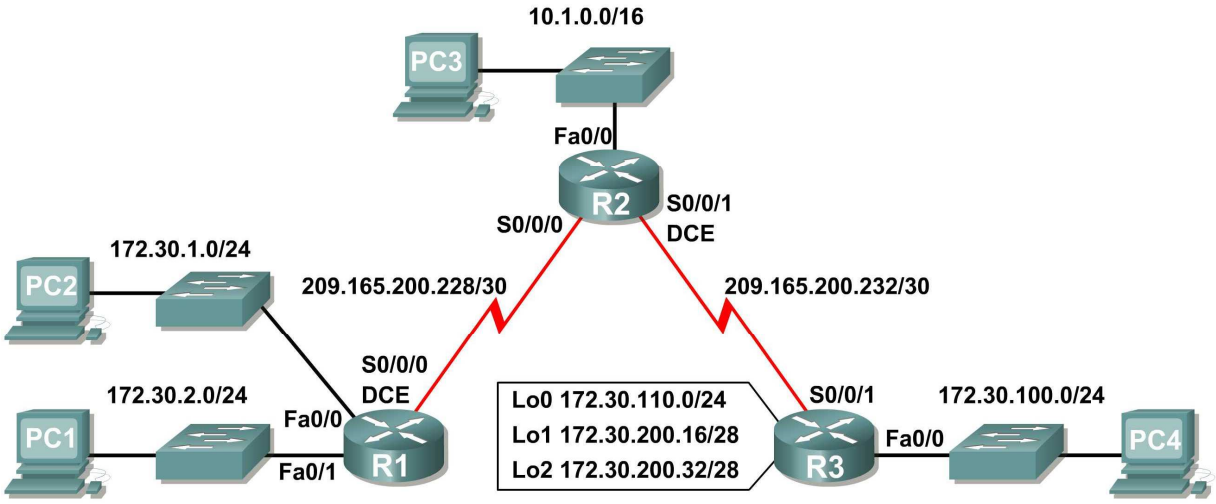
Lab: RIPv2 Basic Configuration Lab

Topology Diagram



Addressing Table

Device	Interface	IP Address	Subnet Mask	Default Gateway
R1	Fa0/0	172.30.1.1	255.255.255.0	N/A
	Fa0/1	172.30.2.1	255.255.255.0	N/A
	S0/0/0	209.165.200.230	255.255.255.252	N/A
R2	Fa0/0	10.1.0.1	255.255.0.0	N/A
	S0/0/0	209.165.200.229	255.255.255.252	N/A
	S0/0/1	209.165.200.233	255.255.255.252	N/A
R3	Fa0/0	172.30.100.1	255.255.255.0	N/A
	S0/0/1	209.165.200.234	255.255.255.252	N/A
	Lo0	172.30.110.1	255.255.255.0	N/A
	Lo1	172.30.200.17	255.255.255.240	N/A
	Lo2	172.30.200.33	255.255.255.240	N/A
PC1	NIC	172.30.1.10	255.255.255.0	172.30.2.1
PC2	NIC	172.30.2.10	255.255.255.0	172.30.1.1
PC3	NIC	10.1.0.10	255.255.0.0	10.1.0.1
PC4	NIC	172.30.100.10	255.255.255.0	172.30.100.1

Step 1: Configure the routers

On the routers, enter global configuration mode and configure the hostname as shown on the chart. Then configure the console, virtual terminal lines password (both “cisco”) and privileged EXEC password (“class”):

Step 2: Add the `logging synchronous` command to the console and virtual terminal lines

This command is very helpful in both lab and production environments and uses the following syntax:

```
Router(config-line)#logging synchronous
```

Step 3: Disable DNS lookup

```
Router(config)#no ip domain-lookup
```

Step 4: Configure the interfaces on R1, R2, and R3

Configure the interfaces on the R1, R2, and R3 routers with the IP addresses from the table under the Topology Diagram.

Step 5: Verify IP addressing and interfaces

Use the **`show ip interface brief`** command to verify that the IP addressing is correct and that the interfaces are active.

Step 6: Configure Ethernet interfaces of PC1, PC2, and PC3

Configure the Ethernet interfaces of PC1, PC2, and PC3 with the IP addresses and default gateways from the table under the Topology Diagram.

Step 7: Test the PC configuration by pinging the default gateway from the PC

Step 8: Configure RIP

To enable RIP, enter the command **`router rip`** in global configuration mode.

```
Router(config)#router rip
```

Once you are in routing configuration mode, enter the classful network address **for each directly connected network**, using the **`network`** command with the following syntax:

```
Router(config-router)#network <network_nr>
```
Router(config-router)#**network <network_nr>**

Task: Examine the Current Status of the Network.

