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CYB 551 - Final Exam: Networking Lab Assignment

1. Overview

This document outlines the configuration, implementation, and testing of a multi-router network designed for a final networking lab assignment. The objective was to build a fully functional routed network connecting two geographical sites — Florida and California — using EIGRP as the dynamic routing protocol. The California site includes VLAN-based segmentation (Sales, Finance, and IT) implemented via router-on-a-stick, while the Florida site connects directly to a local LAN. The network also incorporates end-to-end connectivity for PCs across both regions and a server linked through an intermediary router, ensuring full route propagation, device communication, and structured topology.

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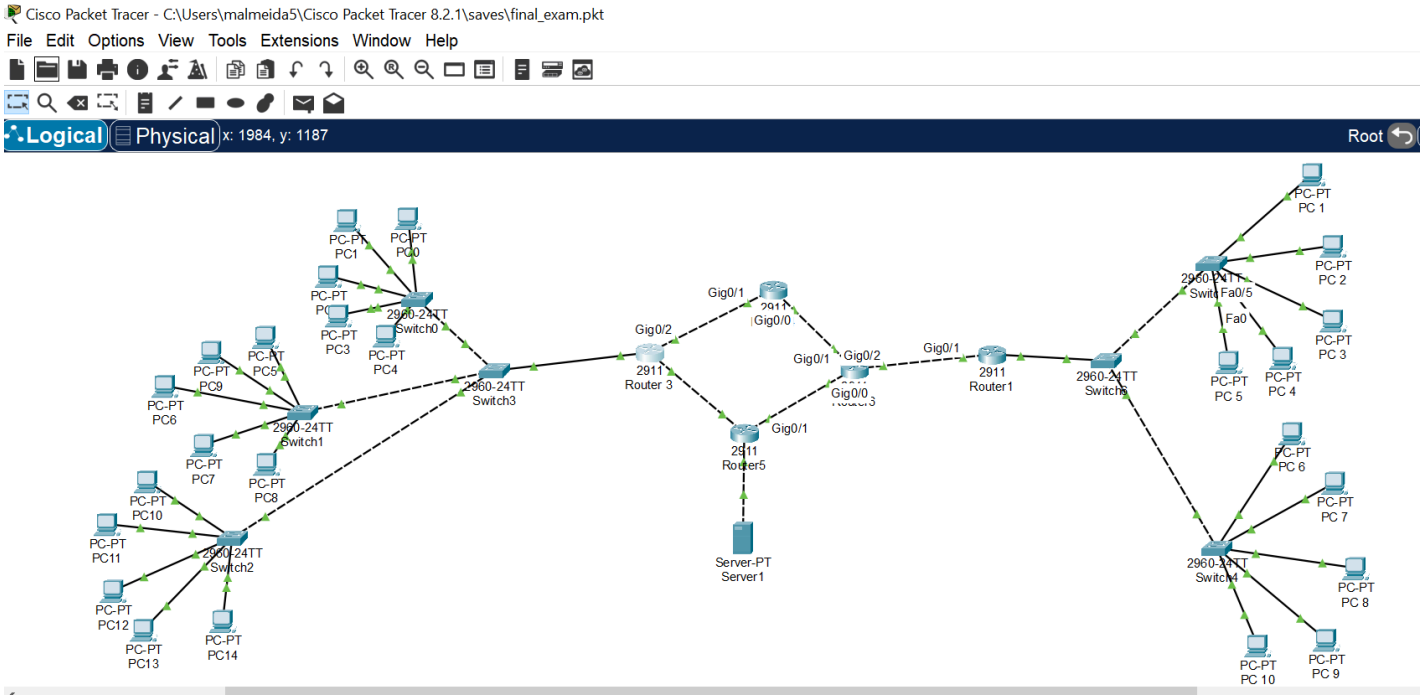
2. Network Topology Description

- Router1 (Florida) connects to the Florida LAN and Router6.
- Router6 connects to Router1, Router4, and Router5 (intermediary router).
- Router4 and Router5 connect Router6 to Router3 (California).
- Router3 (California) connects to VLAN switches for PCs.
- A server is directly connected to Router5.



3. IP Addressing Scheme

Segment / VLAN	Device / Host	Interface	IP Address	Subnet Mask	Default Gateway
Florida LAN	Router1	G0/0	192.168.2.1	255.255.255.240	–
	Florida PC1	–	192.168.2.2	255.255.255.240	192.168.2.1
	Florida PC2	–	192.168.2.3	255.255.255.240	192.168.2.1
	Florida PC3	–	192.168.2.4	255.255.255.240	192.168.2.1
	Florida PC4	–	192.168.2.5	255.255.255.240	192.168.2.1
	Florida PC5	–	192.168.2.6	255.255.255.240	192.168.2.1
	Florida PC6	–	192.168.2.7	255.255.255.240	192.168.2.1

	Florida PC7	–	192.168.2.8	255.255.255.240	192.168.2.1
	Florida PC8	–	192.168.2.9	255.255.255.240	192.168.2.1
	Florida PC9	–	192.168.2.10	255.255.255.240	192.168.2.1
	Florida PC10	–	192.168.2.11	255.255.255.240	192.168.2.1

Router Links	Device	Interface	IP Address	Subnet Mask	Notes
Router1 ↔ Router6	Router1	G0/1	192.168.1.105	255.255.255.252	Link to Router6
	Router6	G0/2	192.168.1.106	255.255.255.252	Link to Router1
Router6 ↔ Router4	Router6	G0/1	192.168.1.109	255.255.255.252	Link to Router4
	Router4	G0/0	192.168.1.110	255.255.255.252	Link to Router6
Router4 ↔ Router0	Router4	G0/1	192.168.1.98	255.255.255.252	Link to Router0
	Router0	G0/1	192.168.1.97	255.255.255.252	Link to Router4
Router6 ↔ Router5	Router6	G0/0	192.168.1.113	255.255.255.252	Link to Router5
	Router5	G0/0	192.168.1.112	255.255.255.252	Link to Router6
Router5 ↔ Router0	Router5	G0/1	192.168.1.102	255.255.255.252	Link to Router0
	Router0	G0/2	192.168.1.101	255.255.255.252	Link to Router5

