Name : Kansara Anjali | Class : A | Branch : Cyber Security
Semester: 5 | Enrollment No: 23162171032|Batch:52

Institute of Computer Technology
B. Tech Computer Science and Engineering

Sub:CN
Practical 9

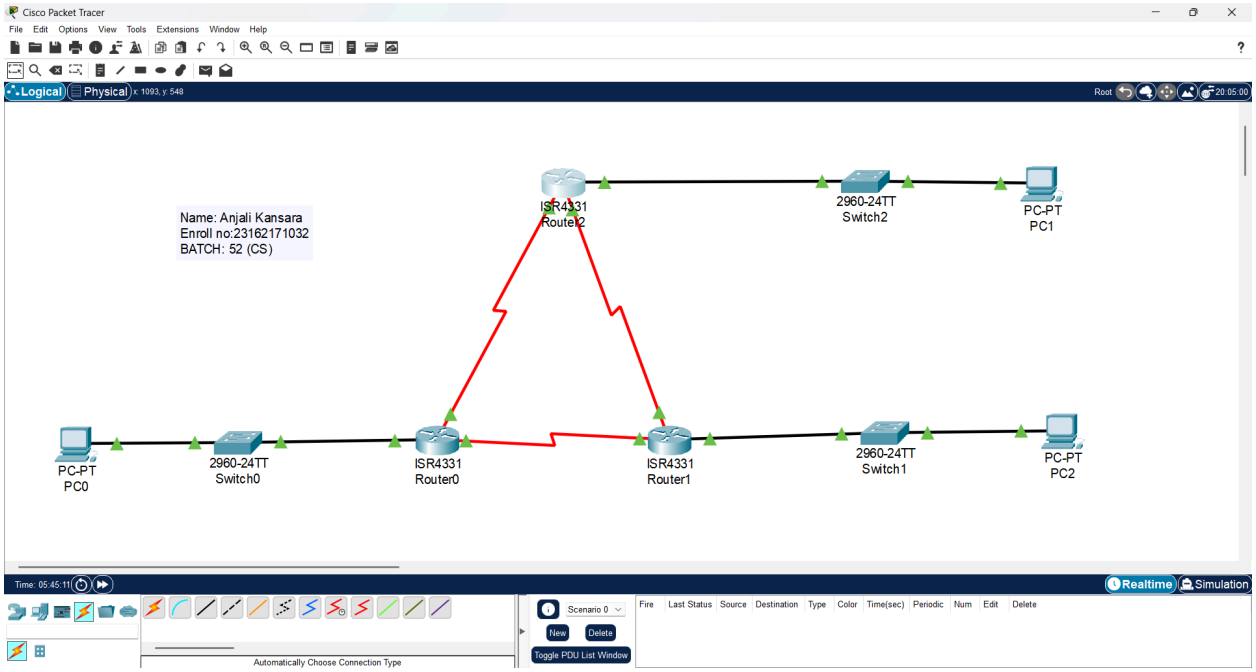
Aim: To design a network using Border Gateway Protocol (BGP).

Scenario:

Consider that the organization has three departments and a routing protocol Border Gateway Protocol (BGP) is to be implemented. Configure network as shown in figure below and implement Border Gateway Protocol (BGP).

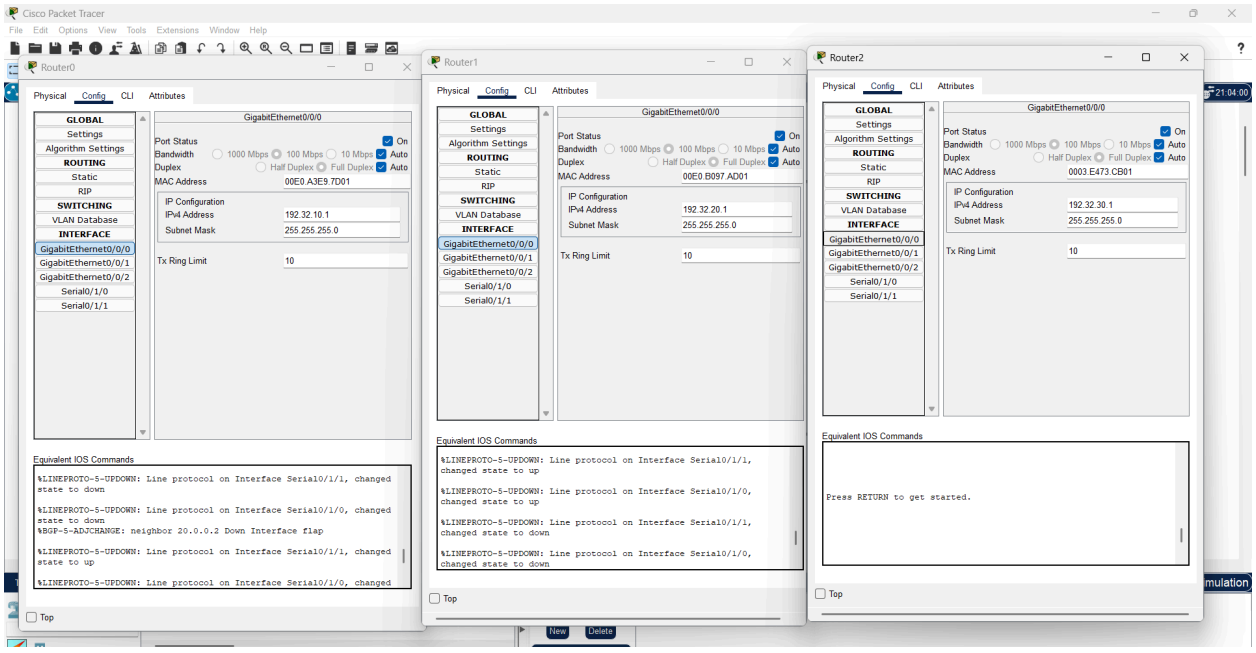
Procedure:

