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RIPv2

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1 Abstract

In this experiment, we will learn and configure the basic configuration for one of the dynamic routing protocols that use inside an organization's network. That is Routing Information Protocol (RIPv2), to build routing table that lead to perform routing in proper way, and we will notice what is the effect when we apply number of specific command on the network at all.

2 introduction

There is number of mechanism to build routing table that use for transmute traffic between LANs, and to do so we should use one of three types of the routing depending on our situation, so the first type is static route and used when we have small, stable network and there is not a huge number of routers in it. On the other hand, the dynamic routing protocol used in the big network and the administrator can't build the routing table for all the routers in the network manually. also there is two category for dynamic protocols depending on router location. between of the previous types there is the third type, using when the router doesn't know where should route this packet, and this type names default route.We can summarize all types of routing protocols as shown in the figure 1 below.

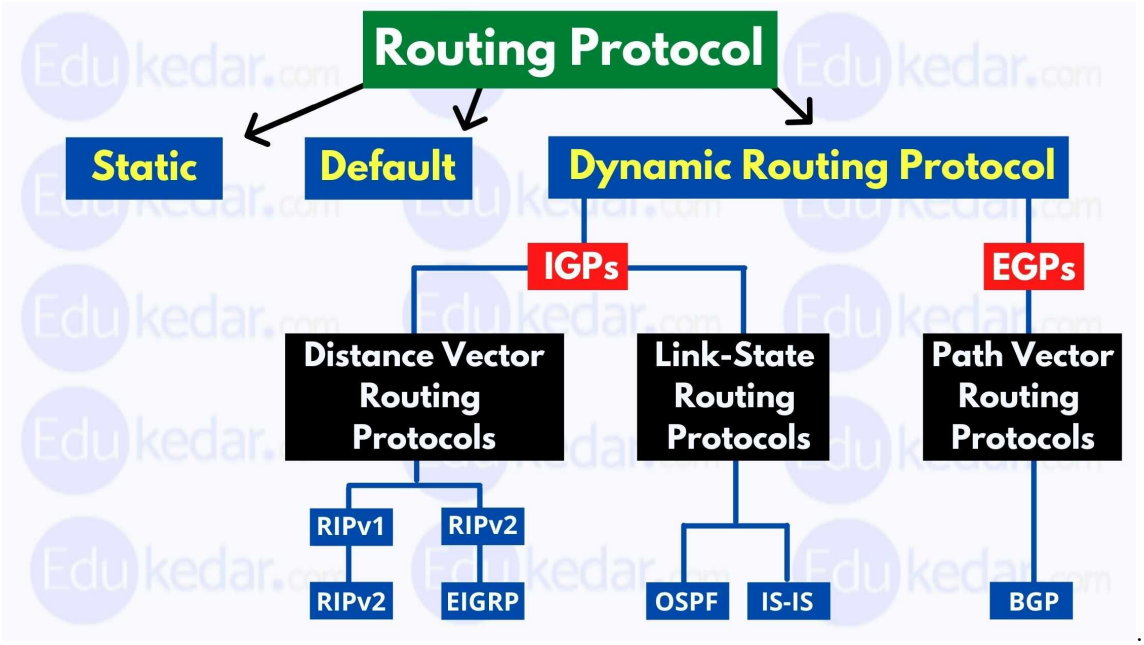

Figure 1: summary of routing protocols types.

RIP one of the dynamic protocols using Bellman–Ford algorithm and it is distance-vector routing protocols this means the protocol depending on number of routers between source and distention to calculate the distance and make the decision to route the traffic, the maximum number of routers that RIP can handle with it is 15 routers so if we have more than 15 routers in the network considered as network unreachable. And we should use other protocols. RIP has administrative distance 120 and it works on the Network layer over UDP and use port number 520.

When use RIP, the routers exchange Updates periodically as broadcast always. but before the routers begin send Updates it should know if there is neighbors that use RIP and they want to share the networks that they have, this is a principle of how the RIP work.