VLAN	Device	Interface	IP Address	Subnet Mask	Default Gateway
VLAN 10	Router0	G0/0.10	192.168.1.1	255.255.255.224	—
VLAN 10	Sales PC1	—	192.168.1.2	255.255.255.224	192.168.1.1
VLAN 10	Sales PC2	—	192.168.1.3	255.255.255.224	192.168.1.1
VLAN 10	Sales PC3	—	192.168.1.4	255.255.255.224	192.168.1.1
VLAN 10	Sales PC4	—	192.168.1.5	255.255.255.224	192.168.1.1

VLAN 20	Router0	G0/0.20	192.168.1.33	255.255.255.224	—
VLAN 20	Finance PC1	—	192.168.1.34	255.255.255.224	192.168.1.33
VLAN 20	Finance PC2	—	192.168.1.35	255.255.255.224	192.168.1.33
VLAN 20	Finance PC3	—	192.168.1.36	255.255.255.224	192.168.1.33
VLAN 20	Finance PC4	—	192.168.1.37	255.255.255.224	192.168.1.33
VLAN 30	Router0	G0/0.30	192.168.1.65	255.255.255.224	—
VLAN 30	IT PC1	—	192.168.1.66	255.255.255.224	192.168.1.65
VLAN 30	IT PC2	—	192.168.1.67	255.255.255.224	192.168.1.65
VLAN 30	IT PC3	—	192.168.1.68	255.255.255.224	192.168.1.65

4. Device Configurations

✅ Router1

```
hostname Router1

interface GigabitEthernet0/0
 ip address 192.168.2.1 255.255.255.240
 no shutdown
exit

interface GigabitEthernet0/1
 ip address 192.168.1.105 255.255.255.252
 no shutdown
exit

router eigrp 100
 network 192.168.2.0 0.0.0.15
 network 192.168.1.104 0.0.0.3
 no auto-summary
exit
```

✅ Router6

```
hostname Router6

interface GigabitEthernet0/0
 ip address 192.168.1.113 255.255.255.252
 no shutdown
exit

interface GigabitEthernet0/1
 ip address 192.168.1.109 255.255.255.252
 no shutdown
exit

interface GigabitEthernet0/2
 ip address 192.168.1.106 255.255.255.252
 no shutdown
exit

router eigrp 100
 network 192.168.1.104 0.0.0.3
 network 192.168.1.108 0.0.0.3
 network 192.168.1.112 0.0.0.3
 no auto-summary
exit
```

✅ Router4

```
hostname Router4

interface GigabitEthernet0/0
 ip address 192.168.1.110 255.255.255.252
 no shutdown
exit

interface GigabitEthernet0/1
 ip address 192.168.1.98 255.255.255.252
 no shutdown
exit

router eigrp 100
 network 192.168.1.108 0.0.0.3
 network 192.168.1.96 0.0.0.3
 no auto-summary
exit
```

✅ Router5

```
hostname Router5

interface GigabitEthernet0/0
 ip address 192.168.1.112 255.255.255.252
 no shutdown
exit

interface GigabitEthernet0/1
 ip address 192.168.1.102 255.255.255.252
 no shutdown
exit

interface GigabitEthernet0/2
 ip address 192.168.1.121 255.255.255.248
 no shutdown
exit

router eigrp 100
 network 192.168.1.112 0.0.0.3
 network 192.168.1.100 0.0.0.3
 network 192.168.1.120 0.0.0.7
 no auto-summary
exit
```

✅ Router3 (California Gateway)

```
interface GigabitEthernet0/1
 ip address 192.168.1.97 255.255.255.252
 no shutdown
exit

interface GigabitEthernet0/2
 ip address 192.168.1.101 255.255.255.252
 no shutdown
exit

interface GigabitEthernet0/0.10
 encapsulation dot1Q 10
 ip address 192.168.1.1 255.255.255.224
 no shutdown
exit

interface GigabitEthernet0/0.20
 encapsulation dot1Q 20
 ip address 192.168.1.33 255.255.255.224
 no shutdown
exit

interface GigabitEthernet0/0.30
 encapsulation dot1Q 30
 ip address 192.168.1.65 255.255.255.224
 no shutdown
exit

router eigrp 100
 network 192.168.1.0 0.0.0.31
 network 192.168.1.32 0.0.0.31
 network 192.168.1.64 0.0.0.31
 network 192.168.1.96 0.0.0.3
 network 192.168.1.100 0.0.0.3
 no auto-summary
exit
```

5. VLAN Configuration (California Side)

- Switch0 (Sales)

Switch0

Physical Config CLI Attributes

IOS Command Line Interface

```
Name: Fa0/4
Switchport: Enabled
Administrative Mode: static access
Operational Mode: static access

Switch#show interfaces trunk
Port        Mode         Encapsulation  Status        Native vlan
Fa0/6       on           802.1q         trunking      1

Port        Vlans allowed on trunk
Fa0/6       1-1005

Port        Vlans allowed and active in management domain
Fa0/6       1,10,20,30

Port        Vlans in spanning tree forwarding state and not pruned
Fa0/6       1,10,20,30

Switch#show vlan brief

VLAN Name                              Status    Ports
---- --------------------------------- --------- -------------------------------
1    default                           active    Fa0/7, Fa0/8, Fa0/9, Fa0/10
                                                 Fa0/11, Fa0/12, Fa0/13, Fa0/14
                                                 Fa0/15, Fa0/16, Fa0/17, Fa0/18
                                                 Fa0/19, Fa0/20, Fa0/21, Fa0/22
                                                 Fa0/23, Fa0/24, Gig0/1, Gig0/2
10   Sales                             active    Fa0/1, Fa0/2, Fa0/3, Fa0/4
                                                 Fa0/5
20   Finance                           active
30   IT                                active
1002 fddi-default                      active
1003 token-ring-default                active
1004 fddinet-default                   active
1005 trnet-default                     active
```

- Switch1 (Finance)

