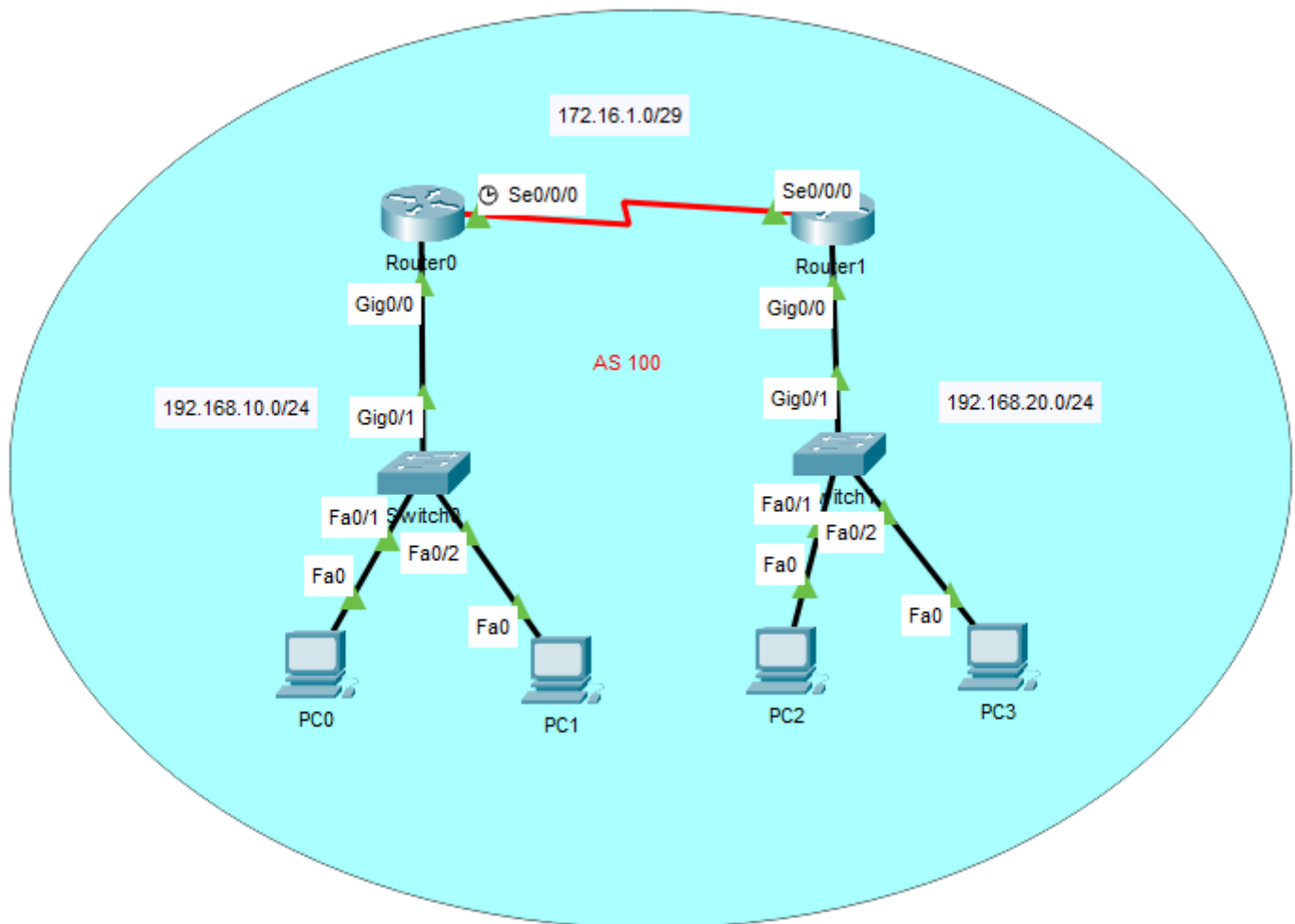


Cisco IOS EIGRP Protocol

Network Topology



Router0 Configuration Commands

```
Router0>enable
Router0#configure terminal
Router0(config)#interface serial 0/0/0
Router0(config-if)#ip address 172.16.1.1 255.255.255.248
Router0(config-if)#no shutdown
Router0(config-if)#interface gigabitEthernet 0/0/1
Router0(config-if)#ip address 192.168.10.1 255.255.255.0
Router0(config-if)#no shutdown
Router0(config-if)#exit
Router0(config)#router eigrp 100
Router0(config-router)#network 192.168.10.0 0.0.0.0
```

```
Router0(config-router)#network 172.16.1.0 0.0.0.0
Router0(config-router)#no auto-summary
Router0(config-router)#end
```

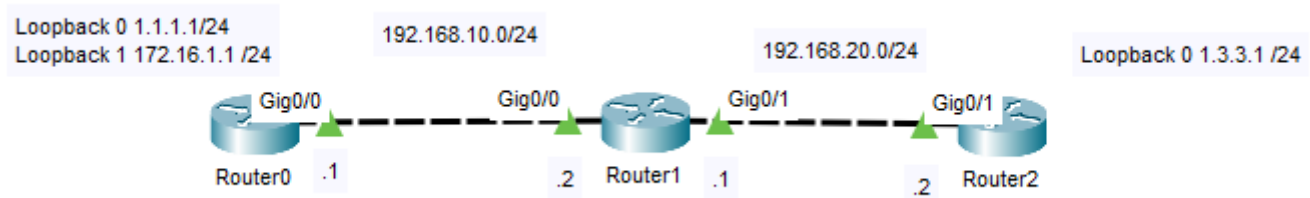
Router1 Configuration Commands

```
Router1>enable
Router1#configure terminal
Router1(config)#interface serial 0/0/0
Router1(config-if)#ip address 172.16.1.2 255.255.255.248
Router1(config-if)#no shutdown
Router1(config-if)#interface gigabitEthernet 0/0
Router1(config-if)#ip address 192.168.20.1 255.255.255.0
Router1(config-if)#no shutdown
Router1(config-if)#exit
Router1(config)#router eigrp 100
Router1(config-router)#network 192.168.20.0 0.0.0.0
Router1(config-router)#network 172.16.1.0 0.0.0.0
Router0(config-router)#no auto-summary
Router1(config-router)#end
```

Comments on a Couple of Configuration Items

A couple of notes about the configurations. First, the network commands show a wildcard of 0.0.0.0, this denotes an exact match for the specific IP on the interfaces. I could have also made the command be for a subnet with network 192.168.10.0 0.0.0.255 It was simply a preference on my part for this configuration.

