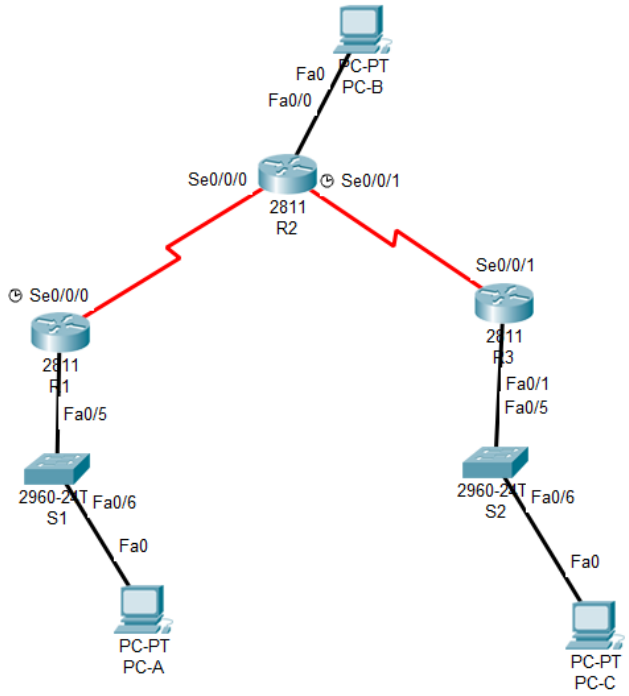
RIPv2

Topology



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

Note: Make sure that the routers and switches have been erased and have no startup configurations. If you are unsure, contact your instructor.

Required Resources

- 3 Routers (Cisco 28011)
- 2 Switches (Cisco 2960)
- 3 PCs (with terminal emulation program)
- Console cables to configure the Cisco IOS devices via the console ports
- Ethernet and Serial cables as shown in the topology

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.

Step 2: Initialize and reload the router and switch if required.

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

a. Disable DNS lookup.
b. Configure device names as shown in the topology.
c. Configure password encryption.
d. Assign **pass** as the privileged EXEC password.
e. Assign **pass** as the console and vty passwords.
f. Configure a MOTD banner to warn users that unauthorized access is prohibited.
g. Configure **logging synchronous** for the console line.
h. Configure the IP addresses listed in the Addressing Table for all interfaces.
i. Configure a description for each interface with an IP address.
j. Configure the clock rate, if applicable, to the DCE serial interface.
k. Copy the running-configuration to the startup-configuration.

Step 4: Configure PC IP Addressing.

Refer to the Addressing Table for IP address information of the PCs.

Step 5: Test connectivity.

At this point, the PCs are unable to ping each other.

a. Each workstation should be able to ping the attached router. Verify and troubleshoot if necessary.
b. The routers should be able to ping one another. 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 the 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.

a. Configure RIPv2 on R1as the routing protocol and advertise the appropriate connected networks.

```
R1# config t
R1(config)# router rip
R1(config-router)# version 2
R1(config-router)# passive-interface f0/1
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.

b. Configure RIPv2 on R3 and use the **network** statement to add the appropriate connected networks (Do not use the passive-interface command on the LAN interface).

c. On PC-C Start a Wireshark capture. Did you capture any RIP messages?

_____

d. Prevent routing updates on the LAN interface of R3.

e. Are routing updates still showing on Wireshark capture? _____

f. Configure RIPv2 on R2 and use the network statements to add the appropriate connected networks. **Do not advertise the 209.165.201.0 network.**

Note: It is not necessary to make the f0/0 interface passive on R2 because the network associated with this interface is not being advertised.

Step 2: Examine the current state of the network.

a. 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
Serial0/0/0                10.1.1.2        YES manual ______                _______
Serial0/0/1                10.2.2.2        YES manual ______                _______
```

b. Check connectivity between PCs.

From PC-A, is it possible to ping PC-B? _____ Why?

_____

From PC-A, is it possible to ping PC-C? _____ Why?

_____

From PC-C, is it possible to ping PC-B? _____ Why?

_____

From PC-C, is it possible to ping PC-A? _____ Why?

_____

c. Verify that RIPv2 is running on the routers.

You can use the **debug ip rip**, **show ip protocols**, and **show run** commands to confirm that RIPv2 is running. The **show ip protocols** command output for R1 is shown below.

```
R1# show ip protocols
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 7 seconds
Invalid after 180 seconds, hold down 180, flushed after 240
Redistributing: rip
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):
    FastEthernet0/1
Routing Information Sources:
  Gateway         Distance      Last Update
  10.1.1.2             120
Distance: (default is 120)
```

When issuing the **debug ip rip** command on R2, 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.

When issuing the **show run** command on R3, what information is provided that confirms RIPv2 is running?

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d. Examine the automatic summarization of routes.

