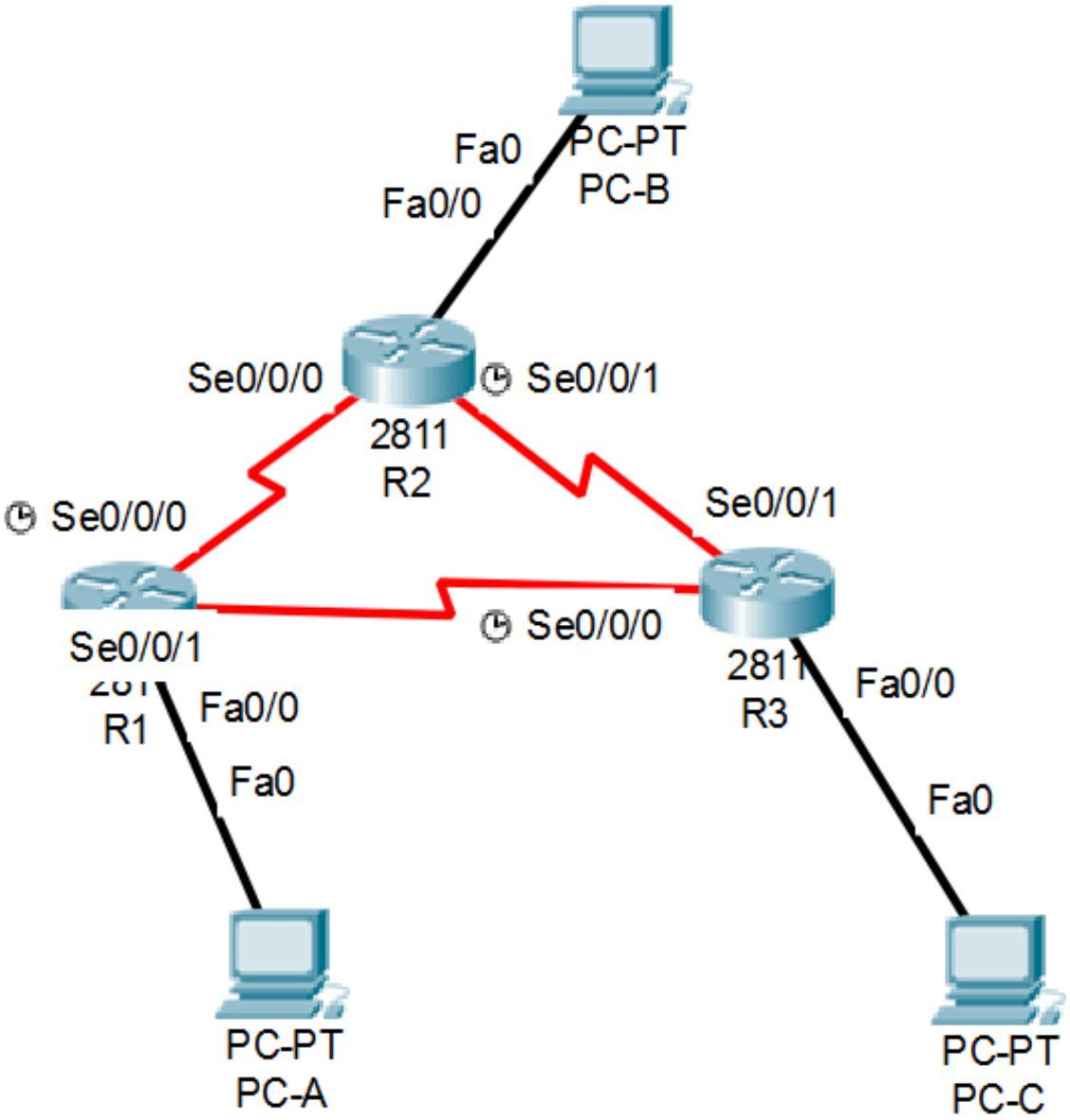
# EIGRP for IPv4

## Topology



### Addressing Table

| Device | Interface | IP Address | Subnet Mask | Default Gateway |
|---|---|---|---|---|
| R1 | F0/0 | 192.168.1.1 | 255.255.255.0 | N/A |
| | S0/0/0 (DCE) | 10.1.1.1 | 255.255.255.252 | N/A |
| | S0/0/1 | 10.3.3.1 | 255.255.255.252 | N/A |
| R2 | F0/0 | 192.168.2.1 | 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 | F0/0 | 192.168.3.1 | 255.255.255.0 | N/A |
| | S0/0/0 (DCE) | 10.3.3.2 | 255.255.255.252 | N/A |
| | S0/0/1 | 10.2.2.1 | 255.255.255.252 | N/A |
| PC-A | NIC | 192.168.1.3 | 255.255.255.0 | 192.168.1.1 |
| PC-B | NIC | 192.168.2.3 | 255.255.255.0 | 192.168.2.1 |
| PC-C | NIC | 192.168.3.3 | 255.255.255.0 | 192.168.3.1 |

### Background / Scenario

Enhanced Interior Gateway Routing Protocol (EIGRP) is a powerful distance vector routing protocol and is relatively easy to configure for basic networks.