Step 1: Verify that both serial links are up.

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
FastEthernet0/0        10.1.0.1        YES manual up                    up
FastEthernet0/1        unassigned      YES manual administratively down down
Serial0/0/0            209.165.200.229 YES manual up                    up
Serial0/0/1            209.165.200.233 YES manual up                    up
Vlan1                  unassigned      YES manual administratively down down
```


Step 2: Check the connectivity from R2 to the hosts on the R1 and R3 LANs.

From the R2 router, how many ICMP messages are successful when pinging PC1?

_____

From the R2 router, how many ICMP messages are successful when pinging PC4?

_____

Step 3: Check the connectivity between the PCs.

From the PC1, is it possible to ping PC2? _____

What is the success rate? _____

From the PC1, is it possible to ping PC3? _____

What is the success rate? _____

From the PC1, is it possible to ping PC4? _____

What is the success rate? _____

From the PC4, is it possible to ping PC2? _____

What is the success rate? _____

From the PC4, is it possible to ping PC3? _____

What is the success rate? _____

Step 4: View the routing table on R2.

Both the R1 and R3 are advertising routes to the 172.30.0.0/16 network; therefore, there are two entries for this network in the R2 routing table. The R2 routing table only shows the major classful network address of 172.30.0.0—it does not show any of the subnets for this network that are used on the LANs attached to R1 and R3. Because the routing metric is the same for both entries, the router alternates the routes that are used when forwarding packets that are destined for the 172.30.0.0/16 network.

```
R2#show ip route

Output omitted

     10.0.0.0/16 is subnetted, 1 subnets
C       10.1.0.0 is directly connected, FastEthernet0/0
R    172.30.0.0/16 [120/1] via 209.165.200.230, 00:00:24, Serial0/0/0
                   [120/1] via 209.165.200.234, 00:00:15, Serial0/0/1
     209.165.200.0/30 is subnetted, 2 subnets
C       209.165.200.228 is directly connected, Serial0/0/0
C       209.165.200.232 is directly connected, Serial0/0/1
```

Step 5: Examine the routing table on the R1 router.

Both R1 and R3 are configured with interfaces on a discontiguous network, 172.30.0.0. The 172.30.0.0 subnets are physically and logically divided by at least one other classful or major network—in this case, the two serial networks 209.165.200.228/30 and 209.165.200.232/30. Classful routing protocols like RIPv1 summarize networks at major network boundaries. Both R1 and R3 will be summarizing 172.30.0.0/24 subnets to 172.30.0.0/16. Because the route to 172.30.0.0/16 is directly connected, and because R1 does not have any specific routes for the 172.30.0.0 subnets on R3, packets destined for the R3 LANs will not be forwarded properly.


```
R1#show ip route

Output omitted



R    10.0.0.0/8 [120/1] via 209.165.200.229, 00:00:02, Serial0/0/0
     172.30.0.0/24 is subnetted, 2 subnets
C       172.30.1.0 is directly connected, FastEthernet0/0
C       172.30.2.0 is directly connected, FastEthernet0/1
     209.165.200.0/30 is subnetted, 2 subnets
C       209.165.200.228 is directly connected, Serial0/0/0
R       209.165.200.232 [120/1] via 209.165.200.229, 00:00:02, Serial0/0/0
```

Step 6: Examine the routing table on the R3 router.

R3 only shows its own subnets for 172.30.0.0 network: 172.30.100/24, 172.30.110/24, 172.30.200.16/28, and 172.30.200.32/28. R3 does not have any routes for the 172.30.0.0 subnets on R1.

```
R3#show ip route

Output omitted

R    10.0.0.0/8 [120/1] via 209.165.200.233, 00:00:19, Serial0/0/1
     172.30.0.0/16 is variably subnetted, 4 subnets, 2 masks
C       172.30.100.0/24 is directly connected, FastEthernet0/0
C       172.30.110.0/24 is directly connected, Loopback0
C       172.30.200.16/28 is directly connected, Loopback1
C       172.30.200.32/28 is directly connected, Loopback2
     209.165.200.0/30 is subnetted, 2 subnets
R       209.165.200.228 [120/1] via 209.165.200.233, 00:00:19, Serial0/0/1
C       209.165.200.232 is directly connected, Serial0/0/1
```

Step 7: Examine the RIPv1 packets that are being received by R2.

Use the **debug ip rip** command to display RIP routing updates.

R2 is receiving the route 172.30.0.0, with 1 hop, from both R1 and R3. Because these are equal cost metrics, both routes are added to the R2 routing table. Because RIPv1 is a classful routing protocol, no subnet mask information is sent in the update.