The LANs connected to R1 and R3 are composed of discontiguous networks. R2 displays two equal-cost paths to the 172.30.0.0/16 network in the routing table. R2 displays only the major classful network address of 172.30.0.0 and does not display any of the subnets for this network.

```
R2# show ip route
<Output omitted>
      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
R     172.30.0.0/16 [120/1] via 10.2.2.1, 00:00:23, Serial0/0/1
                    [120/1] via 10.1.1.1, 00:00:09, Serial0/0/0
      209.165.201.0/24 is variably subnetted, 2 subnets, 2 masks
C        209.165.201.0/24 is directly connected, FastEthernet0/0
```

```
L        209.165.201.1/32 is directly connected, FasttEthernet0/0
```

R1 displays only its own subnet for the 172.30.10.0/24 network. R1 does not have a route for the 172.30.30.0/24 subnet on R3.

```
R1# show ip route
<Output omitted>
      10.0.0.0/8 is variably subnetted, 3 subnets, 2 masks
C        10.1.1.0/30 is directly connected, Serial0/0/0
L        10.1.1.1/32 is directly connected, Serial0/0/0
R        10.2.2.0/30 [120/1] via 10.1.1.2, 00:00:21, Serial0/0/0
      172.30.0.0/16 is variably subnetted, 2 subnets, 2 masks
C        172.30.10.0/24 is directly connected, FasttEthernet0/1
L        172.30.10.1/32 is directly connected, FasttEthernet0/1
```

R3 only displays its own subnet for the 172.30.30.0/24 network. R3 does not have a route for the 172.30.10.0/24 subnets on R1.

```
R3# show ip route
<Output omitted>
      10.0.0.0/8 is variably subnetted, 3 subnets, 2 masks
C        10.2.2.0/30 is directly connected, Serial0/0/1
L        10.2.2.1/32 is directly connected, Serial0/0/1
R        10.1.1.0/30 [120/1] via 10.2.2.2, 00:00:23, Serial0/0/1
      172.30.0.0/16 is variably subnetted, 2 subnets, 2 masks
C        172.30.30.0/24 is directly connected, FasttEthernet0/1
L        172.30.30.1/32 is directly connected, FastEthernet0/1
```

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

_____

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.

Step 3: Disable automatic summarization.

a. 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
```

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

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

c. Examine the routing tables. Remember that it will 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>
Gateway of last resort is not set

      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
      172.30.0.0/16 is variably subnetted, 3 subnets, 2 masks
R        172.30.0.0/16 [120/1] via 10.2.2.1, 00:01:01, Serial0/0/1
                       [120/1] via 10.1.1.1, 00:01:15, Serial0/0/0
R        172.30.10.0/24 [120/1] via 10.1.1.1, 00:00:21, Serial0/0/0
R        172.30.30.0/24 [120/1] via 10.2.2.1, 00:00:04, Serial0/0/1
      209.165.201.0/24 is variably subnetted, 2 subnets, 2 masks
C        209.165.201.0/24 is directly connected, FastEthernet0/0
L        209.165.201.1/32 is directly connected, FastEthernet0/0
R1# show ip route
<Output omitted>
Gateway of last resort is not set

      10.0.0.0/8 is variably subnetted, 3 subnets, 2 masks
C        10.1.1.0/30 is directly connected, Serial0/0/0
L        10.1.1.1/32 is directly connected, Serial0/0/0
R        10.2.2.0/30 [120/1] via 10.1.1.2, 00:00:12, Serial0/0/0
      172.30.0.0/16 is variably subnetted, 3 subnets, 2 masks
C        172.30.10.0/24 is directly connected, FastEthernet0/1
L        172.30.10.1/32 is directly connected, FastEthernet0/1
R        172.30.30.0/24 [120/2] via 10.1.1.2, 00:00:12, Serial0/0/0
R3# show ip route
<Output omitted>
      10.0.0.0/8 is variably subnetted, 3 subnets, 2 masks
C        10.2.2.0/30 is directly connected, Serial0/0/1
L        10.2.2.1/32 is directly connected, Serial0/0/1
R        10.1.1.0/30 [120/1] via 10.2.2.2, 00:00:23, Serial0/0/1
      172.30.0.0/16 is variably subnetted, 2 subnets, 2 masks
C        172.30.30.0/24 is directly connected, FastEthernet0/1
L        172.30.30.1/32 is directly connected, FastEthernet0/1
R        172.30.10.0 [120/2] via 10.2.2.2, 00:00:16, Serial0/0/1
```

d. Use the **debug ip rip** command on R2 to examine 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?

_____

Are the subnet masks included in the routing updates? _____

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

a. From R2, 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.

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

b. 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.

a. 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
      10.0.0.0/8 is variably subnetted, 3 subnets, 2 masks
C        10.1.1.0/30 is directly connected, Serial0/0/0
L        10.1.1.1/32 is directly connected, Serial0/0/0
R        10.2.2.0/30 [120/1] via 10.1.1.2, 00:00:13, Serial0/0/0
      172.30.0.0/16 is variably subnetted, 3 subnets, 2 masks
C        172.30.10.0/24 is directly connected, FastEthernet0/1
L        172.30.10.1/32 is directly connected, FastEthernet0/1
R        172.30.30.0/24 [120/2] via 10.1.1.2, 00:00:13, Serial0/0/0
```

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

_____

_____

b. View the routing table on R2.

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

_____

_____

Step 6: Verify connectivity.

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

Were the pings successful? _____

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

Were the pings successful? _____

Note: It may be necessary to disable the PCs firewall.

Thoughts

1. Why would you turn off automatic summarization for RIPv2?

   _____

2. How did R1 and R3 learn the pathway to the Internet?

   _____