

Institute of Computer Technology
B. Tech Computer Science and Engineering
Sub: Computer Network

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Batch: 53

Class: B

Practical-9

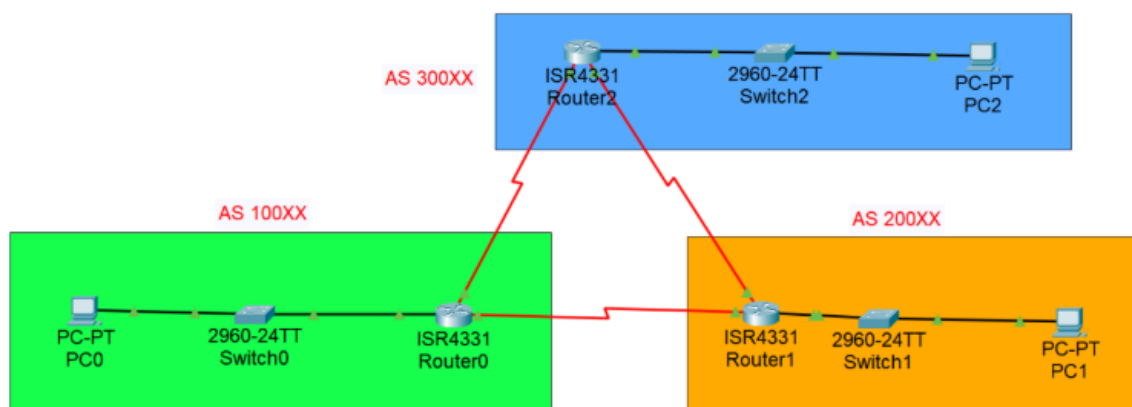
Aim: To design a network using Border Gateway Protocol (BGP).

Scenario:

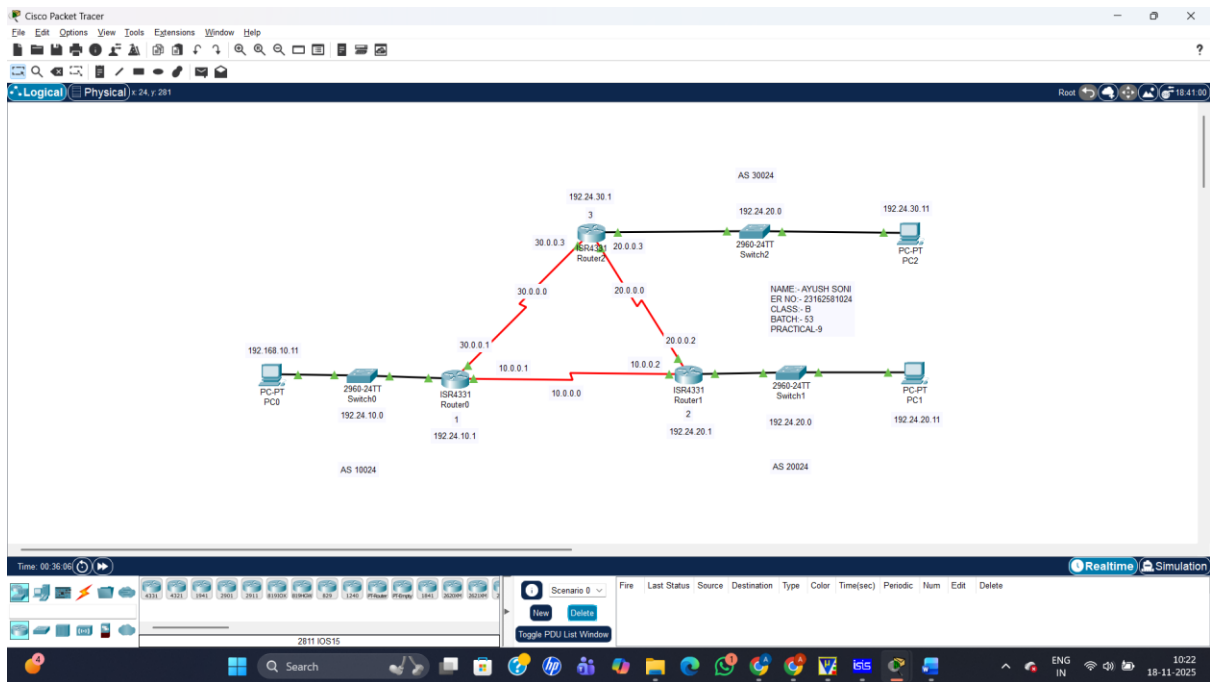
Consider that organization has three departments and as routing protocol Border Gateway Protocol (BGP) is to be implemented. Configure network as shown in figure below and implement Border Gateway Protocol (BGP).