Second, the command no auto-summary. EIGRP is a routing protocol that supports auto summarization. This isn't very intuitive to understand. Auto summarization in EIGRP means that it will automatically advertise the classful A, B, or C subnet if it is not told otherwise. Let's take a look at another network topology to demonstrate the auto-summary effect.



In the above example there are three routers configured for eigrp. In the initial setup Router0 and Router2 have auto-summary on for EIGRP. All three networks 192.168.2.0, 172.16.1.0, and 1.1.1.0 are configured in the EIGRP router for Router0.

```

router eigrp 1
 network 1.1.1.0 0.0.0.255
 network 172.16.1.0 0.0.0.255
 network 192.168.10.0
 auto-summary

```

Similarly, Router 2 has EIGRP configured and 1.3.3.0 and 192.168.20.0 are configured. Also, auto-summary has been explicitly turned on.

```

router eigrp 1
 network 1.3.3.0 0.0.0.255
 network 192.168.20.0
 auto-summary

```

Router1 is pretty vanilla with EIGRP configured and advertising the 192.168.10.0 and 192.168.20.0 networks. No auto-summary is on for Router1. The interesting thing is taking a look at the routing tables of each of the routers to see what auto-summary does in this scenario. And how it will break the routing. Let's look at Router0 first.

```

Router0#show ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