Switch1

Physical Config CLI Attributes

IOS Command Line Interface

```
Switch>enable
Switch#show vlan brief

VLAN Name                              Status    Ports
---- --------------------------------- --------- -------------------------------
1    default                           active    Fa0/7, Fa0/8, Fa0/9, Fa0/10
                                                 Fa0/11, Fa0/12, Fa0/13, Fa0/14
                                                 Fa0/15, Fa0/16, Fa0/17, Fa0/18
                                                 Fa0/19, Fa0/20, Fa0/21, Fa0/22
                                                 Fa0/23, Fa0/24, Gig0/1, Gig0/2
10   Sales                             active
20   Finance                           active    Fa0/1, Fa0/2, Fa0/3, Fa0/4
                                                 Fa0/5
30   IT                                active
1002 fddi-default                      active
1003 token-ring-default                active
1004 fddinet-default                   active
1005 trnet-default                     active
Switch#show interfaces trunk
Port        Mode         Encapsulation  Status        Native vlan
Fa0/6       auto         n-802.1q       trunking      1

Port        Vlans allowed on trunk
Fa0/6       1-1005

Port        Vlans allowed and active in management domain
Fa0/6       1,10,20,30

Port        Vlans in spanning tree forwarding state and not pruned
Fa0/6       1,10,20,30

Switch#
```

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- Switch2 (IT)

Switch2

Physical Config CLI Attributes

IOS Command Line Interface

```
Switch>enable
Switch#show vlan brief

VLAN Name                              Status    Ports
---- --------------------------------- --------- -------------------------------
1    default                           active    Fa0/7, Fa0/8, Fa0/9, Fa0/10
                                                 Fa0/11, Fa0/12, Fa0/13, Fa0/14
                                                 Fa0/15, Fa0/16, Fa0/17, Fa0/18
                                                 Fa0/19, Fa0/20, Fa0/21, Fa0/22
                                                 Fa0/23, Fa0/24, Gig0/1, Gig0/2
10   Sales                             active
20   Finance                           active
30   IT                                active    Fa0/1, Fa0/2, Fa0/3, Fa0/4
                                                 Fa0/5
1002 fddi-default                      active
1003 token-ring-default                active
1004 fddinet-default                   active
1005 trnet-default                     active
Switch#show interfaces trunk
Port        Mode         Encapsulation  Status        Native vlan
Fa0/6       on           802.1q         trunking      1

Port        Vlans allowed on trunk
Fa0/6       1-1005

Port        Vlans allowed and active in management domain
Fa0/6       1,10,20,30

Port        Vlans in spanning tree forwarding state and not pruned
Fa0/6       1,10,20,30
```

Switch 3 trunk to Router3

Switch3

Physical Config CLI Attributes

IOS Command Line Interface

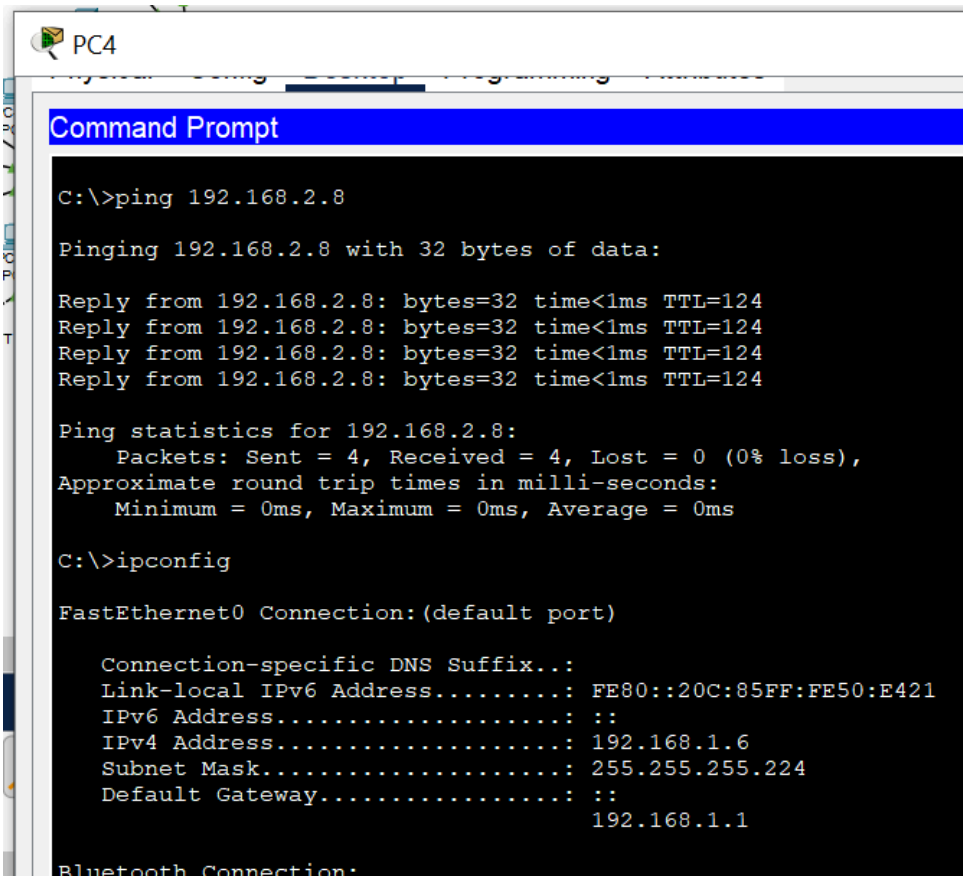
```
Switch#show vlan brief

VLAN Name                              Status    Ports
---- --------------------------------- --------- -------------------------------
1    default                           active    Fa0/5, Fa0/6, Fa0/7, Fa0/8
                                                 Fa0/9, Fa0/10, Fa0/11, Fa0/12
                                                 Fa0/13, Fa0/14, Fa0/15, Fa0/16
                                                 Fa0/17, Fa0/18, Fa0/19, Fa0/20
                                                 Fa0/21, Fa0/22, Fa0/23, Fa0/24
                                                 Gig0/1, Gig0/2
10   Sales                             active
20   Finance                           active
30   IT                                active
1002 fddi-default                      active
1003 token-ring-default                active
1004 fddinet-default                   active
1005 trnet-default                     active
Switch#show interfaces trunk
Port        Mode         Encapsulation  Status        Native vlan
Fa0/1       on           802.1q         trunking      1
Fa0/2       on           802.1q         trunking      1
Fa0/3       on           802.1q         trunking      1
Fa0/4       on           802.1q         trunking      1

Port        Vlans allowed on trunk
Fa0/1       1-1005
Fa0/2       1-1005
Fa0/3       1-1005
Fa0/4       1-1005

Port        Vlans allowed and active in management domain
Fa0/1       1,10,20,30
Fa0/2       1,10,20,30
Fa0/3       1,10,20,30
Fa0/4       1,10,20,30

Port        Vlans in spanning tree forwarding state and not pruned
Fa0/1       1,10,20,30
Fa0/2       1,10,20,30
Fa0/3       1,10,20,30
```