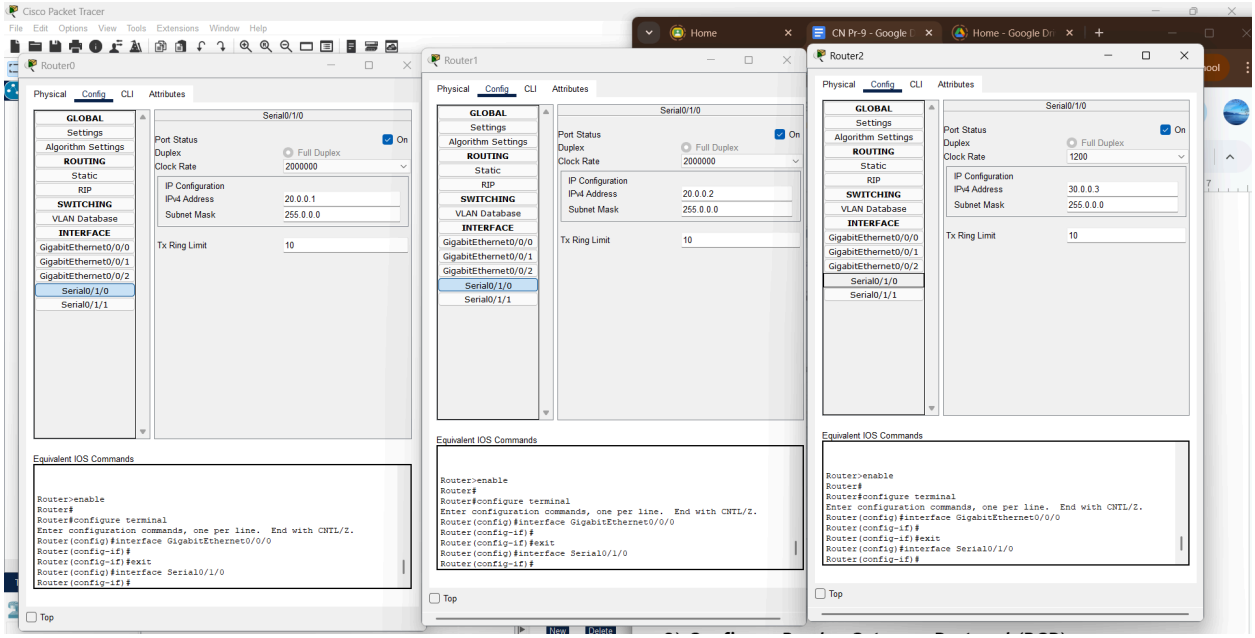
1) Create a network as given below. (XX indicates the last two digits of your enrollment no.)

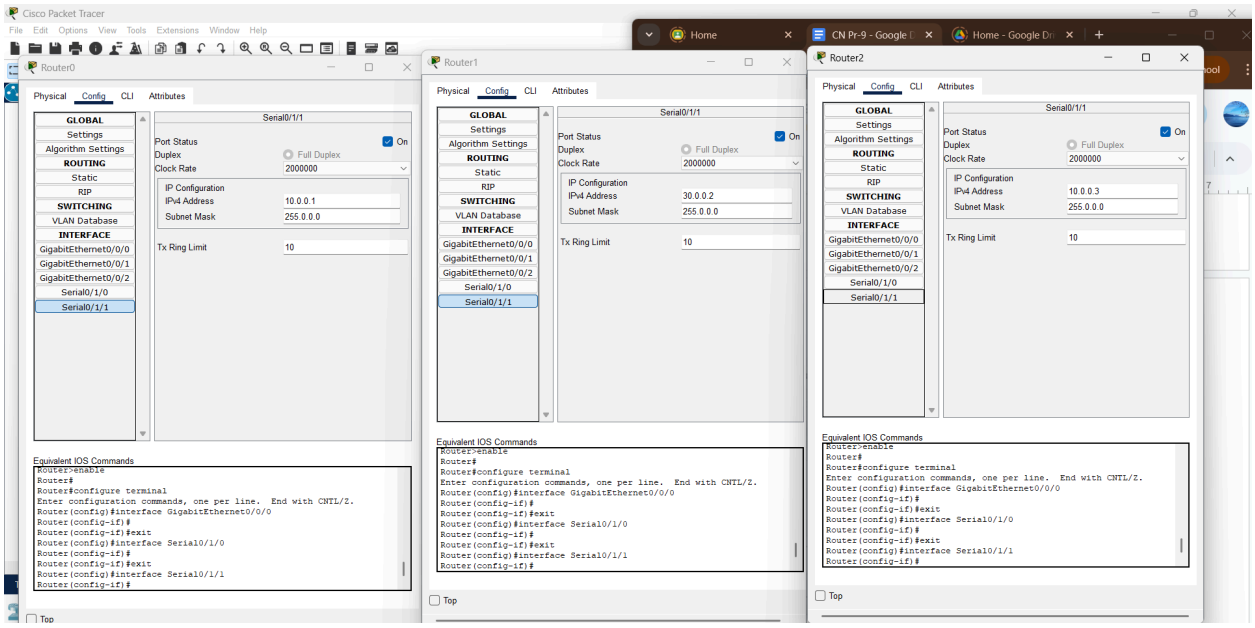


2) Configure IP address (All Devices, Routers)