```
R2#debug ip rip
RIP protocol debugging is on
RIP: received v1 update from 209.165.200.234 on Serial0/0/1
      172.30.0.0 in 1 hops
RIP: received v1 update from 209.165.200.230 on Serial0/0/0
      172.30.0.0 in 1 hops
```

R2 is sending only the routes for the 10.0.0.0 LAN and the two serial connections to R1 and R3. R1 and R3 are not receiving any information about the 172.30.0.0 subnet routes.

```
RIP: sending  v1 update to 255.255.255.255 via Serial0/0/1
(209.165.200.233)
RIP: build update entries
      network 10.0.0.0 metric 1
      network 209.165.200.228 metric 1
```



```
RIP: sending  v1 update to 255.255.255.255 via Serial0/0/0
(209.165.200.229)
RIP: build update entries
      network 10.0.0.0 metric 1
      network 209.165.200.232 metric 1
```

When you are finished, turn off the debugging.

```
R2#undebug all
```

Task: Configure RIP Version 2.

Step 1: Use the `version 2` command to enable RIP version 2 on each of the routers.

```
R2(config)#router rip
R2(config-router)#version 2

R1(config)#router rip
R1(config-router)#version 2

R3(config)#router rip
R3(config-router)#version 2
```

RIPv2 messages include the subnet mask in a field in the routing updates. This allows subnets and their masks to be included in the routing updates. However, by default RIPv2 summarizes networks at major network boundaries, just like RIPv1, except that the subnet mask is included in the update.

Step 2: Verify that RIPv2 is running on the routers.

The **`debug ip rip`**, **`show ip protocols`**, and **`show run`** commands can all be used to confirm that RIPv2 is running. The output of the **`show ip protocols`** command for R1 is shown below.

```
R1# show ip protocols
Routing Protocol is "rip"
Sending updates every 30 seconds, next due in 7 seconds
Invalid after 180 seconds, hold down 180, flushed after 240
Outgoing update filter list for all interfaces is not set
Incoming update filter list for all interfaces is not set
Redistributing: rip
Default version control: send version 2, receive 2
  Interface             Send  Recv  Triggered RIP  Key-chain
  FastEthernet0/0       2     2
  FastEthernet0/1       2     2
  Serial0/0/0           2     2
Automatic network summarization is in effect
Maximum path: 4
Routing for Networks:
   172.30.0.0
   209.165.200.0
Passive Interface(s):
   FastEthernet0/0
   FastEthernet0/1
Routing Information Sources:
   Gateway         Distance      Last Update
   209.165.200.229      120
```



```
Distance: (default is 120)
```

Task: Examine the Automatic Summarization of Routes.

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

```
R2#show ip route

Output omitted

     10.0.0.0/16 is subnetted, 1 subnets
C       10.1.0.0 is directly connected, FastEthernet0/0
R    172.30.0.0/16 [120/1] via 209.165.200.230, 00:00:07, Serial0/0/0
                   [120/1] via 209.165.200.234, 00:00:08, Serial0/0/1
     209.165.200.0/30 is subnetted, 2 subnets
C       209.165.200.228 is directly connected, Serial0/0/0
C       209.165.200.232 is directly connected, Serial0/0/1
```

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

```
R1#show ip route

Output omitted

R    10.0.0.0/8 [120/1] via 209.165.200.229, 00:00:09, Serial0/0/0
     172.30.0.0/24 is subnetted, 2 subnets
C       172.30.1.0 is directly connected, FastEthernet0/0
C       172.30.2.0 is directly connected, FastEthernet0/1
     209.165.200.0/30 is subnetted, 2 subnets
C       209.165.200.228 is directly connected, Serial0/0/0
R       209.165.200.232 [120/1] via 209.165.200.229, 00:00:09, Serial0/0/0
```

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

```
R3#show ip route

Output omitted

R    10.0.0.0/8 [120/1] via 209.165.200.233, 00:00:16, Serial0/0/1
     172.30.0.0/16 is variably subnetted, 4 subnets, 2 masks
C       172.30.100.0/24 is directly connected, FastEthernet0/0
C       172.30.110.0/24 is directly connected, Loopback0
C       172.30.200.16/28 is directly connected, Loopback1
C       172.30.200.32/28 is directly connected, Loopback2
     209.165.200.0/30 is subnetted, 2 subnets
R       209.165.200.228 [120/1] via 209.165.200.233, 00:00:16, Serial0/0/1
C       209.165.200.232 is directly connected, Serial0/0/1
```


Use the output of the **debug ip rip** command to answer the following questions:

What entries are included in the RIP updates sent out from R3?

_____

_____

_____

_____

_____

On R2, what routes are in the RIP updates that are received from R3?

_____

_____

_____

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. This is why R2 and R1 are not seeing the 172.30.0.0 subnets on R3.

Task: 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 network boundaries.

