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ASSIGNMENT OF Network Device and Configuration

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Routing Information Protocol (RIP)

- RIP is a distance-vector routing protocol. This means routers exchange routing information with their directly connected neighbors.
- RIP only uses hop count to determine the best path between two locations.
- Hop count is the number of routers the packet must go through till it reaches the destination network.
- RIP limits the maximum hop count to 15. A hop count of 16 indicates that a network is unreachable.
- When a router receives an update, it compares the received routes with its own and updates its routing table with the best (lowest hop count) paths.
- Repeaters, Hubs, the end stations, and Switches (do not include them in the hop count) - these devices are all transparent, and do not route - and therefore is not included in the hop count
- Typically Hop Count = routers and also Firewall that are Routers can be included in the Hop Count
- RIP works well in small networks, but it's inefficient on large networks .
- For larger, more complex networks, consider using more advanced routing protocols like OSPF or EIGRP.

Differences between RIPv1 & RIPv2

RIPv1

- **Classful Routing**: It doesn't support subnets or variable-length subnet masks (VLSM), meaning it only works with classful networks (Class A, B, C).
- **Broadcast Updates**: Sends routing updates using broadcasts to all devices, which is less efficient.
- **No Security**: Doesn't have built-in authentication, so it's more vulnerable to attacks.

RIPv2

- **Classless Routing**: Supports subnets and VLSM, allowing more flexible and efficient use of IP address space.
- **Multicast Updates**: Uses multicast addresses (224.0.0.9) to send routing updates, which is more efficient than broadcasts.
- **Authentication**: Supports simple authentication, adding a layer of security to prevent unauthorized routers from sending updates.

Advantages of RIP

- **Simplicity and Ease of Configuration:**

RIP is relatively simple to configure and manage compared to other routing protocols like OSPF or BGP, making it a good choice for small to medium-sized networks.

- **Low Resource Requirement:**

RIP does not require much computational power or memory, making it suitable for devices with limited resources, like older routers or low-end network equipment.

- **Widely Supported:**

RIP is supported by almost all networking devices, making it easy to implement in various types of networking equipment.

- **Good for Small Networks:**

It is effective for small or less complex networks where simplicity is more important than advanced features.

- **Loop Prevention:**

RIP uses the split horizon, route poisoning, and hold-down timers to prevent routing loops, making it a relatively stable protocol under normal circumstances.

- **Periodic Updates:**

RIP sends periodic updates (every 30 seconds), which helps ensure that all routers in the network maintain a synchronized view of the network topology.

Disadvantages of RIP:

- **Limited Scalability:**

RIP is not well-suited for large or complex networks. It supports a maximum hop count of 15, which means any destination that requires more than 15 hops is considered unreachable. This limits its use in larger networks.

- **Slow Convergence:**

RIP has slow convergence, meaning it takes time to adapt to changes in the network (like a router failure or topology change). This can cause temporary network issues such as routing loops.

- **Inefficient Use of Bandwidth:**

Since RIP broadcasts updates every 30 seconds (even when there are no changes), it can consume significant bandwidth, especially in larger networks with many routers.

- **No Support for Complex Metrics:**

RIP uses only hop count as its metric, which is a basic and limited way to measure the "cost" of a route. It doesn't account for factors like bandwidth, latency, or load on the link, which can lead to sub optimal routing decisions.

❖ **Security Issues:**

RIP doesn’t have strong built-in security features. Although RIPng (RIP for IPv6) supports authentication, it still lacks the robust security measures found in more modern protocols like OSPF or BGP.

❖ **No Support for Hierarchical Routing:**

RIP lacks support for hierarchical routing, which makes it difficult to scale in large networks where you might need more advanced routing strategies.

❖ **Routing Loops and Count-to-Infinity Problem:**

Although RIP has mechanisms to prevent loops, it still suffers from the "count-to-infinity" problem during slow convergence, where routes might not be corrected quickly enough, leading to temporary network instability.

RIP Protocol configuration

Step 1: Design Network Topology

Step 2: Assign IP Addresses to Interfaces

Step 3: Configure RIP on Each Router

- Now, we'll configure RIP routing on each router to allow them to exchange routing information.
- **Router 1**
- ✓ R1(config)#router rip
- ✓ R1(config-router)#version 2
- ✓ R1(config-router)#network 10.0.0.0
- ✓ R1(config-router)#network 12.0.0.0
- ✓ R1(config-router)#network 192.168.1.0
- **Router 2**
- ✓ R2(config)#router rip
- ✓ R2(config-router)#version 2
- ✓ R2(config-router)#network 11.0.0.0
- ✓ R2(config-router)#network 12.0.0.0
- ✓ R2(config-router)#network 192.168.2.0
- **Router 3**
- ✓ R3(config)#router rip
- ✓ R3(config-router)#version 2
- ✓ R3(config-router)#network 10.0.0.0
- ✓ R3(config-router)#network 11.0.0.0
- ✓ R3(config-router)#network 192.168.4.0

Step 4: Verify the RIP Configuration

- ❖ After configuring RIP on all routers, you can check if RIP is properly exchanging routing information by using the following commands.
- ✓ **show ip route:** Displays the routing table.
- ✓ **show ip protocols:** Displays information about the RIP process.
- ✓ **show ip rip database:** shows the RIP routing database.

Step 5: Test Connectivity

- ❖ To verify if the routing is working, use the ping command from the routers or PCs to test the network connectivity.
- ✓ **ping <destination-IP>:** Ping devices on other networks to test connectivity.