```

Gateway of last resort is not set

```

      1.0.0.0/8 is variably subnetted, 3 subnets, 3 masks
D       1.0.0.0/8 is a summary, 00:06:45, Null0
C       1.1.1.0/24 is directly connected, Loopback0
L       1.1.1.1/32 is directly connected, Loopback0
      172.16.0.0/16 is variably subnetted, 3 subnets, 3 masks
D       172.16.0.0/16 is a summary, 00:06:45, Null0
C       172.16.1.0/24 is directly connected, Loopback1
L       172.16.1.1/32 is directly connected, Loopback1
      192.168.10.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.10.0/24 is directly connected, GigabitEthernet0/0
L       192.168.10.1/32 is directly connected, GigabitEthernet0/0
D       192.168.20.0/24 [90/3072] via 192.168.10.2, 00:06:44, GigabitEthernet0/0

```

The 1.1.1.0 /24 network has been summarized the classful A network of 1.0.0.0 /8. Similarly, the 172.16.1.0 /24 has been summarized to the classful B network of 172.16.0.0 /16. This isn't necessary bad when you just look at it from Router0's perspective but hold that thought until we take a closer look at Router1 in a moment. One last note for Router0, the network 192.168.10.0 /24 is as expected because it is already a class C network.

Now let's look at Router2 and then we will get to Router1.

```
Router2#show ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route
```

Gateway of last resort is not set

```
1.0.0.0/8 is variably subnetted, 3 subnets, 3 masks
D    1.0.0.0/8 is a summary, 00:14:28, Null0
C    1.3.3.0/24 is directly connected, Loopback0
L    1.3.3.1/32 is directly connected, Loopback0
D    172.16.0.0/16 [90/131072] via 192.168.20.1, 00:14:27, GigabitEthernet0/1
D    192.168.10.0/24 [90/3072] via 192.168.20.1, 00:14:27, GigabitEthernet0/1
    192.168.20.0/24 is variably subnetted, 2 subnets, 2 masks
C    192.168.20.0/24 is directly connected, GigabitEthernet0/1
L    192.168.20.2/32 is directly connected, GigabitEthernet0/1
```

Now, you can already start to see the problem, Router2 is advertising a summarized classful A for 1.0.0.0 /8 just as Router0 was. And what does that do to Router1, confuses the heck out of its routing table, that's what! Let's look.

```
Router1>en
Router1#show ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route
```

Gateway of last resort is not set

```
D    1.0.0.0/8 [90/130816] via 192.168.20.2, 00:16:29, GigabitEthernet0/1
    [90/130816] via 192.168.10.1, 00:16:29, GigabitEthernet0/0
D    172.16.0.0/16 [90/130816] via 192.168.10.1, 00:16:29, GigabitEthernet0/0
    192.168.10.0/24 is variably subnetted, 2 subnets, 2 masks
C    192.168.10.0/24 is directly connected, GigabitEthernet0/0
L    192.168.10.2/32 is directly connected, GigabitEthernet0/0
    192.168.20.0/24 is variably subnetted, 2 subnets, 2 masks
C    192.168.20.0/24 is directly connected, GigabitEthernet0/1
L    192.168.20.1/32 is directly connected, GigabitEthernet0/1
```

So, now Router1 is advertising that 1.0.0.0 /8, which is the summarized subnet for both 1.1.1.0 and 1.3.3.0 is reachable through both the other routers. This is what unchecked auto-summary can do to EIGRP if you are not careful. The fix is to turn off auto-summary in Router0 and Router1. And problem resolved. Take a look at Router1, the one that was so confused before we turned off auto-summary, it has the correct routes now.

```

Router1#show ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

    1.0.0.0/24 is subnetted, 2 subnets
D       1.1.1.0/24 [90/130816] via 192.168.10.1, 00:01:19, GigabitEthernet0/0
D       1.3.3.0/24 [90/130816] via 192.168.20.2, 00:00:47, GigabitEthernet0/1
    172.16.0.0/24 is subnetted, 1 subnets
D       172.16.1.0/24 [90/130816] via 192.168.10.1, 00:01:19, GigabitEthernet0/0
    192.168.10.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.10.0/24 is directly connected, GigabitEthernet0/0
L       192.168.10.2/32 is directly connected, GigabitEthernet0/0
    192.168.20.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.20.0/24 is directly connected, GigabitEthernet0/1
L       192.168.20.1/32 is directly connected, GigabitEthernet0/1

