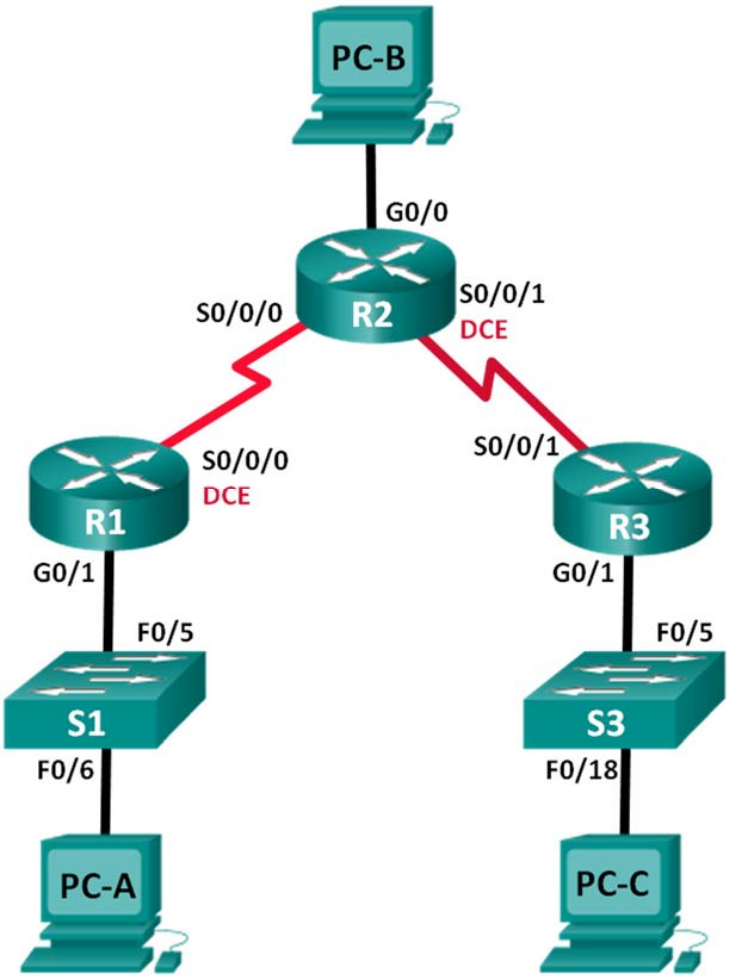
Lab 2 – Configuring Basic RIPv2

Topology



Addressing Table

Device	Interface	IP Address	Subnet Mask	Default Gateway
R1	G0/1	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	G0/0	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	G0/1	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

Objectives

Part 1: Build the Network and Configure Basic Device Settings

Part 2: Configure and Verify RIPv2 Routing

- Configure RIPv2 on the routers and verify that it is running..
- Configure a passive interface.
- Examine routing tables.
- Disable automatic summarization.
- Configure a default route.
- Verify end-to-end connectivity.

Background / Scenario

RIP version 2 (RIPv2) is used for routing of IPv4 addresses in small networks. RIPv2 is a classless, distance-vector routing protocol, as defined by RFC 1723. Because RIPv2 is a classless routing protocol, subnet masks are included in the routing updates. By default, RIPv2 automatically summarizes networks at major network boundaries. When automatic summarization has been disabled, RIPv2 no longer summarizes subnetworks to their address at the classful boundary.

Note: Three groups will share the work during this lab. The groups will organize the work with three sets of devices (router, switch and PC) in the lab room.

Part 1: Build the Network and Configure Basic Device Settings

In Part 1, you will set up the network topology and configure basic settings.

Step 1: Cable the network as shown in the topology.

Note: It is recommended that each group will have a separate copy of the topology and the addressing table in order to verify and troubleshoot the configuration.

Step 2: Initialize and reload the router and switch.

Make sure that the routers and switches have been erased and have no startup configurations.

Step 3: Configure basic settings for each router and switch.

- Disable DNS lookup.
- Configure device names as shown in the topology.
- Configure password encryption.
- Assign **class** as the privileged EXEC password.
- Assign **cisco** as the console and vty passwords.
- Configure **logging synchronous** for the console line.
- Configure the IP address listed in the Addressing Table for all interfaces.
- Configure the clock rate if applicable to the DCE serial interface.
- Copy the running-configuration to the startup-configuration.

Step 4: Configure PC hosts.

Refer to the Addressing Table for PC host address information.

Step 5: Test connectivity.

- Each workstation should be able to ping the attached router (default gateway).
- The neighbor routers should be able to ping one another between their serial interfaces.
- At this point, the PCs are unable to ping each other. Verify and troubleshoot if necessary.

Part 2: Configure and Verify RIPv2 Routing

In Part 2, you will configure RIPv2 routing on all routers in the network and then verify that routing tables are updated correctly. After RIPv2 has been verified, you will disable automatic summarization, configure a default route, and verify end-to-end connectivity.

Step 1: Configure RIPv2 routing.

- On R1, configure RIPv2 as the routing protocol and advertise the appropriate networks.

```
R1# config t
R1(config)# router rip
R1(config-router)# version 2
R1(config-router)# passive-interface g0/1
R1(config-router)# network 172.30.0.0
R1(config-router)# network 10.0.0.0
```

  The **passive-interface** command stops routing updates out the specified interface. This process prevents unnecessary routing traffic on the LAN. However, the network that the specified interface belongs to is still advertised in routing updates that are sent out across other interfaces.

- Configure RIPv2 on R3 and use the **network** statement to add appropriate networks and prevent routing updates on the LAN interface.
- Configure RIPv2 on R2. Do **not** advertise the 209.165.201.0 network.

  Note: It is not necessary to make the LAN interface passive on R2 because the network associated with this interface is not being advertised.