In this lab, you will configure EIGRP for the topology and networks shown above. You will modify bandwidth and configure passive interfaces to allow EIGRP to function more efficiently.

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

### Required Resources

- 3 Routers
- 3 PCs
- 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 Verify Connectivity

In Part 1, you will set up the network topology and configure basic settings, such as the interface IP addresses, device access, and passwords.

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

### Step 2: Configure PC hosts.

### Step 3: Initialize and reload the routers as necessary.

### Step 4: Configure basic settings for each router.

a. Disable DNS lookup.
b. Configure IP addresses for the routers, as listed in the Addressing Table.
c. Configure device name as shown in the topology.
d. Assign **pass** as the console and vty passwords.
e. Assign **pass** as the privileged EXEC password.
f. Configure **logging synchronous** to prevent console and vty messages from interrupting command entry.
g. Configure a message of the day.
h. Copy the running configuration to the startup configuration.

### Step 5: Verify connectivity.

The routers should be able to ping one another, and each PC should be able to ping its default gateway. The PCs will not be able to ping other PCs until EIGRP routing is configured. Verify and troubleshoot if necessary.

## Part 2: Configure EIGRP Routing

### Step 1: Enable EIGRP routing on R1. Use AS number 10.

```
R1(config)# router eigrp 10
```

### Step 2: Advertise the directly connected networks on R1 using the wildcard mask.

```
R1(config-router)# network 10.1.1.0 0.0.0.3
R1(config-router)# network 192.168.1.0 0.0.0.255
R1(config-router)# network 10.3.3.0 0.0.0.3
```

Why is it a good practice to use wildcard masks when advertising networks? Could the mask have been omitted from any of the network statements above? If so, which one(s)?

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### Step 3: Enable EIGRP routing and advertise the directly connected networks on R2 and R3.

You will see neighbor adjacency messages as interfaces are added to the EIGRP routing process. The messages on R2 are displayed as an example.

```
*Mar 12 11:24:59.543: %DUAL-5-NBRCHANGE: EIGRP-IPv4 10: Neighbor 10.1.1.1
(Serial0/0/0) is up: new adjacency
```

### Step 4: Verify end-to-end connectivity.

All devices should be able to ping each other if EIGRP is configured correctly.

## Part 3: Verify EIGRP Routing

### Step 1: Examine the EIGRP neighbor table.

On R1, issue the **show ip eigrp neighbors** command to verify that the adjacency has been established with its neighboring routers.

```
R1# show ip eigrp neighbors
EIGRP-IPv4 Neighbors for AS(10)
H   Address                 Interface              Hold Uptime   SRTT   RTO  Q  Seq
                                                   (sec)         (ms)       Cnt Num
1   10.3.3.2                Se0/0/1                 13 00:24:58    8   100  0  17
0   10.1.1.2                Se0/0/0                 13 00:29:23    7   100  0  23
```

### Step 2: Examine the IP EIGRP routing table.

```
R1# show ip route eigrp
...
Gateway of last resort is not set

      10.0.0.0/8 is variably subnetted, 5 subnets, 2 masks
D        10.2.2.0/30 [90/2681856] via 10.3.3.2, 00:29:01, Serial0/0/1
                     [90/2681856] via 10.1.1.2, 00:29:01, Serial0/0/0
D     192.168.2.0/24 [90/2172416] via 10.1.1.2, 00:29:01, Serial0/0/0
D     192.168.3.0/24 [90/2172416] via 10.3.3.2, 00:27:56, Serial0/0/1
```

Why does R1 have two paths to the 10.2.2.0/30 network?

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### Step 3: Examine the EIGRP topology table.

```
R1# show ip eigrp topology
EIGRP-IPv4 Topology Table for AS(10)/ID(192.168.1.1)
Codes: P - Passive, A - Active, U - Update, Q - Query, R - Reply,
       r - reply Status, s - sia Status

P 192.168.3.0/24, 1 successors, FD is 2172416
        via 10.3.3.2 (2172416/28160), Serial0/0/1
P 192.168.2.0/24, 1 successors, FD is 2172416
        via 10.1.1.2 (2172416/28160), Serial0/0/0
P 10.2.2.0/30, 2 successors, FD is 2681856
        via 10.1.1.2 (2681856/2169856), Serial0/0/0
        via 10.3.3.2 (2681856/2169856), Serial0/0/1
P 10.3.3.0/30, 1 successors, FD is 2169856
        via Connected, Serial0/0/1
```

```
P 192.168.1.0/24, 1 successors, FD is 2816
        via Connected, FastEthernet0/0
P 10.1.1.0/30, 1 successors, FD is 2169856
        via Connected, Serial0/0/0
```

Why are there no feasible successors listed in the R1 topology table?

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### Step 4: Verify the EIGRP routing parameters and networks advertised.