3 Procedure

3.1 Build the Network and Verify Connectivity

1. We cabled the network as shown in the topology 2.

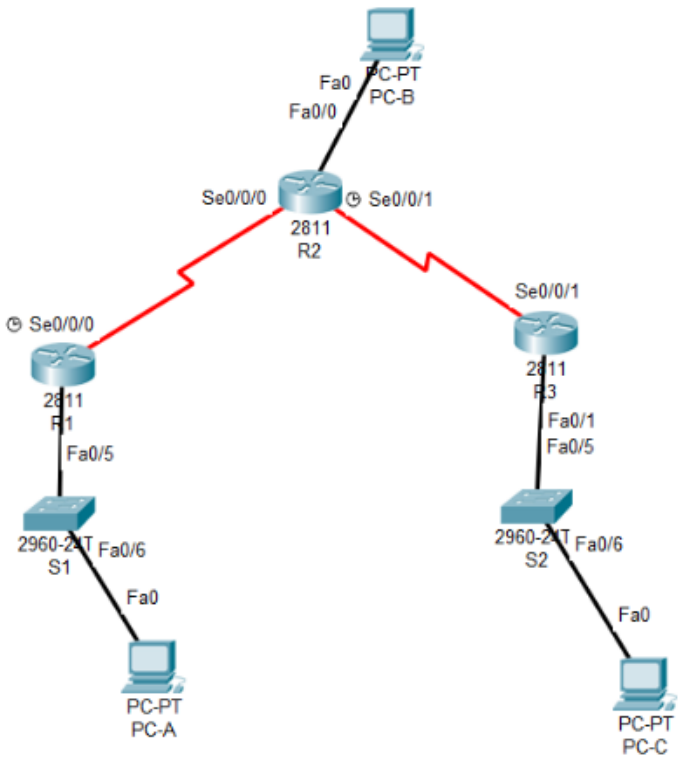

Figure 2: topology

3.2 Addressing Table

Device	Interface	IP Address	Subnet Mask	Default Gateway
R1	F0/1	172.30.10.1	255.255.255.0	N/A
	S0/0/0 (DCE)	10.1.1.1	255.255.255.252	N/A
R2	F0/0	209.165.201.1	255.255.255.0	N/A
	S0/0/0	10.1.1.2	255.255.255.252	N/A
	S0/0/1 (DCE)	10.2.2.2	255.255.255.252	N/A
R3	F0/1	172.30.30.1	255.255.255.0	N/A
	S0/0/1	10.2.2.1	255.255.255.252	N/A
S1	N/A	VLAN 1	N/A	N/A
S3	N/A	VLAN 1	N/A	N/A
PC-A	NIC	172.30.10.3	255.255.255.0	172.30.10.1
PC-B	NIC	209.165.201.2	255.255.255.0	209.165.201.1
PC-C	NIC	172.30.30.3	255.255.255.0	172.30.30.1