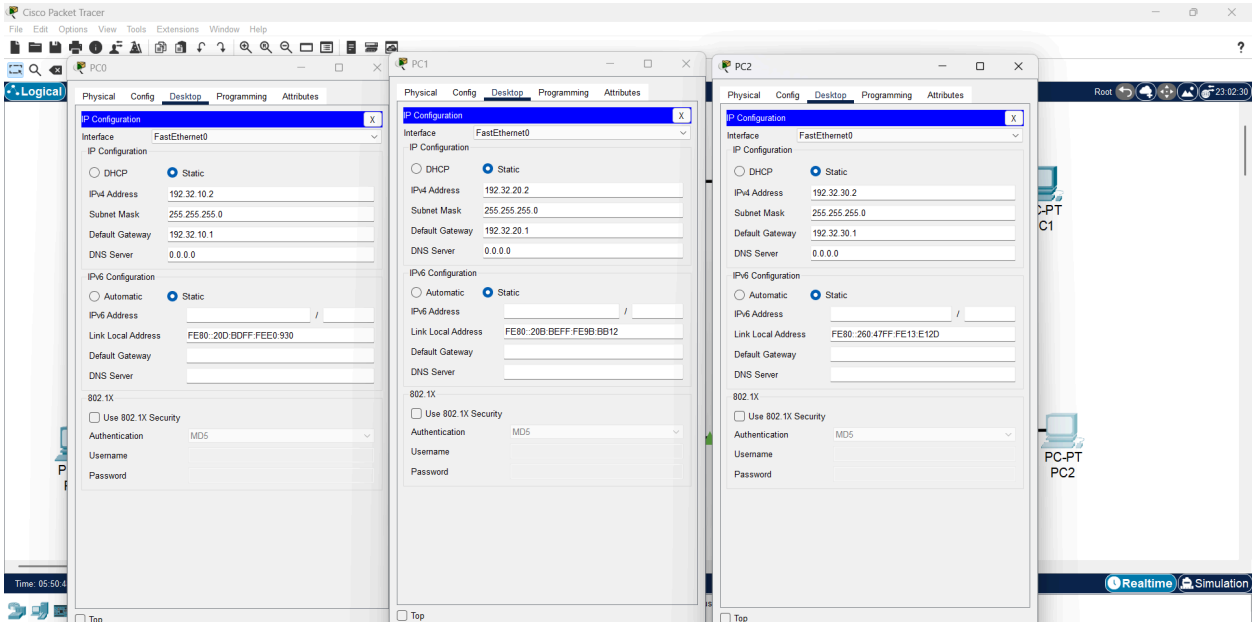
ROUTERS:




Cisco Packet Tracer
Router0
Router1
Router2
Physical
Config
CLI
Attributes
GLOBAL
Settings
Algorithm Settings
ROUTING
Static
RIP
SWITCHING
VLAN Database
INTERFACE
GigabitEthernet0/0/0
GigabitEthernet0/0/1
GigabitEthernet0/0/2
Serial0/1/0
Serial0/1/1
Serial0/1/0
Port Status
On
Duplex
Full Duplex
Clock Rate
2000000
1200
IP Configuration
IPv4 Address
20.0.0.1
20.0.0.2
30.0.0.3
Subnet Mask
255.0.0.0
Tx Ring Limit
10
Equivalent IOS Commands
Router>enable
Router#
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface GigabitEthernet0/0/0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface Serial0/1/0
Router(config-if)#
Top