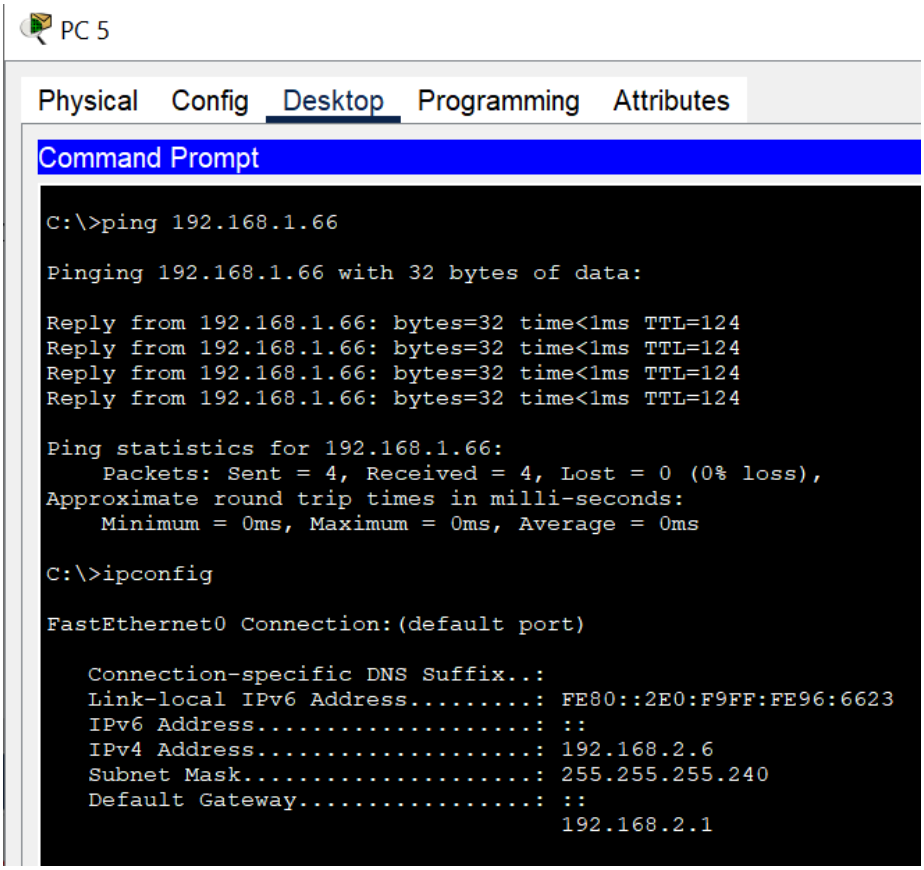
6. Server Configuration

Field	Value
IP Address	192.168.1.122
Subnet Mask	255.255.255.248
Default Gateway	192.168.1.121