Figure 3: Addressing Table

2. We configure basic settings for each router and switch.

3. We configure PC IP Addressing. below figure as an example

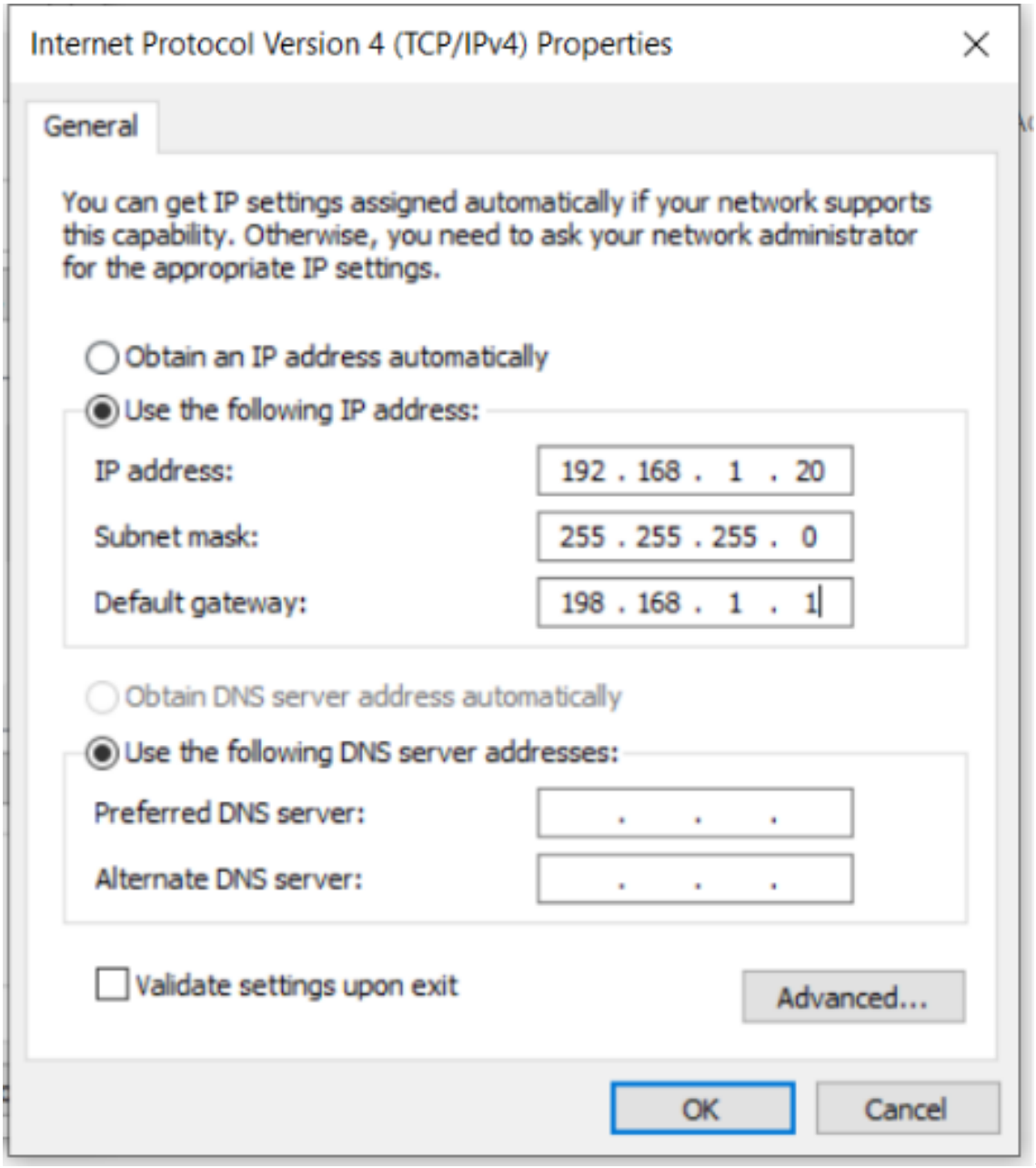

Figure 4: change IP for PC

3.2.1 Configure and Verify RIPv2 Routing

1. We Configure RIPv2 on R2 as the routing protocol and to advertise the appropriate connected networks we use **network** command, and the other thing that occur when enter this command is activate send and receive update messages in all interfaces for this router unless **passive interface** used, that command stop routing updates out the specified interface, so this command necessary for security reason, we use command to onfigure RIPv2 as shown in the figure 5

```
R2(config)#router rip
R2(config-router)#ver
R2(config-router)#version 2
R2(config-router)#netw
R2(config-router)#network 10.0.0.0
```

Figure 5: RIPv2 configuration

2. We configure RIPv2 on R3 using the network statement to add the appropriate connected networks as the previous step.

3. **Question:** On PC-C Start a Wireshark capture. Did you capture any RIP messages?
   Yes, we capture RIP message on PC-C as the below figure shows.

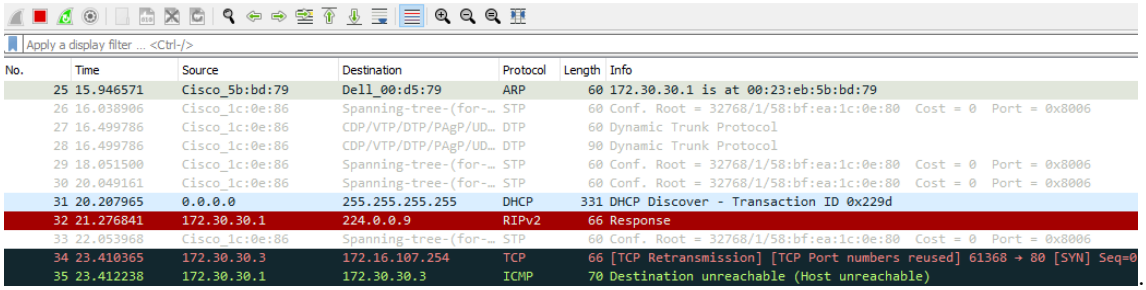

Figure 6: Wireshark caption

4. We prevent routing updates on the LAN interface of R3 using **passive interface** command.

5. **Question:** Are routing updates still showing on Wireshark capture?
   NO, Wireshark didn't capture any updates. the reason is the effect of the previous step (The LAN interface on router3 stop routing the update message out of it).

