001:db8:4::10`, `2001:db8:4::11`, etc.
- PCs connected to Router2's LAN: `2001:db8:5::10`, `2001:db8:5::11`, etc.

Basic IPv6 and RIPng Configuration on Router0

```
enable
configure terminal
ipv6 unicast-routing
interface <int_num>
 ipv6 address 2001:db8:1::1/64
 ipv6 rip RIPNG enable
exit
ipv6 router rip RIPNG
exit
```

Basic IPv6 and RIPng Configuration on Router1

```
enable
configure terminal
ipv6 unicast-routing
interface <int_num>
 ipv6 address 2001:db8:1::2/64
 ipv6 rip RIPNG enable
exit
interface <int_num>
 ipv6 address 2001:db8:2::1/64
 ipv6 rip RIPNG enable
exit
ipv6 router rip RIPNG
exit
```

Basic IPv6 and RIPng Configuration on Router2

```
enable
```

```
configure terminal
ipv6 unicast-routing
interface <int_num>
 ipv6 address 2001:db8:2::2/64
 ipv6 rip RIPNG enable
exit
ipv6 router rip RIPNG
exit
```

To test the Routing Information Protocol (RIP) connection and ensure that it is functioning as expected, the following commands can be utilized for diagnostics and troubleshooting. These commands are generally executed in the command-line interface (CLI) of routers running RIP.

General Inspection Commands

1. show ip protocols: This command provides information about the routing protocol configurations, including RIP. It will also show the timers and networks for which RIP is enabled.

2. show ip route or show ipv6 route: To inspect the IP routing table. If RIP is functioning, you will see routes tagged with "R" for RIP in IPv4 or "RIPng" for IPv6.

3. show ip interface brief or show ipv6 interface brief: To ensure all interfaces are up and properly configured with IP addresses.

Detailed Inspection Commands

1. show running-config | section router rip: To review the current RIP configurations on a router. This will show which version is configured, along with networks and other settings.

2. show ip rip database: Displays the RIP routing database, which includes the RIP routes known by the router.