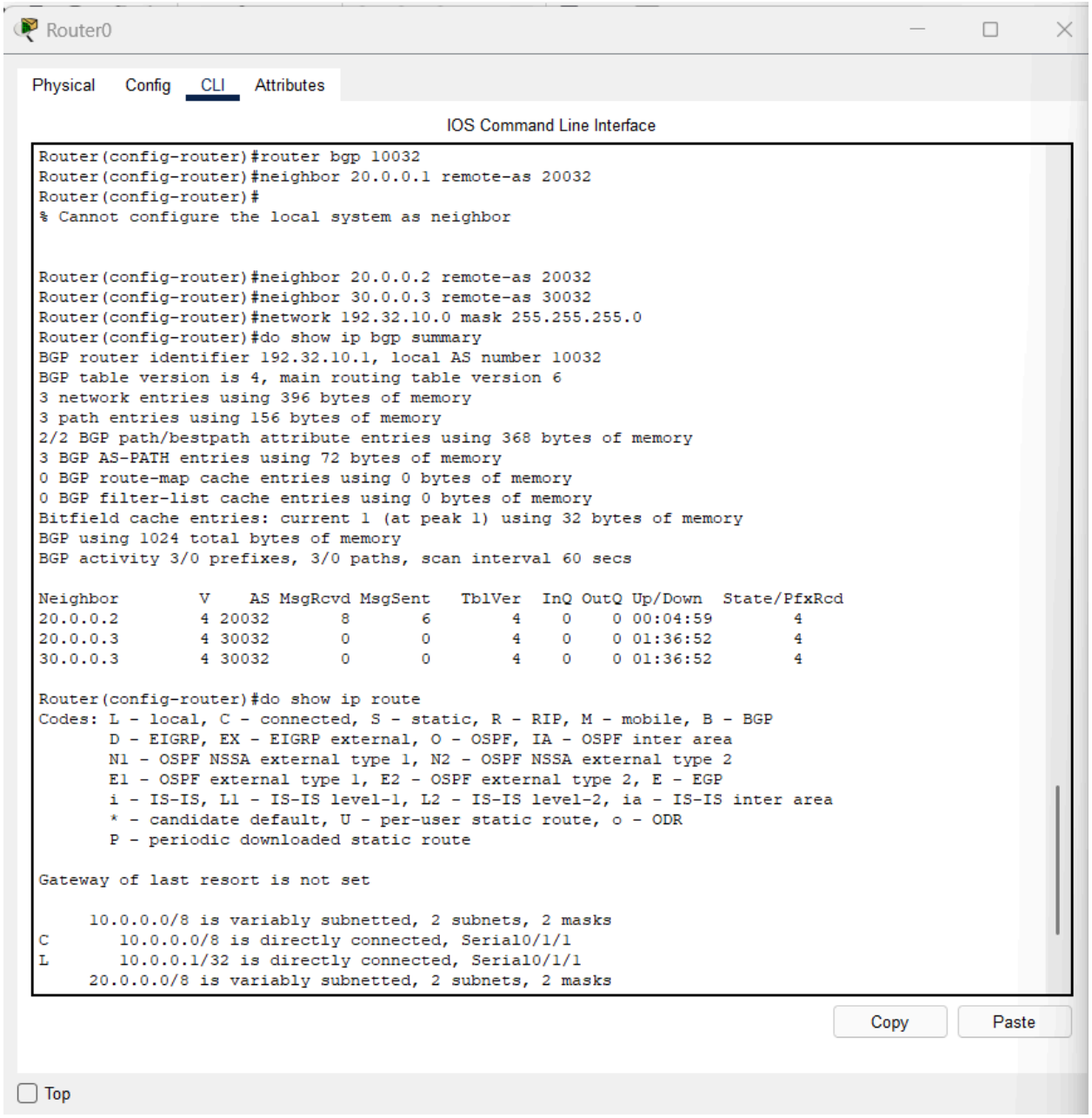

Cisco Packet Tracer
Router0
Router1
Router2
Physical
Config
CLI
Attributes
GLOBAL
Settings
Algorithm Settings
ROUTING
Static
RIP
SWITCHING
VLAN Database
INTERFACE
GigabitEthernet0/0/0
GigabitEthernet0/0/1
GigabitEthernet0/0/2
Serial0/1/0
Serial0/1/1
Port Status
On
Duplex
Full Duplex
Clock Rate
2000000
IP Configuration
IPv4 Address
10.0.0.1
30.0.0.2
10.0.0.3
Subnet Mask
255.0.0.0
Tx Ring Limit
10
Equivalent IOS Commands
Router>enable
Router#
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface GigabitEthernet0/0/0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface Serial0/1/0
Router(config-if)#
Router(config)#interface Serial0/1/1
Router(config-if)#
Top

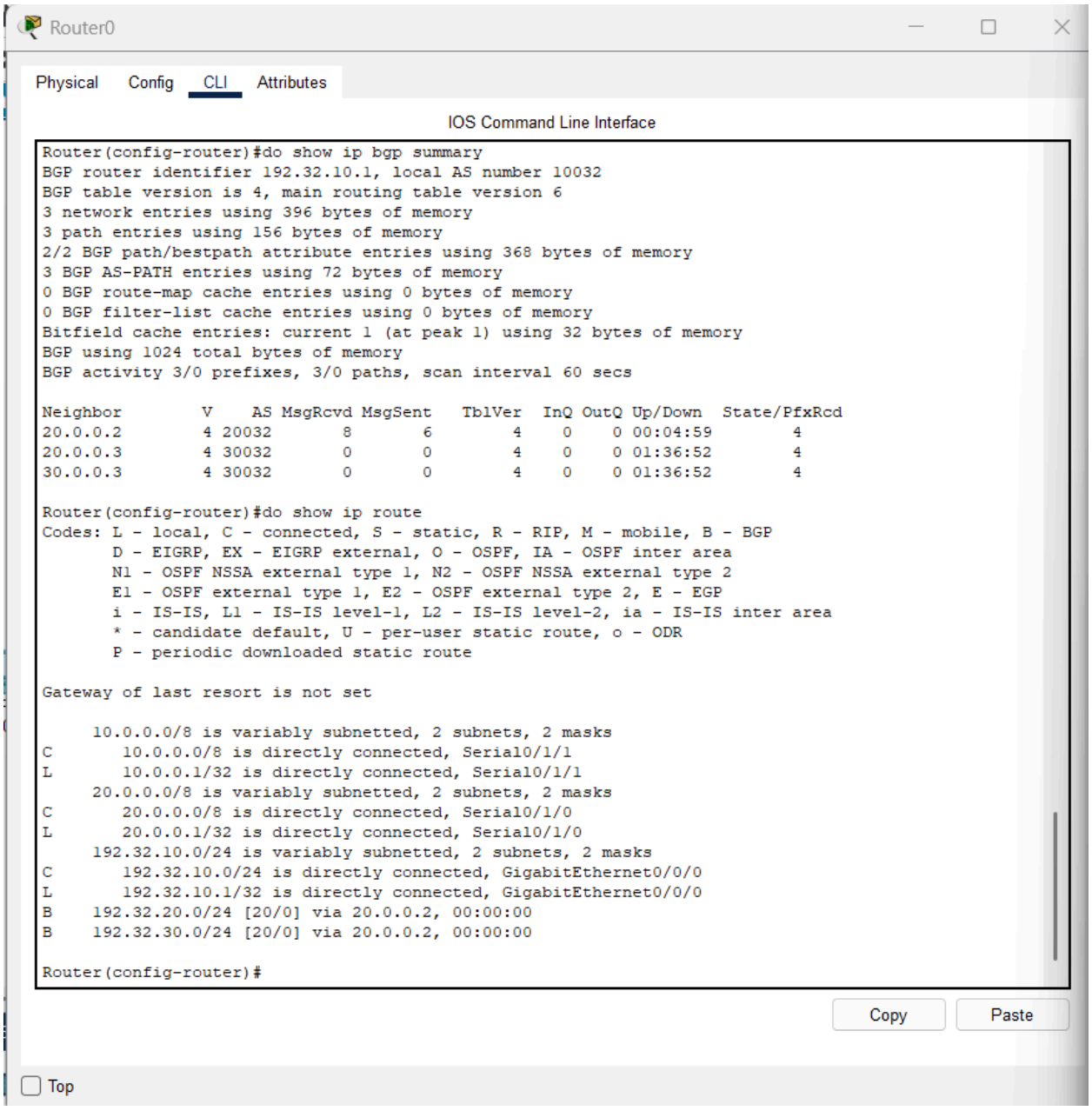
PCs



3) Configure Border Gateway Protocol (BGP)

Router 0:


Router0
Physical
Config
CLI
Attributes
IOS Command Line Interface
Router(config-router)#router bgp 10032
Router(config-router)#neighbor 20.0.0.1 remote-as 20032
Router(config-router)#
% Cannot configure the local system as neighbor
Router(config-router)#neighbor 20.0.0.2 remote-as 20032
Router(config-router)#neighbor 30.0.0.3 remote-as 30032
Router(config-router)#network 192.32.10.0 mask 255.255.255.0
Router(config-router)#do show ip bgp summary
BGP router identifier 192.32.10.1, local AS number 10032
BGP table version is 4, main routing table version 6
3 network entries using 396 bytes of memory
3 path entries using 156 bytes of memory
2/2 BGP path/bestpath attribute entries using 368 bytes of memory
3 BGP AS-PATH entries using 72 bytes of memory
0 BGP route-map cache entries using 0 bytes of memory
0 BGP filter-list cache entries using 0 bytes of memory
Bitfield cache entries: current 1 (at peak 1) using 32 bytes of memory
BGP using 1024 total bytes of memory
BGP activity 3/0 prefixes, 3/0 paths, scan interval 60 secs
Neighbor V AS MsgRcvd MsgSent TblVer InQ OutQ Up/Down State/PfxRcd
20.0.0.2 4 20032 8 6 4 0 0 00:04:59 4
20.0.0.3 4 30032 0 0 4 0 0 01:36:52 4
30.0.0.3 4 30032 0 0 4 0 0 01:36:52 4
Router(config-router)#do 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
10.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C 10.0.0.0/8 is directly connected, Serial0/1/1
L 10.0.0.1/32 is directly connected, Serial0/1/1
20.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
Copy
Paste
Top