3.2.2 Examine the current state of the network.

1. We check the status of the two serial links in the router2 using **show ip interface br** as show in the figure 7
   note: the loopback0 instead of PC2. Because in our lab we have just 2 PCs for every group.

```
R2#show ip interface br
Interface                  IP-Address      OK? Method Status                Protoc
FastEthernet0/0            unassigned      YES unset  administratively down down
FastEthernet0/1            unassigned      YES unset  administratively down down
Serial0/0/0                10.1.1.2        YES manual up                    up
Serial0/0/1                10.2.2.2        YES SLARP  up                    up
Loopback0                  209.165.201.2   YES manual up                    up
R2#
```

Figure 7: R2: show ip interface br

2. Check connectivity between PCs.

   (a) **Question 1:** From PC-A, is it possible to ping PC-B? Why?
   No it is not possible, because we didn't advertise the network that the PC-B connect to it on router2 (the path unknown).

   (b) **Question 2:** From PC-A, is it possible to ping PC-C? Why?
   no it is not possible, because the summarization problem .

   (c) **Question 3:** From PC-C, is it possible to ping PC-B? Why?
   No it is not possible, because we didn't advertise the network that the PC-B connect to it on router2 (the path unknown).

   (d) **Question 4:** From PC-C, is it possible to ping PC-A? Why?
   no it is not possible, because the summarization problem

3. We verify that RIPv2 is running on the routers using **show ip protocol** command as the figure in the next page.

```
R3#show ip protocols
*** IP Routing is NSF aware ***

Routing Protocol is "rip"
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Sending updates every 30 seconds, next due in 24 seconds
  Invalid after 180 seconds, hold down 180, flushed after 240
  Redistributing: rip
  Default version control: send version 2, receive version 2
    Interface             Send  Recv  Triggered RIP  Key-chain
    FastEthernet0/1       2     2
    Serial0/0/1           2     2
  Automatic network summarization is in effect
  Maximum path: 4
  Routing for Networks:
    10.0.0.0
    172.30.0.0
  Routing Information Sources:
    Gateway         Distance      Last Update
  Distance: (default is 120)
```

Figure 8: R3: show ip protocol

4. **Question:** When issuing the debug ip rip command on R2, what information is provided that confirms RIPv2 is running?

```
R2#debug ip rip
RIP protocol debugging is on
R2#
R2#
R2#
R2#
R2#
Jan  2 13:04:03.575: RIP: sending v2 update to 224.0.0.9 via Serial0/0/1 (10.2.2.2)
Jan  2 13:04:03.575: RIP: build update entries
Jan  2 13:04:03.575:    10.1.1.0/30 via 0.0.0.0, metric 1, tag 0
Jan  2 13:04:04.755: RIP: sending v2 update to 224.0.0.9 via Serial0/0/0 (10.1.1.2)
Jan  2 13:04:04.755: RIP: build update entries
Jan  2 13:04:04.755:    10.2.2.0/30 via 0.0.0.0, metric 1, tag 0
Jan  2 13:04:08.471: RIP: received v2 update from 10.1.1.1 on Serial0/0/0
Jan  2 13:04:08.471:      172.30.0.0/16 via 0.0.0.0 in 1 hops
Jan  2 13:04:11.075: RIP: received v2 update from 10.2.2.1 on Serial0/0/1
Jan  2 13:04:11.075:      172.30.0.0/16 via 0.0.0.0 in 1 hops
```

Figure 9: R2: debug ip rip

as the figure show, debug ip rip command show the RIP update flow and what is the sending and receiving message and in which interface.

5. **Question:** When issuing the debug ip rip command on R2, what information is provided that confirms RIPv2 is running?