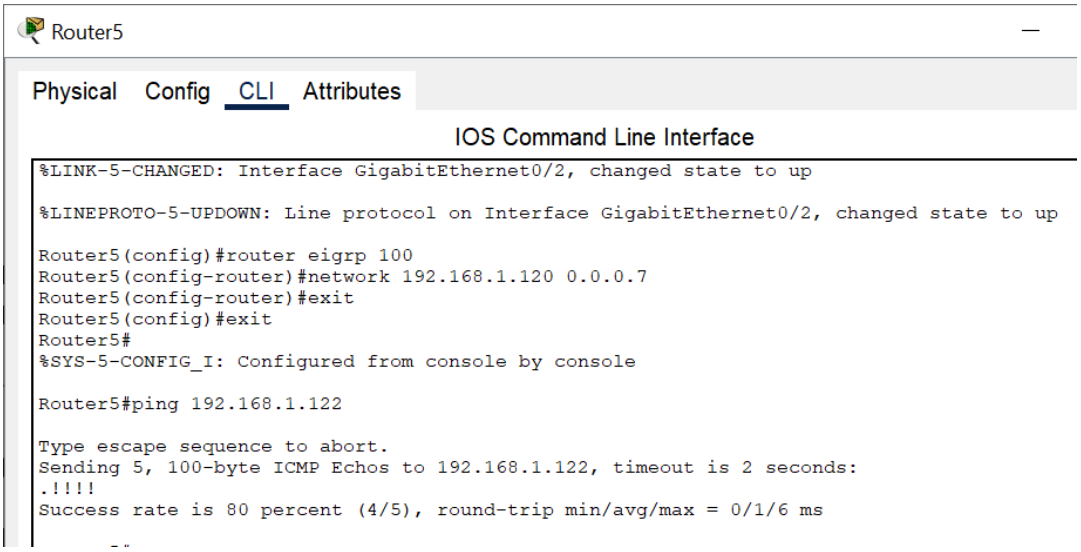
7. Testing and Validation

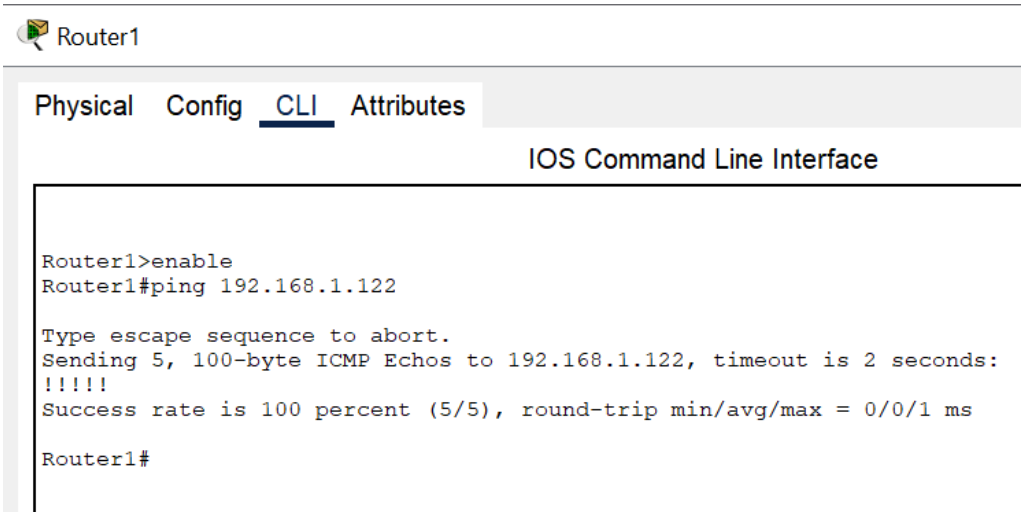
- Ping Tests:
    - PC to PC across Florida and California: ✅