Step 2: Examine current state of network.

- The status of the two serial links can quickly be verified using the **show ip interface brief** command on R2.

```
R2# show ip interface brief
Interface                  IP-Address      OK? Method Status                Protocol
GigabitEthernet0/0
Serial0/0/0
Serial0/0/1
```

- Check connectivity between PCs.

  Which pair of PCs is the ping possible? Why or why not?

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- Verify that RIPv2 is running on the all routers.

  You can use the **debug ip rip**, and **show ip protocols** commands to confirm that RIPv2 is running.

  The **show ip protocols** command output for the router is shown below as an example.

```
Router# show ip protocols
Routing Protocol is "rip"
.............. <omitted>
Default version control: send version 2, receive 2
  Interface             Send  Recv  Triggered RIP  Key-chain
  Serial0/0/0           2     2
Automatic network summarization is in effect
Maximum path: 4
Routing for Networks:
  10.0.0.0
  172.30.0.0
Passive Interface(s):
    GigabitEthernet0/1
Routing Information Sources:
  Gateway         Distance      Last Update
  10.1.1.2             120
Distance: (default is 120)
```

  Note: Be sure that you have configured **logging synchronous** for the console line before running **debug** command.

- When issuing the **debug ip rip** command on the router, what information is provided that confirms RIPv2 is running?

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  When you are finished observing the debugging outputs, issue the **undebug all** command at the privileged EXEC prompt.

- Examine the automatic summarization of routes.

  The LANs connected to R1 and R3 are composed of discontiguous networks.

Which two equal-cost paths to the 172.30.0.0/16 network router R2 displays in the routing table?

.....

```
R2# show ip route
<Output omitted>

R     ............. [120/1] via ..................................

                    [120/1] via ..................................
```

Note that R2 displays only a major classful network address of 172.30.0.0/16 and does not display any of the subnets for this network.

Why does R1 display only its own subnets for the 172.30.0.0 network?

.....

```
R1# show ip route
<Output omitted>

      172.30.0.0/16 is variably subnetted, 2 subnets, 2 masks

C     ..........................................................
```

Also R3 does not have any routes for the 172.30.0.0 subnets on R1. R3 only displays its own subnets for the 172.30.0.0 network.

```
R3# show ip route
<Output omitted>

      172.30.0.0/16 is variably subnetted, 2 subnets, 2 masks

C     ..........................................................
```

Use the **debug ip rip** command again on R2 to determine the routes received in the RIP updates from R3 and list them here.

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It should be now clear that R3 is not sending any of the 172.30.0.0 subnets, only the summarized route of 172.30.0.0/16, including the subnet mask.

Therefore, the routing tables on R1 and R2 do not display the 172.30.0.0 subnets on R3. The routers by default, is still summarizing the routes of the VLSM subnets into the classful boundary of the major network which is not good at all when using CIDR.

Step 3: Disable automatic summarization.

- The **no auto-summary** command is used to turn off automatic summarization in RIPv2. Disable auto summarization on **all routers**. The routers will no longer summarize routes at major classful network boundaries. R1 is shown here as an example.

```
R1(config)# router rip
R1(config-router)# no auto-summary
```

- Issue the **clear ip route *** command to clear the routing table.

```
R1(config-router)# end
R1# clear ip route *
```

- Examine the routing tables. Remember will it take some time to converge the routing tables after clearing them.

  The LAN subnets connected to R1 and R3 should now be included in all three routing tables.

```
R2# show ip route
<Output omitted>
      172.30.0.0/16 is variably subnetted, 3 subnets, 2 masks

R          ..........................................................

           ..........................................................

R          ..........................................................

R          ..........................................................

R1# show ip route
<Output omitted>
<Output omitted>
      172.30.0.0/16 is variably subnetted, 3 subnets, 2 masks

R          ..........................................................

R          ..........................................................

R          ..........................................................
R3# show ip route
<Output omitted>
<Output omitted>
      172.30.0.0/16 is variably subnetted, 3 subnets, 2 masks

R          ..........................................................

R          ..........................................................

R          ..........................................................
```

- Use the **debug ip rip** command on R2 to exam the RIP updates.

  R2# debug ip rip

  After 60 seconds, issue the **no debug ip rip** command.

  What routes are in the RIP updates that are received from R3?

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  Are the subnet masks now included in the routing updates? .....

Step 4: Configure and redistribute a default route for Internet access.

- From R2, create a static route to network 0.0.0.0 0.0.0.0, using the **ip route** command. This forwards any unknown destination address traffic to the R2 G0/0 toward PC-B, simulating the Internet by setting a Gateway of Last Resort on the R2 router.

```
R2(config)# ip route 0.0.0.0 0.0.0.0 209.165.201.2
```

- R2 will advertise a route to the other routers if the **default-information originate** command is added to its RIP configuration.

```
R2(config)# router rip
R2(config-router)# default-information originate
```

Step 5: Verify the routing configuration.

- View the routing table on R1.

```
R1# show ip route
<Output omitted>
Gateway of last resort is 10.1.1.2 to network 0.0.0.0

R*    0.0.0.0/0 [120/1] via 10.1.1.2, 00:00:13, Serial0/0/0

<Output omitted>
```

How can you tell from the routing table that the subnetted network shared by R1 and R3 has a pathway for Internet traffic?

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- View the routing table on R2.

How is the pathway for Internet traffic provided in its routing table?

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Step 6: Verify connectivity.

- Simulate sending traffic to the Internet by pinging from PC-A and PC-C to 209.165.201.2.

Were the pings successful? .....

- Verify that hosts within the subnetted network can reach each other by pinging between PC-A and PC-C.

Were the pings successful? ..... What is the path that ping packets are taking through the network?

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Reflection

Why would you turn off automatic summarization for RIPv2?

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