Issue the **show ip protocols** command to verify the EIGRP routing parameters used.

```
R1# show ip protocols
*** IP Routing is NSF aware ***

Routing Protocol is "eigrp 10"
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Default networks flagged in outgoing updates
  Default networks accepted from incoming updates
  EIGRP-IPv4 Protocol for AS(10)
    Metric weight K1=1, K2=0, K3=1, K4=0, K5=0
    NSF-aware route hold timer is 240
    Router-ID: 192.168.1.1
    Topology : 0 (base)
      Active Timer: 3 min
      Distance: internal 90 external 170
      Maximum path: 4
      Maximum hopcount 100
      Maximum metric variance 1

  Automatic Summarization: disabled
  Maximum path: 4
  Routing for Networks:
    10.1.1.0/30
    10.3.3.0/30
    192.168.1.0
  Routing Information Sources:
    Gateway         Distance      Last Update
    10.3.3.2              90      02:38:34
    10.1.1.2              90      02:38:34
  Distance: internal 90 external 170
```

Based on the output of issuing the **show ip protocols** command, answer the following questions.

What AS number is used? _____

What networks are advertised? _____

What is the administrative distance for EIGRP? _____

How many equal cost paths does EIGRP use by default? _____

# Part 4: Configure Bandwidth and Passive Interfaces

EIGRP uses a default bandwidth based on the type of interface in the router. In Part 4, you will modify the bandwidth so that the link between R1 and R3 has a lower bandwidth than the link between R1/R2 and R2/R3. In addition, you will set passive interfaces on each router.

## Step 1: Observe the current routing settings.

a. Issue the **show interface s0/0/0** command on R1.

```
R1# show interface s0/0/0
Serial0/0/0 is up, line protocol is up
  Hardware is WIC MBRD Serial
  Internet address is 10.1.1.1/30
  MTU 1500 bytes, BW 1544 Kbit/sec, DLY 20000 usec,
     reliability 255/255, txload 1/255, rxload 1/255
```

What is the default bandwidth for this serial interface? _____

b. How many routes are listed in the routing table to reach the 10.2.2.0/30 network? _____

## Step 2: Modify the bandwidth on the routers.

a. Modify the bandwidth on R1 for the serial interfaces.

```
R1(config)# interface s0/0/0
R1(config-if)# bandwidth 2000
R1(config-if)# interface s0/0/1
R1(config-if)# bandwidth 64
```

Issue **show ip route** command on R1. Is there a difference in the routing table? If so, what is it?

```
Gateway of last resort is not set

      10.0.0.0/8 is variably subnetted, 5 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
D        10.2.2.0/30 [90/2681856] via 10.1.1.2, 00:03:09, Serial0/0/0
C        10.3.3.0/30 is directly connected, Serial0/0/1
L        10.3.3.1/32 is directly connected, Serial0/0/1
      192.168.1.0/24 is variably subnetted, 2 subnets, 2 masks
C        192.168.1.0/24 is directly connected, FastEthernet0/0
L        192.168.1.1/32 is directly connected, FastEthernet0/0
D     192.168.2.0/24 [90/1794560] via 10.1.1.2, 00:03:09, Serial0/0/0
D     192.168.3.0/24 [90/2684416] via 10.1.1.2, 00:03:08, Serial0/0/0
```

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b. Modify the bandwidth on the R2 and R3 serial interfaces.

```
R2(config)# interface s0/0/0
R2(config-if)# bandwidth 2000
R2(config-if)# interface s0/0/1
```

```
R2(config-if)# bandwidth 2000

R3(config)# interface s0/0/0
R3(config-if)# bandwidth 64
R3(config-if)# interface s0/0/1
R3(config-if)# bandwidth 2000
```

### Step 3: Verify the bandwidth modifications.

a. Verify bandwidth modifications. Issue a **show interface serial 0/0/x** command, with x being the appropriate serial interface on all three routers to verify that bandwidth is set correctly. R1 is shown as an example.

```
R1# show interface s0/0/0
Serial0/0/0 is up, line protocol is up
  Hardware is WIC MBRD Serial
  Internet address is 10.1.1.1/30
  MTU 1500 bytes, BW 2000 Kbit/sec, DLY 20000 usec,
     reliability 255/255, txload 1/255, rxload 1/255
```

Based on your bandwidth configuration, try and determine what the R2 and R3 routing tables will look like before you issue a **show ip route** command. Are their routing tables the same or different?

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### Step 4: Configure F0/0 interface as passive on R1, R2, and R3.

A passive interface does not allow outgoing and incoming routing updates over the configured interface. The **passive-interface** *interface* command causes the router to stop sending and receiving Hello packets over an interface; however, the network associated with the interface is still advertised to other routers through the non-passive interfaces. Router interfaces connected to LANs are typically configured as passive.

```
R1(config)# router eigrp 10
R1(config-router)# passive-interface F0/0

R2(config)# router eigrp 10
R2(config-router)# passive-interface F0/0

R3(config)# router eigrp 10
R3(config-router)# passive-interface F0/0
```

### Step 5: Verify the passive interface configuration.

Issue a **show ip protocols** command on R1, R2, and R3 and verify that F0/0 has been configured as passive.

```
R1# show ip protocols
...
  Passive Interface(s):
    FastEthernet0/0
```

End