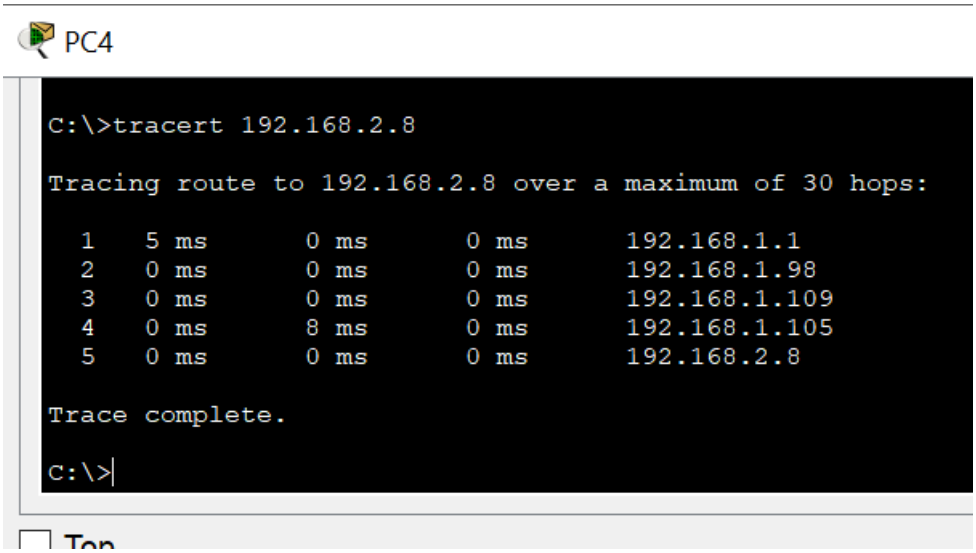


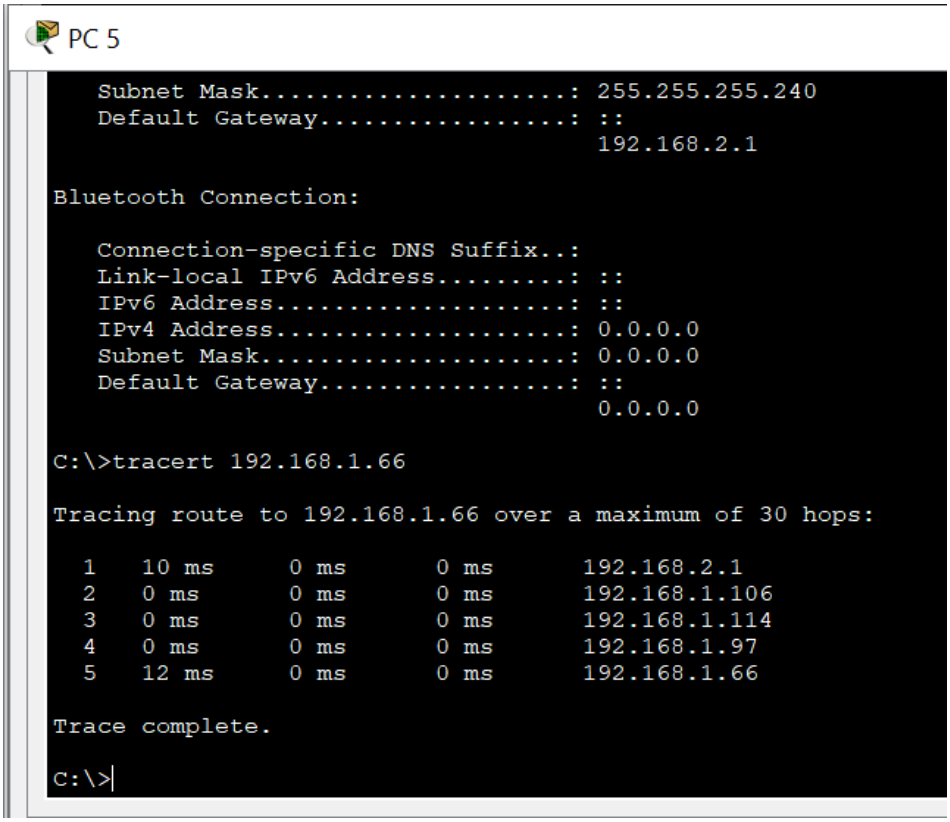
- Router to Server: ✅



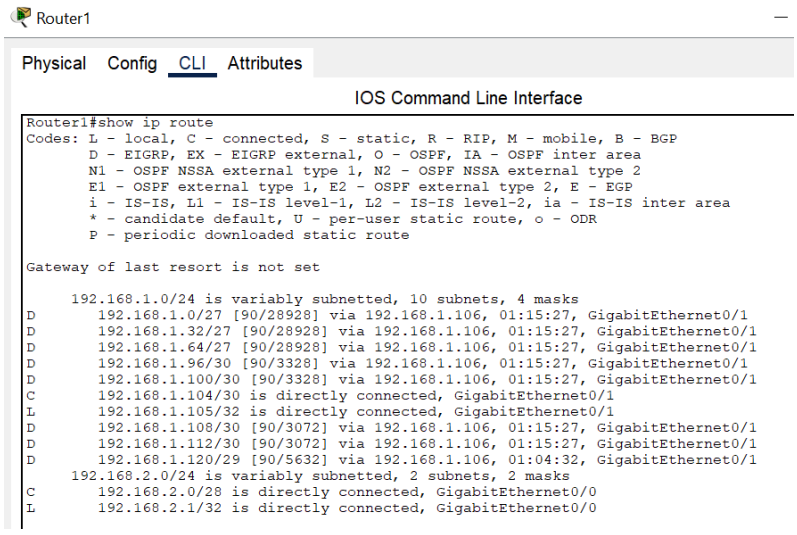


- Traceroute tests confirmed correct hop sequences





- Routing Tables: show ip route confirmed learned EIGRP routes



Router6

Physical Config CLI Attributes

IOS Command Line Interface

```
Router6#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

     192.168.1.0/24 is variably subnetted, 12 subnets, 4 masks
D       192.168.1.0/27 [90/28672] via 192.168.1.110, 01:44:47, GigabitEthernet0/1
                       [90/28672] via 192.168.1.114, 01:44:47, GigabitEthernet0/0
D       192.168.1.32/27 [90/28672] via 192.168.1.110, 01:44:47, GigabitEthernet0/1
                        [90/28672] via 192.168.1.114, 01:44:47, GigabitEthernet0/0
D       192.168.1.64/27 [90/28672] via 192.168.1.114, 01:44:47, GigabitEthernet0/0
                        [90/28672] via 192.168.1.110, 01:44:47, GigabitEthernet0/1
D       192.168.1.96/30 [90/3072] via 192.168.1.110, 01:44:47, GigabitEthernet0/1
D       192.168.1.100/30 [90/3072] via 192.168.1.114, 01:44:47, GigabitEthernet0/0
C       192.168.1.104/30 is directly connected, GigabitEthernet0/2
L       192.168.1.106/32 is directly connected, GigabitEthernet0/2
C       192.168.1.108/30 is directly connected, GigabitEthernet0/1
L       192.168.1.109/32 is directly connected, GigabitEthernet0/1
C       192.168.1.112/30 is directly connected, GigabitEthernet0/0
L       192.168.1.113/32 is directly connected, GigabitEthernet0/0
D       192.168.1.120/29 [90/5376] via 192.168.1.114, 01:05:48, GigabitEthernet0/0
     192.168.2.0/28 is subnetted, 1 subnets
D       192.168.2.0/28 [90/5376] via 192.168.1.105, 01:16:43, GigabitEthernet0/2
```

Router4

Physical Config CLI Attributes

IOS Command Line Interface

```
Router4#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

     192.168.1.0/24 is variably subnetted, 11 subnets, 4 masks
D       192.168.1.0/27 [90/28416] via 192.168.1.97, 4294967274:4294967282:4294967271,
GigabitEthernet0/1
D       192.168.1.32/27 [90/28416] via 192.168.1.97, 4294967274:4294967282:4294967271,
GigabitEthernet0/1
D       192.168.1.64/27 [90/28416] via 192.168.1.97, 4294967274:4294967282:4294967271,
GigabitEthernet0/1
C       192.168.1.96/30 is directly connected, GigabitEthernet0/1
L       192.168.1.98/32 is directly connected, GigabitEthernet0/1
D       192.168.1.100/30 [90/3072] via 192.168.1.97, 4294967274:4294967282:4294967271,
GigabitEthernet0/1
D       192.168.1.104/30 [90/3072] via 192.168.1.109, 4294967274:4294967259:4294967268,
GigabitEthernet0/0
C       192.168.1.108/30 is directly connected, GigabitEthernet0/0
L       192.168.1.110/32 is directly connected, GigabitEthernet0/0
D       192.168.1.112/30 [90/3072] via 192.168.1.109, 4294967274:4294967282:4294967271,
GigabitEthernet0/0
D       192.168.1.120/29 [90/5632] via 192.168.1.97, 4294967274:4294967243:4294967272,
GigabitEthernet0/1
                         [90/5632] via 192.168.1.109, 4294967274:4294967243:4294967272,
GigabitEthernet0/0
     192.168.2.0/28 is subnetted, 1 subnets
D       192.168.2.0/28 [90/5632] via 192.168.1.109, 4294967274:4294967254:4294967267,
GigabitEthernet0/0
```

Router5

Physical Config CLI Attributes

IOS Command Line Interface

```
Router5#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

     192.168.1.0/24 is variably subnetted, 12 subnets, 4 masks
D       192.168.1.0/27 [90/28416] via 192.168.1.101, 4294967274:4294967283:4294967259,
GigabitEthernet0/0
D       192.168.1.32/27 [90/28416] via 192.168.1.101, 4294967274:4294967283:4294967259,
GigabitEthernet0/0
D       192.168.1.64/27 [90/28416] via 192.168.1.101, 4294967274:4294967283:4294967259,
GigabitEthernet0/0
D       192.168.1.96/30 [90/3072] via 192.168.1.101, 4294967274:4294967283:4294967259,
GigabitEthernet0/0
C       192.168.1.100/30 is directly connected, GigabitEthernet0/0
L       192.168.1.102/32 is directly connected, GigabitEthernet0/0
D       192.168.1.104/30 [90/3072] via 192.168.1.113, 4294967274:4294967260:4294967256,
GigabitEthernet0/1
D       192.168.1.108/30 [90/3072] via 192.168.1.113, 4294967274:4294967283:4294967259,
GigabitEthernet0/1
C       192.168.1.112/30 is directly connected, GigabitEthernet0/1
L       192.168.1.114/32 is directly connected, GigabitEthernet0/1
C       192.168.1.120/29 is directly connected, GigabitEthernet0/2
L       192.168.1.121/32 is directly connected, GigabitEthernet0/2
     192.168.2.0/28 is subnetted, 1 subnets
D       192.168.2.0/28 [90/5632] via 192.168.1.113, 4294967274:4294967255:4294967254,
GigabitEthernet0/1
```