```
R2(config)#router rip
R2(config-router)#no auto-summary

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

R3(config)#router rip
R3(config-router)#no auto-summary
```

The **show ip route** and **ping** commands can be used to verify that automatic summarization is off.

Task: Examine the Routing Tables.

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

```
R2#show ip route

Output omitted

     10.0.0.0/16 is subnetted, 1 subnets
C       10.1.0.0 is directly connected, FastEthernet0/0
     172.30.0.0/16 is variably subnetted, 7 subnets, 3 masks
R       172.30.0.0/16 [120/1] via 209.165.200.230, 00:01:28, Serial0/0/0
                      [120/1] via 209.165.200.234, 00:01:56, Serial0/0/1
R       172.30.1.0/24 [120/1] via 209.165.200.230, 00:00:08, Serial0/0/0
```



```
R       172.30.2.0/24 [120/1] via 209.165.200.230, 00:00:08, Serial0/0/0
R       172.30.100.0/24 [120/1] via 209.165.200.234, 00:00:08, Serial0/0/1
R       172.30.110.0/24 [120/1] via 209.165.200.234, 00:00:08, Serial0/0/1
R       172.30.200.16/28 [120/1] via 209.165.200.234, 00:00:08, Serial0/0/1
R       172.30.200.32/28 [120/1] via 209.165.200.234, 00:00:08, Serial0/0/1
     209.165.200.0/30 is subnetted, 2 subnets
C       209.165.200.228 is directly connected, Serial0/0/0
C       209.165.200.232 is directly connected, Serial0/0/1R2#
```

R1#**show ip route**

Output omitted

```
     10.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
R       10.0.0.0/8 [120/1] via 209.165.200.229, 00:02:13, Serial0/0/0
R       10.1.0.0/16 [120/1] via 209.165.200.229, 00:00:21, Serial0/0/0
     172.30.0.0/16 is variably subnetted, 6 subnets, 2 masks
C       172.30.1.0/24 is directly connected, FastEthernet0/0
C       172.30.2.0/24 is directly connected, FastEthernet0/1
R       172.30.100.0/24 [120/2] via 209.165.200.229, 00:00:21, Serial0/0/0
R       172.30.110.0/24 [120/2] via 209.165.200.229, 00:00:21, Serial0/0/0
R       172.30.200.16/28 [120/2] via 209.165.200.229, 00:00:21, Serial0/0/0
R       172.30.200.32/28 [120/2] via 209.165.200.229, 00:00:21, Serial0/0/0
     209.165.200.0/30 is subnetted, 2 subnets
C       209.165.200.228 is directly connected, Serial0/0/0
R       209.165.200.232 [120/1] via 209.165.200.229, 00:00:21, Serial0/0/0
```

R3#**show ip route**

Output omitted

```
     10.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
R       10.0.0.0/8 [120/1] via 209.165.200.233, 00:02:28, Serial0/0/1
R       10.1.0.0/16 [120/1] via 209.165.200.233, 00:00:08, Serial0/0/1
     172.30.0.0/16 is variably subnetted, 6 subnets, 2 masks
R       172.30.1.0/24 [120/2] via 209.165.200.233, 00:00:08, Serial0/0/1
R       172.30.2.0/24 [120/2] via 209.165.200.233, 00:00:08, Serial0/0/1
C       172.30.100.0/24 is directly connected, FastEthernet0/0
C       172.30.110.0/24 is directly connected, Loopback0
C       172.30.200.16/28 is directly connected, Loopback1
C       172.30.200.32/28 is directly connected, Loopback2
     209.165.200.0/30 is subnetted, 2 subnets
R       209.165.200.228 [120/1] via 209.165.200.233, 00:00:08, Serial0/0/1
C       209.165.200.232 is directly connected, Serial0/0/1
```

Use the output of the **debug ip rip** command to answer the following questions:

What entries are included in the RIP updates sent out from R1?

_____

_____

_____

On R2, what routes are in the RIP updates that are received from R1?

_____

_____

_____

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

Task: Verify Network Connectivity.

Step 1: Check connectivity between R2 router and PCs.

From R2, how many ICMP messages are successful when pinging PC1?

_____

From R2, how many ICMP messages are successful when pinging PC4?

_____

Step 2: Check the connectivity between the PCs.

From PC1, is it possible to ping PC2? _____

What is the success rate? _____

From PC1, is it possible to ping PC3? _____

What is the success rate? _____

From PC1, is it possible to ping PC4? _____

What is the success rate? _____

From PC4, is it possible to ping PC2? _____

What is the success rate? _____

From PC4, is it possible to ping PC3? _____

What is the success rate? _____

Task: Clean Up

Erase the configurations and disconnect attached cabling