Router0
Physical
Config
CLI
Attributes
IOS Command Line Interface
Router(config-router)#do show ip bgp summary
BGP router identifier 192.32.10.1, local AS number 10032
BGP table version is 4, main routing table version 6
3 network entries using 396 bytes of memory
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2/2 BGP path/bestpath attribute entries using 368 bytes of memory
3 BGP AS-PATH entries using 72 bytes of memory
0 BGP route-map cache entries using 0 bytes of memory
0 BGP filter-list cache entries using 0 bytes of memory
Bitfield cache entries: current 1 (at peak 1) using 32 bytes of memory
BGP using 1024 total bytes of memory
BGP activity 3/0 prefixes, 3/0 paths, scan interval 60 secs
Neighbor V AS MsgRcvd MsgSent TblVer InQ OutQ Up/Down State/PfxRcd
20.0.0.2 4 20032 8 6 4 0 0 00:04:59 4
20.0.0.3 4 30032 0 0 4 0 0 01:36:52 4
30.0.0.3 4 30032 0 0 4 0 0 01:36:52 4
Router(config-router)#do 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
10.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C 10.0.0.0/8 is directly connected, Serial0/1/1
L 10.0.0.1/32 is directly connected, Serial0/1/1
20.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C 20.0.0.0/8 is directly connected, Serial0/1/0
L 20.0.0.1/32 is directly connected, Serial0/1/0
192.32.10.0/24 is variably subnetted, 2 subnets, 2 masks
C 192.32.10.0/24 is directly connected, GigabitEthernet0/0/0
L 192.32.10.1/32 is directly connected, GigabitEthernet0/0/0
B 192.32.20.0/24 [20/0] via 20.0.0.2, 00:00:00
B 192.32.30.0/24 [20/0] via 20.0.0.2, 00:00:00
Router(config-router)#
Copy
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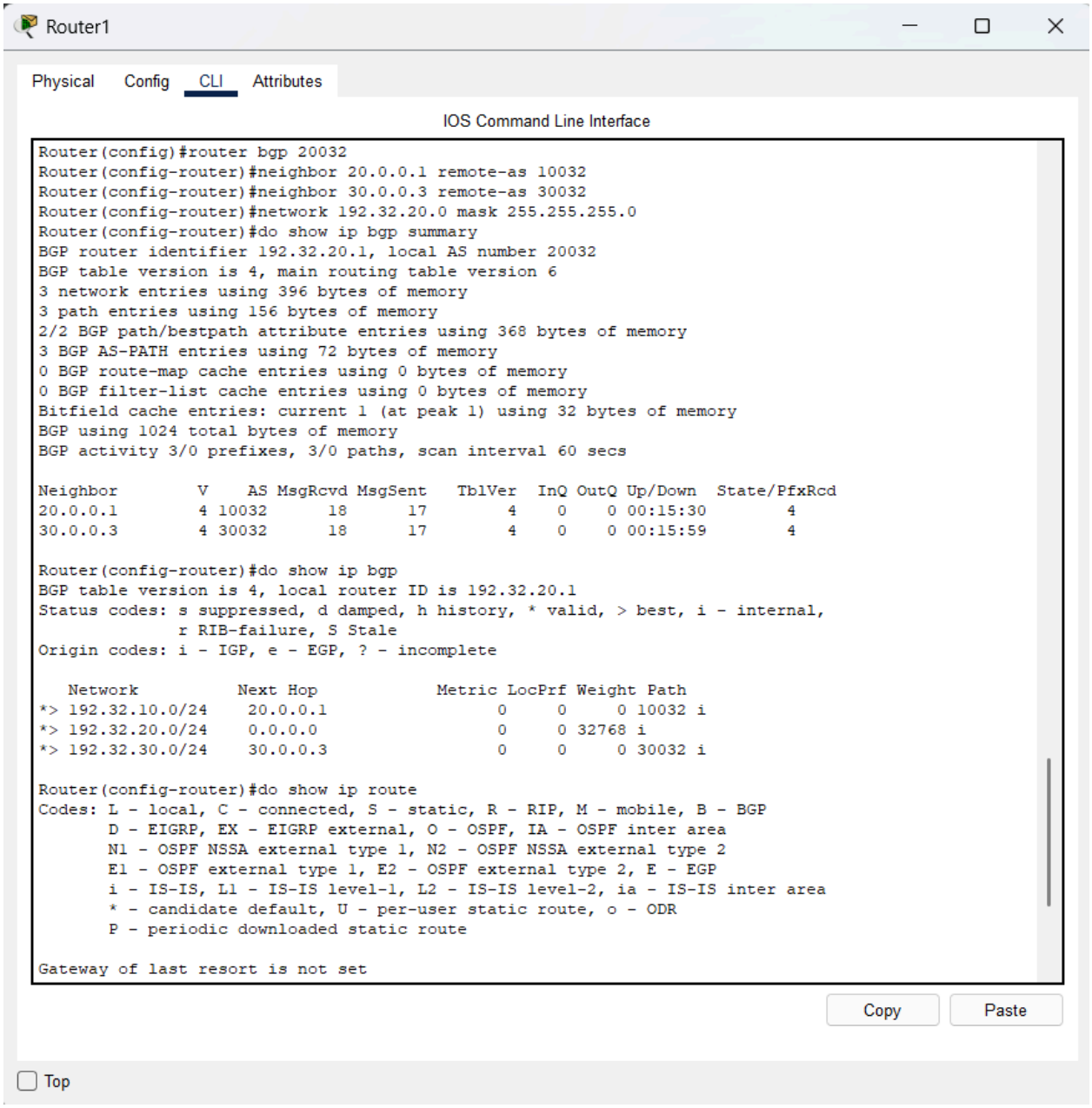
Top