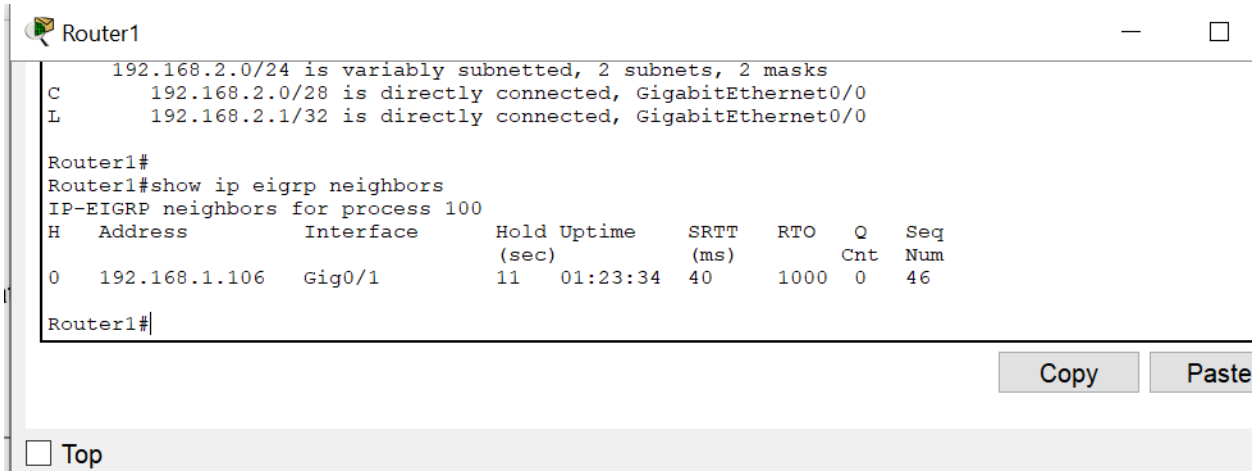
Router 3

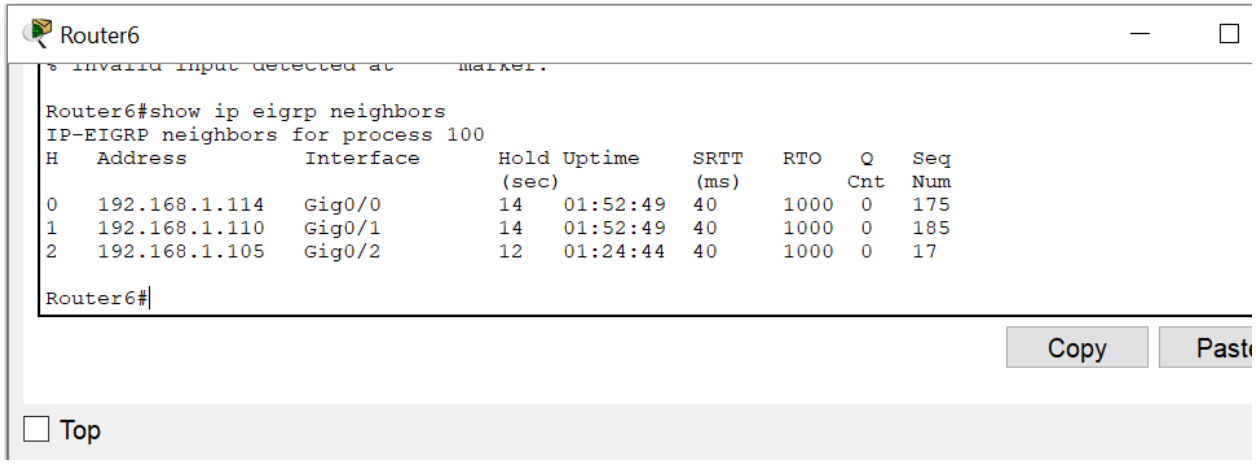
Physical Config CLI Attributes

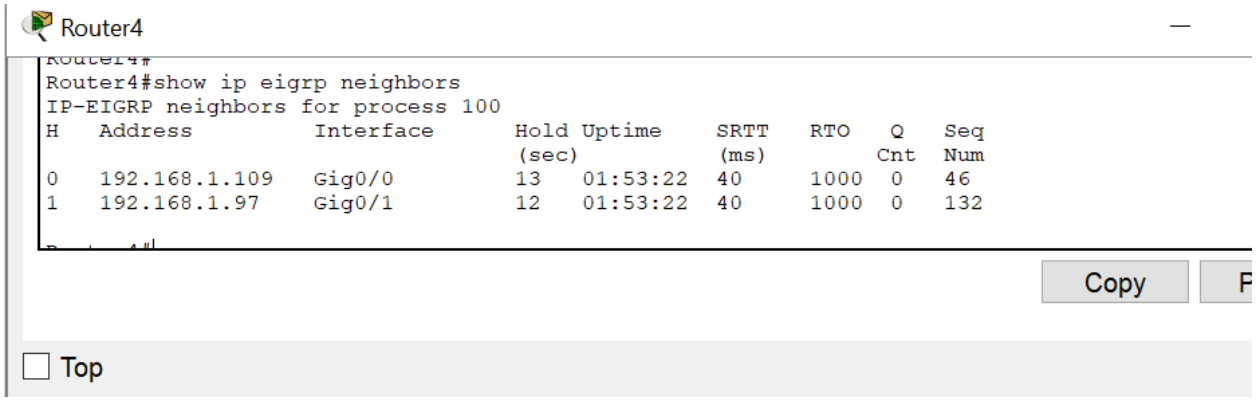
IOS Command Line Interface

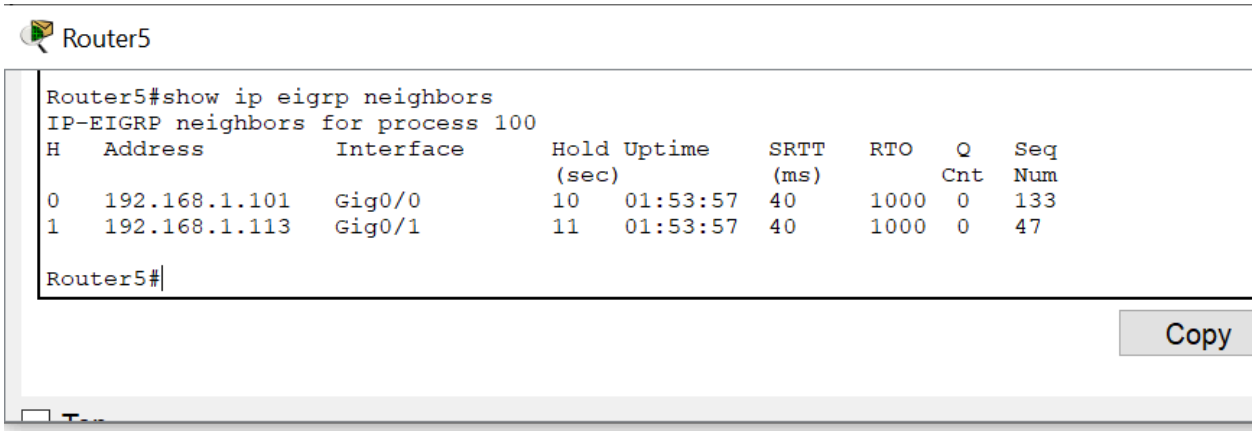
```
Router3#show ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, 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

     192.168.1.0/24 is variably subnetted, 14 subnets, 4 masks
C       192.168.1.0/27 is directly connected, GigabitEthernet0/0.10
L       192.168.1.1/32 is directly connected, GigabitEthernet0/0.10
C       192.168.1.32/27 is directly connected, GigabitEthernet0/0.20
L       192.168.1.33/32 is directly connected, GigabitEthernet0/0.20
C       192.168.1.64/27 is directly connected, GigabitEthernet0/0.30
L       192.168.1.65/32 is directly connected, GigabitEthernet0/0.30
C       192.168.1.96/30 is directly connected, GigabitEthernet0/2
L       192.168.1.97/32 is directly connected, GigabitEthernet0/2
C       192.168.1.100/30 is directly connected, GigabitEthernet0/1
L       192.168.1.101/32 is directly connected, GigabitEthernet0/1
D       192.168.1.104/30 [90/3328] via 192.168.1.98, 4294967274:4294967262:4294967268,
GigabitEthernet0/2