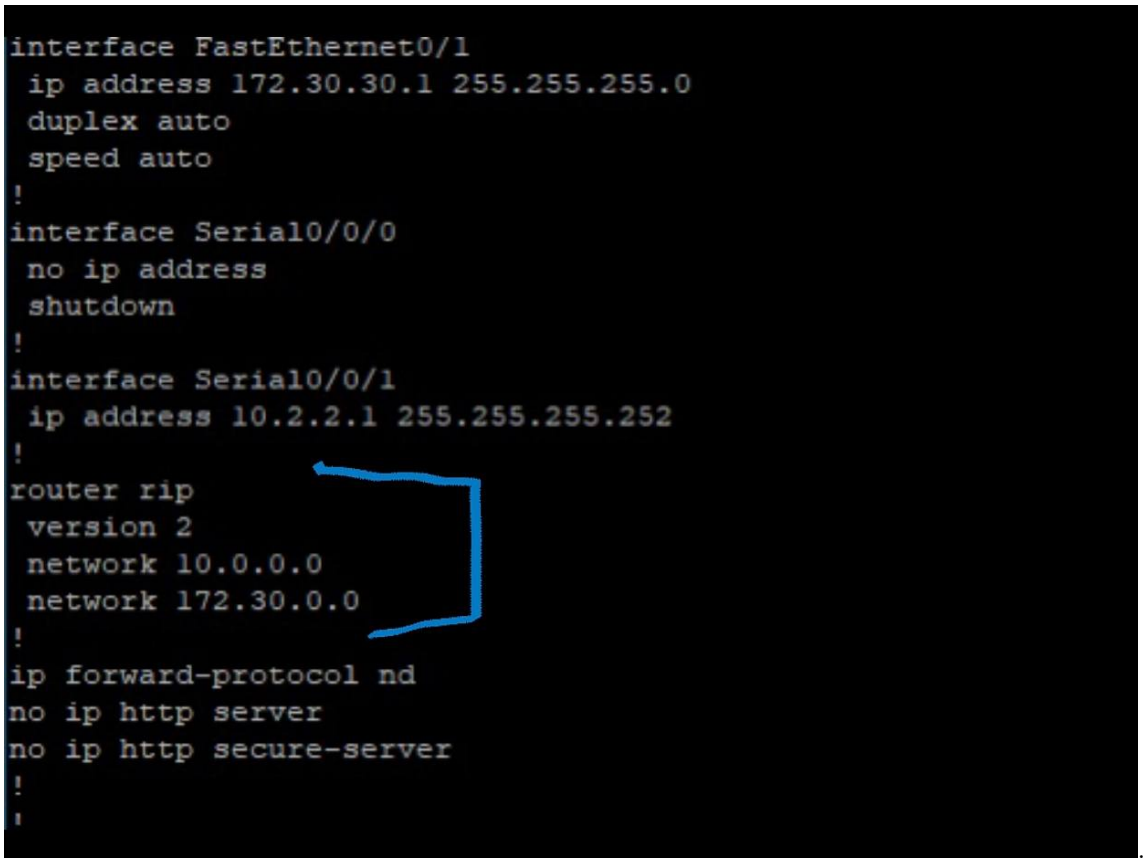

Figure 10: R3: show run

6. **Summarization definition:** When the network contains discontiguous subnets and more than one side has the same network, and the connected router advertise this network to the middle router. and the middle router already know this network but from the other side of the lAN, this cause a big problem because the middle router adds both routes to its routing table as a single route with load balancing feature. as shown in the figure 11.