Router 1:


Router1
Physical
Config
CLI
Attributes
IOS Command Line Interface
Router(config)#router bgp 20032
Router(config-router)#neighbor 20.0.0.1 remote-as 10032
Router(config-router)#neighbor 30.0.0.3 remote-as 30032
Router(config-router)#network 192.32.20.0 mask 255.255.255.0
Router(config-router)#do show ip bgp summary
BGP router identifier 192.32.20.1, local AS number 20032
BGP table version is 4, main routing table version 6
3 network entries using 396 bytes of memory
3 path entries using 156 bytes of memory
2/2 BGP path/bestpath attribute entries using 368 bytes of memory
3 BGP AS-PATH entries using 72 bytes of memory
0 BGP route-map cache entries using 0 bytes of memory
0 BGP filter-list cache entries using 0 bytes of memory
Bitfield cache entries: current 1 (at peak 1) using 32 bytes of memory
BGP using 1024 total bytes of memory
BGP activity 3/0 prefixes, 3/0 paths, scan interval 60 secs
Neighbor V AS MsgRcvd MsgSent TblVer InQ OutQ Up/Down State/PfxRcd
20.0.0.1 4 10032 18 17 4 0 0 00:15:30 4
30.0.0.3 4 30032 18 17 4 0 0 00:15:59 4
Router(config-router)#do show ip bgp
BGP table version is 4, local router ID is 192.32.20.1
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
r RIB-failure, S Stale
Origin codes: i - IGP, e - EGP, ? - incomplete
Network Next Hop Metric LocPrf Weight Path
*> 192.32.10.0/24 20.0.0.1 0 0 0 10032 i
*> 192.32.20.0/24 0.0.0.0 0 0 32768 i
*> 192.32.30.0/24 30.0.0.3 0 0 0 30032 i
Router(config-router)#do 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
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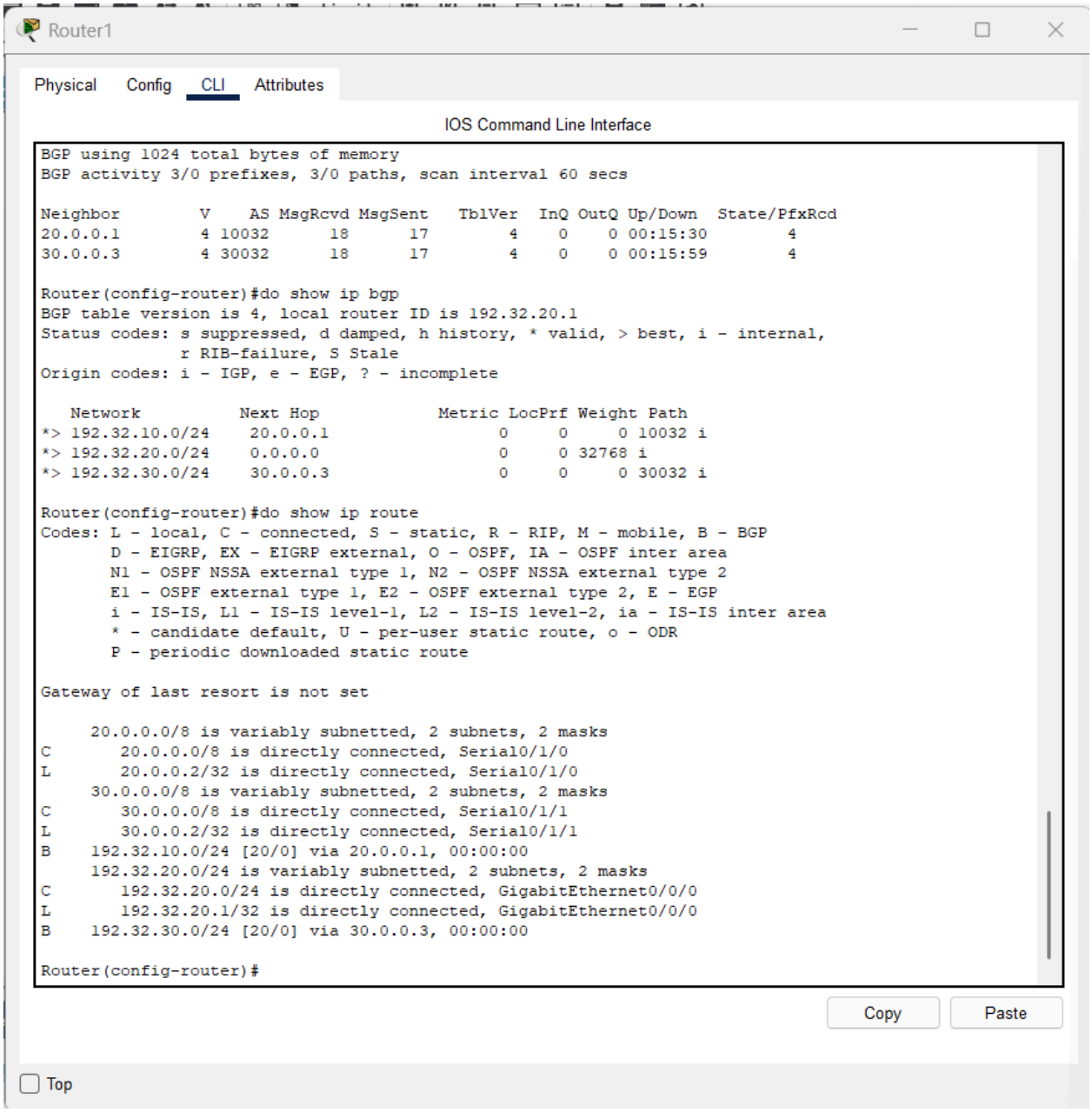
Top