```

Back to the EIGRP Configuration

Verify the configuration

Router0#show ip route

```

Router0#show ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

    172.16.0.0/16 is variably subnetted, 2 subnets, 2 masks
C       172.16.1.0/29 is directly connected, Serial0/0/0
L       172.16.1.1/32 is directly connected, Serial0/0/0
    192.168.10.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.10.0/24 is directly connected, GigabitEthernet0/0
L       192.168.10.1/32 is directly connected, GigabitEthernet0/0
D       192.168.20.0/24 [90/2170112] via 172.16.1.2, 03:22:21, Serial0/0/0

```

Router0#show ip eigrp neighbors

```

Router0#show ip eigrp neighbors
IP-EIGRP neighbors for process 100
H   Address           Interface       Hold Uptime    SRTT   RTO   Q   Seq
                               (sec)          (ms)       Cnt   Num
0   172.16.1.2         Se0/0/0        12   03:23:49    40    1000   0    3

```

Router0#show ip eigrp topology

```

Router0#show ip eigrp topology
IP-EIGRP Topology Table for AS 100/ID(192.168.10.1)

Codes: P - Passive, A - Active, U - Update, Q - Query, R - Reply,
       r - Reply status

P 172.16.1.0/29, 1 successors, FD is 2169856
    via Connected, Serial0/0/0
P 192.168.10.0/24, 1 successors, FD is 2816
    via Connected, GigabitEthernet0/0
P 192.168.20.0/24, 1 successors, FD is 2170112
    via 172.16.1.2 (2170112/2816), Serial0/0/0

```

Router0#show ip eigrp interfaces

```

Router0#show ip eigrp interfaces
IP-EIGRP interfaces for process 100

Interface      Peers    Xmit Queue  Mean  Pacing Time  Multicast  Pending
              Un/Reliable SRTT   Un/Reliable  Flow Timer  Routes
Gig0/0         0         0/0        1236      0/10         0          0
Se0/0/0        1         0/0        1236      0/10         0          0