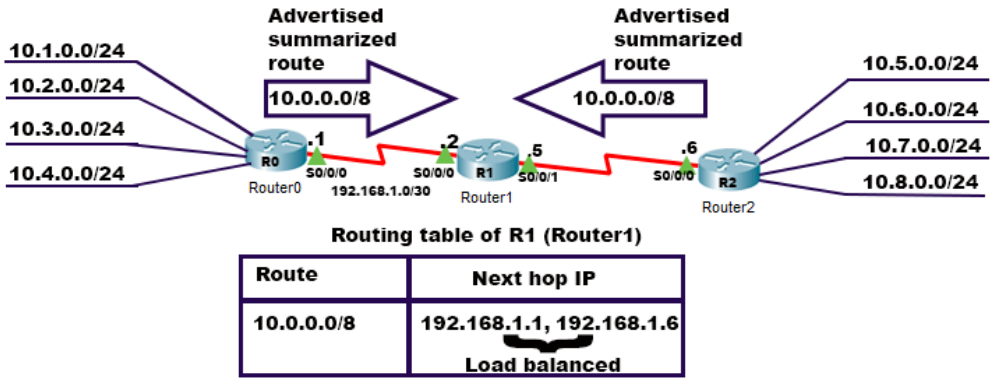

Figure 11: Summarization problem

7. We use the **debug ip rip** command on R2 to determine the routes received in the RIP updates from R3 on S0/0/1 interface as shown in the figure below .

```
R2#debug ip rip
RIP protocol debugging is on
R2#
R2#
R2#
R2#
R2#
Jan  2 13:04:03.575: RIP: sending v2 update to 224.0.0.9 via Serial0/0/1 (10.2.2.2)
Jan  2 13:04:03.575: RIP: build update entries
Jan  2 13:04:03.575:    10.1.1.0/30 via 0.0.0.0, metric 1, tag 0
Jan  2 13:04:04.755: RIP: sending v2 update to 224.0.0.9 via Serial0/0/0 (10.1.1.2)
Jan  2 13:04:04.755: RIP: build update entries
Jan  2 13:04:04.755:    10.2.2.0/30 via 0.0.0.0, metric 1, tag 0
Jan  2 13:04:08.471: RIP: received v2 update from 10.1.1.1 on Serial0/0/0
Jan  2 13:04:08.471:      172.30.0.0/16 via 0.0.0.0 in 1 hops
Jan  2 13:04:11.075: RIP: received v2 update from 10.2.2.1 on Serial0/0/1
Jan  2 13:04:11.075:      172.30.0.0/16 via 0.0.0.0 in 1 hops
```

Figure 12: Summarization problem

3.2.3 Disable automatic summarization.

1. We use **no auto-summary** command to turn off automatic summarization in RIPv2 on all routers and clear the routing table.

2. after converge the routing tables in router2 and add default route the routing table shows in the figure below.

```
S*    0.0.0.0/0 is directly connected, Loopback0
      10.0.0.0/8 is variably subnetted, 4 subnets, 2 masks
C        10.1.1.0/30 is directly connected, Serial0/0/0
L        10.1.1.2/32 is directly connected, Serial0/0/0
C        10.2.2.0/30 is directly connected, Serial0/0/1
L        10.2.2.2/32 is directly connected, Serial0/0/1
      172.30.0.0/24 is subnetted, 2 subnets
R        172.30.10.0 [120/1] via 10.1.1.1, 00:00:20, Serial0/0/0
R        172.30.30.0 [120/1] via 10.2.2.1, 00:00:13, Serial0/0/1
      209.165.201.0/24 is variably subnetted, 2 subnets, 2 masks
C        209.165.201.0/24 is directly connected, Loopback0
L        209.165.201.2/32 is directly connected, Loopback0
R2(config)#
```

Figure 13: R2 routing table

3. **Question:** What routes are in the RIP updates that are received from R3?
   172.30.30.0/24

4. **Question:** Are the subnet masks included in the routing update ?
   yes

3.2.4 Configure and redistribute a default route for Internet access.

1. As we say previously From R2, we create a static route to network 0.0.0.0 0.0.0.0, using the ip route command. This forwards any traffic with an unknown destination address to PC-B at 209.165.201.2, simulating the Internet by setting a Gateway of Last Resort on router R2 as shown in the figure 13

2. we use **efault-information originate** command to advertise a route to the other routers

3.2.5 Verify the routing configuration.

1. **Question:** How can you tell from the routing table that the subnetted network shared by R1 and R3 has a pathway for Internet traffic?
   There is default route shows up in the routing table as being learned via RIP.

2. **Question:** How is the pathway for Internet traffic provided in its routing table?
   R2 has a default static route to 0.0.0.0 via 209.165.201.2, and it is directly connected to f0/0

3.2.6 Verify connectivity.

1. **Question:** Simulate sending traffic to the Internet by pinging from PC-A and PC-C to 209.165.201.2. Were the pings successful?
   Yes

2. **Question:** Verify that hosts within the subnetted network can reach each other by pinging between PC-A and PC-C. Were the pings successful?
   Yes

4 Reflection

1. **Question:** Why would you turn off automatic summarization for RIPv2? To perform the routing process in the right way because we have a non-contiguous network

2. **Question:** How did R1 and R3 learn the pathway to the Internet?
   From RIP routing updates received from the router where the default route was configured (R2)

5 Conclusion

In brief, RIP is an important protocol to routing traffic between lANs, and we noticed some problem like auto summarization and how we can solve it ,in addition to configure the interfaces to stops routing updates out of it to improve security by using special command, then we traced and verify the update using debug tool, finaly we add a static route to simulate the connection to the intranet and how the other devices can reach to it.

6 references

https://www.ibm.com/docs/en/i/7.1?topic=routing-information-protocol
https://edukedar.com/routing-protocols/
https://www.geeksforgeeks.org/routing-information-protocol-rip
https://www.computernetworkingnotes.com/ccna-study-guide/route-summarization-and-auto-summarization-explained.html