Router1
Physical
Config
CLI
Attributes
IOS Command Line Interface
BGP using 1024 total bytes of memory
BGP activity 3/0 prefixes, 3/0 paths, scan interval 60 secs
Neighbor V AS MsgRcvd MsgSent TblVer InQ OutQ Up/Down State/PfxRcd
20.0.0.1 4 10032 18 17 4 0 0 00:15:30 4
30.0.0.3 4 30032 18 17 4 0 0 00:15:59 4
Router(config-router)#do show ip bgp
BGP table version is 4, local router ID is 192.32.20.1
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
r RIB-failure, S Stale
Origin codes: i - IGP, e - EGP, ? - incomplete
Network Next Hop Metric LocPrf Weight Path
*> 192.32.10.0/24 20.0.0.1 0 0 0 10032 i
*> 192.32.20.0/24 0.0.0.0 0 0 32768 i
*> 192.32.30.0/24 30.0.0.3 0 0 0 30032 i
Router(config-router)#do 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
20.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C 20.0.0.0/8 is directly connected, Serial0/1/0
L 20.0.0.2/32 is directly connected, Serial0/1/0
30.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C 30.0.0.0/8 is directly connected, Serial0/1/1
L 30.0.0.2/32 is directly connected, Serial0/1/1
B 192.32.10.0/24 [20/0] via 20.0.0.1, 00:00:00
192.32.20.0/24 is variably subnetted, 2 subnets, 2 masks
C 192.32.20.0/24 is directly connected, GigabitEthernet0/0/0
L 192.32.20.1/32 is directly connected, GigabitEthernet0/0/0
B 192.32.30.0/24 [20/0] via 30.0.0.3, 00:00:00
Router(config-router)#
Copy
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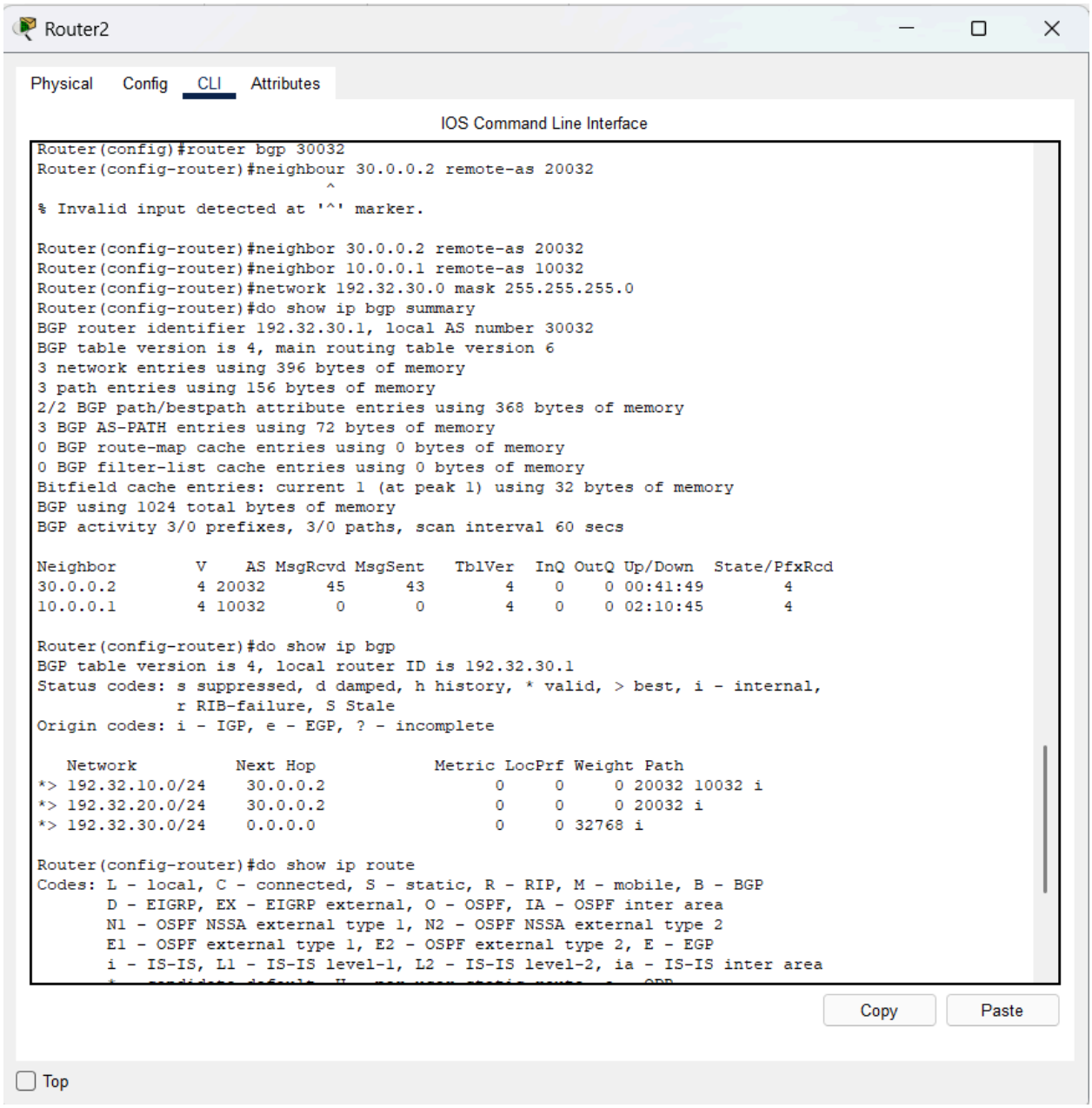
Top

Router 2:


Router2
Physical
Config
CLI
Attributes
IOS Command Line Interface
Router(config)#router bgp 30032
Router(config-router)#neighbour 30.0.0.2 remote-as 20032
^
% Invalid input detected at '^' marker.
Router(config-router)#neighbor 30.0.0.2 remote-as 20032
Router(config-router)#neighbor 10.0.0.1 remote-as 10032
Router(config-router)#network 192.32.30.0 mask 255.255.255.0
Router(config-router)#do show ip bgp summary
BGP router identifier 192.32.30.1, local AS number 30032
BGP table version is 4, main routing table version 6
3 network entries using 396 bytes of memory
3 path entries using 156 bytes of memory
2/2 BGP path/bestpath attribute entries using 368 bytes of memory
3 BGP AS-PATH entries using 72 bytes of memory
0 BGP route-map cache entries using 0 bytes of memory
0 BGP filter-list cache entries using 0 bytes of memory
Bitfield cache entries: current 1 (at peak 1) using 32 bytes of memory
BGP using 1024 total bytes of memory
BGP activity 3/0 prefixes, 3/0 paths, scan interval 60 secs
Neighbor V AS MsgRcvd MsgSent TblVer InQ OutQ Up/Down State/PfxRcd
30.0.0.2 4 20032 45 43 4 0 0 00:41:49 4
10.0.0.1 4 10032 0 0 4 0 0 02:10:45 4
Router(config-router)#do show ip bgp
BGP table version is 4, local router ID is 192.32.30.1
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
r RIB-failure, S Stale
Origin codes: i - IGP, e - EGP, ? - incomplete
Network Next Hop Metric LocPrf Weight Path
*> 192.32.10.0/24 30.0.0.2 0 0 0 20032 10032 i
*> 192.32.20.0/24 30.0.0.2 0 0 0 20032 i
*> 192.32.30.0/24 0.0.0.0 0 0 32768 i
Router(config-router)#do 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
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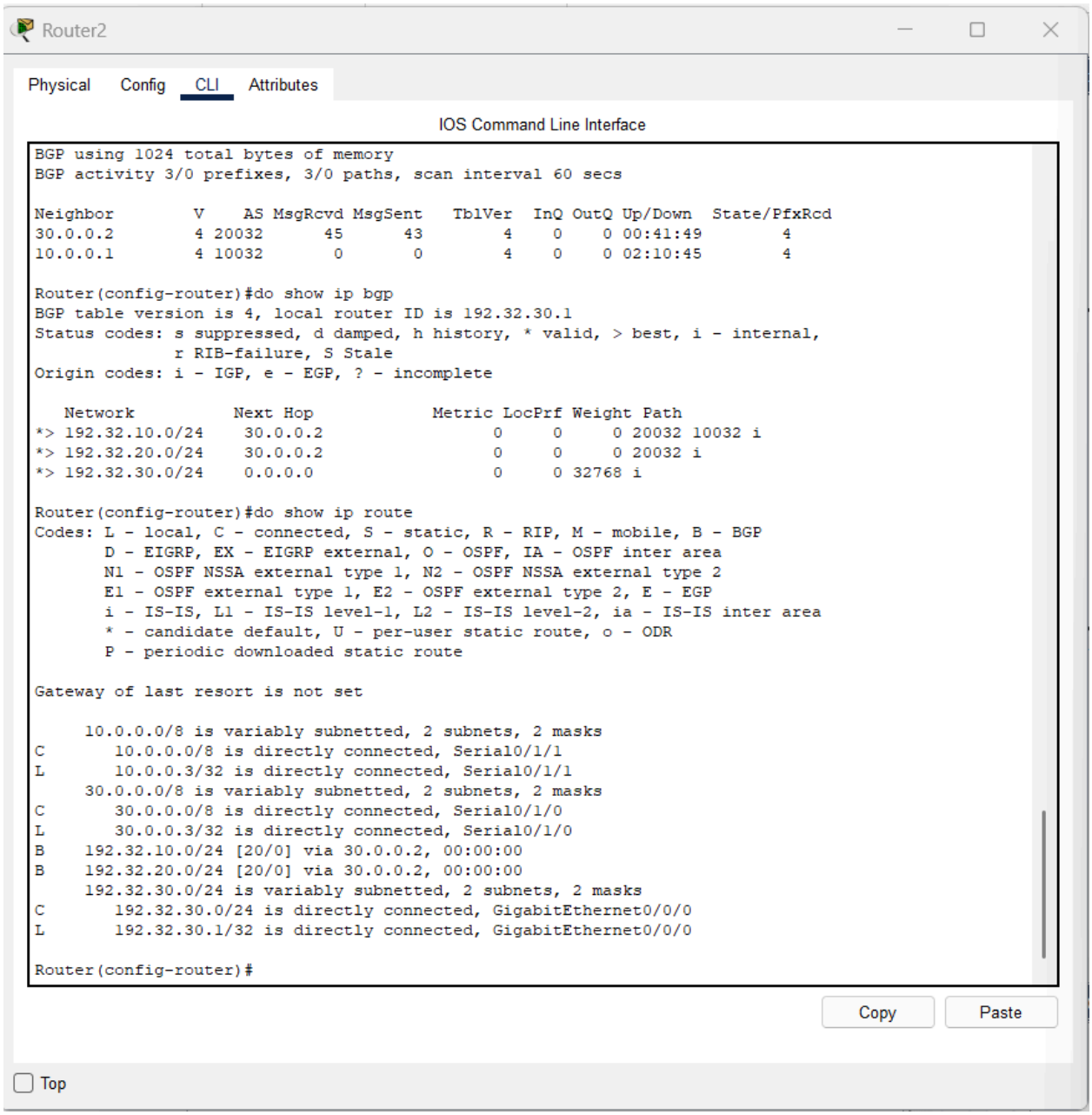
E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
Copy
Paste
Top



Conclusion:

In this practical, a network was designed and configured using the Border Gateway Protocol (BGP). Each router was assigned appropriate IP addresses, AS numbers, and neighbor relationships to enable inter-domain routing.

After completing the configuration, all routers successfully exchanged BGP routing information and built their routing tables based on advertised networks. The results verified that BGP correctly established peer connections, propagated routes across different autonomous systems, and ensured reliable communication between all departments in the organization. This practical demonstrated how BGP is used for scalable, policy-based routing across large networks and different autonomous systems.