```

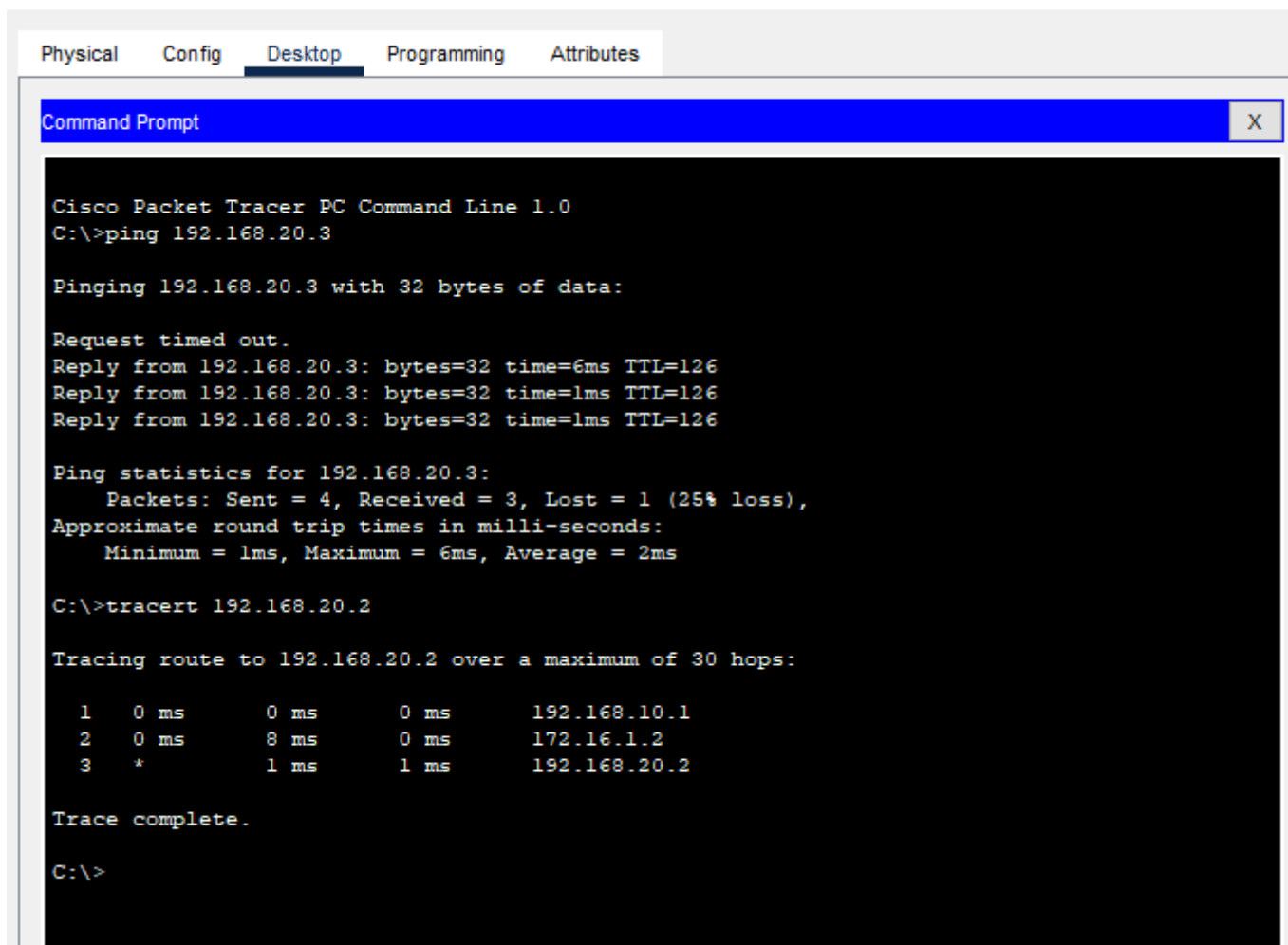
Router0#show ip eigrp traffic

```

Router0#show ip eigrp traffic
IP-EIGRP Traffic Statistics for process 100
  Hellos sent/received: 5344/2671
  Updates sent/received: 2/2
  Queries sent/received: 0/0
  Replies sent/received: 0/0
  Acks sent/received: 2/2
  Input queue high water mark 1, 0 drops
  SIA-Queries sent/received: 0/0
  SIA-Replies sent/received: 0/0

```

Ping and Tracert Tests



The screenshot shows a Cisco Packet Tracer PC Command Line window for PC0. The window has tabs for Physical, Config, Desktop, Programming, and Attributes, with Desktop selected. The Command Prompt displays the following output:

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 192.168.20.3

Pinging 192.168.20.3 with 32 bytes of data:

Request timed out.
Reply from 192.168.20.3: bytes=32 time=6ms TTL=126
Reply from 192.168.20.3: bytes=32 time=1ms TTL=126
Reply from 192.168.20.3: bytes=32 time=1ms TTL=126

Ping statistics for 192.168.20.3:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 6ms, Average = 2ms

C:\>tracert 192.168.20.2

Tracing route to 192.168.20.2 over a maximum of 30 hops:

  0  0 ms    0 ms    0 ms    192.168.10.1
  1  0 ms    8 ms    0 ms    172.16.1.2
  2  *       1 ms    1 ms    192.168.20.2

Trace complete.

C:\>
```

Cisco Packet Tracer Files

[net16 eigrp.pkt](#)

[net17 eigrp auto-summary.pkt](#)

Revision #1

Created 8 January 2023 22:59:06 by Glen Taylor

Updated 24 January 2023 22:45:52 by Glen Taylor