                         [90/3328] via 192.168.1.102, 4294967274:4294967262:4294967268,
GigabitEthernet0/1
D       192.168.1.108/30 [90/3072] via 192.168.1.98, 4294967274:4294967285:4294967271,
GigabitEthernet0/2
D       192.168.1.112/30 [90/3072] via 192.168.1.102, 4294967274:4294967285:4294967271,
GigabitEthernet0/1
D       192.168.1.120/29 [90/5376] via 192.168.1.102, 4294967274:4294967246:4294967271,
GigabitEthernet0/1
     192.168.2.0/28 is subnetted, 1 subnets
D       192.168.2.0/28 [90/5888] via 192.168.1.102, 4294967274:4294967257:4294967266,
GigabitEthernet0/1
                       [90/5888] via 192.168.1.98, 4294967274:4294967257:4294967266,
GigabitEthernet0/2
```

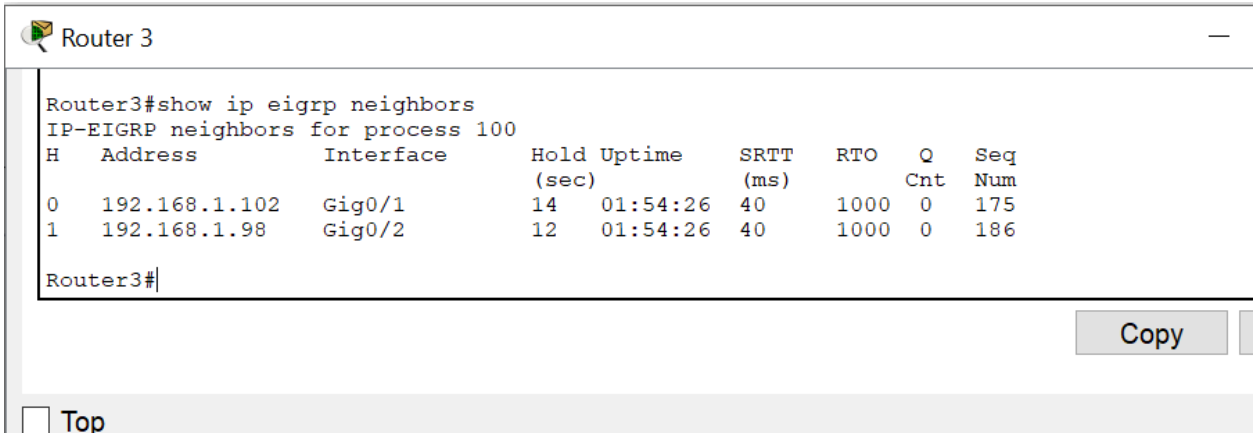
- Neighbor Status: show ip eigrp neighbors confirmed stable adjacencies











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8. Conclusion

The network was successfully configured with full routing and switching functionality. EIGRP was used to dynamically propagate routes across five routers. Subnetting, VLAN segmentation, and server configuration were implemented accurately. All testing confirmed complete end-to-end connectivity between hosts in Florida and California, including external services via the server on Router5.