Procedure:

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



MAIN CONNECTION



2) Configure IP address (All Devices, Routers)

PC0:

The screenshot shows the configuration window for PC0 in a network simulator. The window has a title bar with a PC icon and the text "PC0". Below the title bar are four tabs: "Physical", "Config", "Desktop" (which is selected), and "Attributes". The "Desktop" tab contains a sub-tab titled "IP Configuration" with a close button (X). Below this sub-tab is a dropdown menu for "Interface" set to "FastEthernet0". The main configuration area is divided into three sections: "IP Configuration", "IPv6 Configuration", and "802.1X". In the "IP Configuration" section, the "Static" radio button is selected, and the fields are filled with: IPv4 Address: 192.24.10.11, Subnet Mask: 255.255.255.0, Default Gateway: 192.24.10.1, and DNS Server: 0.0.0.0. In the "IPv6 Configuration" section, the "Static" radio button is also selected, with fields for IPv6 Address (empty), Link Local Address (FE80::201:C9FF:FE55:9C66), Default Gateway (empty), and DNS Server (empty). The "802.1X" section has a checkbox for "Use 802.1X Security" which is unchecked, and fields for Authentication (MD5), Username (empty), and Password (empty). At the bottom left of the window is a "Top" button. The taskbar at the bottom of the screen shows several application icons, including a web browser, a file explorer, and a terminal, along with system status icons for language (ENG IN), network, and battery, and a clock showing 10:35 on 18-11-2025.

PC0

Physical Config **Desktop** Programming Attributes

IP Configuration X

Interface: FastEthernet0

IP Configuration

☐ DHCP ☒ Static

IPv4 Address: 192.24.10.11

Subnet Mask: 255.255.255.0

Default Gateway: 192.24.10.1

DNS Server: 0.0.0.0

IPv6 Configuration

☐ Automatic ☒ Static

IPv6 Address: /

Link Local Address: FE80::201:C9FF:FE55:9C66

Default Gateway:

DNS Server:

802.1X

☐ Use 802.1X Security

Authentication: MD5

Username:

Password:

☐ Top

10:35 18-11-2025

PC1:

PC1

Physical

Config

Desktop

Programming

Attributes

IP Configuration

X

Interface

FastEthernet0

IP Configuration

DHCP

Static

IPv4 Address

192.24.20.11

Subnet Mask

255.255.255.0

Default Gateway

192.24.20.1

DNS Server

0.0.0.0

IPv6 Configuration

Automatic

Static

IPv6 Address

/

Link Local Address

FE80::2E0:F7FF:FE49:C35D

Default Gateway

DNS Server

802.1X

Use 802.1X Security

Authentication

MD5

Username

Password

Top

PC2:

PC2

Physical Config **Desktop** Programming Attributes

IP Configuration X

Interface FastEthernet0

IP Configuration

☐ DHCP ☒ Static

IPv4 Address 192.24.30.11

Subnet Mask 255.255.255.0

Default Gateway 192.24.30.1

DNS Server 0.0.0.0

IPv6 Configuration

☐ Automatic ☒ Static

IPv6 Address /

Link Local Address FE80::201:C9FF:FEEE:8153

Default Gateway

DNS Server

802.1X

☐ Use 802.1X Security

Authentication MD5

Username

Password

☐ Top

10:37
18-11-2025

ROUTER CONFIG

ROUTER 0:

The screenshot shows the configuration window for Router0, specifically the GigabitEthernet0/0/0 interface. The window has tabs for Physical, Config, CLI, and Attributes. The Config tab is active, showing a left sidebar with a tree view of configuration categories: GLOBAL, Settings, Algorithm Settings, ROUTING, Static, RIP, SWITCHING, VLAN Database, and INTERFACE. Under INTERFACE, the selected interface is GigabitEthernet0/0/0. The main area displays the configuration for this interface, including Port Status (On), Bandwidth (100 Mbps), Duplex (Full Duplex), MAC Address (0090.2187.49D6), IP Configuration (IPv4 Address: 192.24.10.1, Subnet Mask: 255.255.255.0), and Tx Ring Limit (10). Below the configuration area, there is a section for Equivalent IOS Commands, which shows the following commands: Router>enable, Router#, Router#configure terminal, Enter configuration commands, one per line. End with CNTL/Z., Router(config)#interface GigabitEthernet0/0/0, and Router(config-if)#. At the bottom of the window, there is a 'Top' button and a taskbar with various application icons and system status indicators.

Router0

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

GigabitEthernet0/0/0

Port Status ☒ On

Bandwidth ☐ 1000 Mbps ☒ 100 Mbps ☐ 10 Mbps ☒ Auto

Duplex ☐ Half Duplex ☒ Full Duplex ☒ Auto

MAC Address 0090.2187.49D6

IP Configuration

IPv4 Address 192.24.10.1

Subnet Mask 255.255.255.0

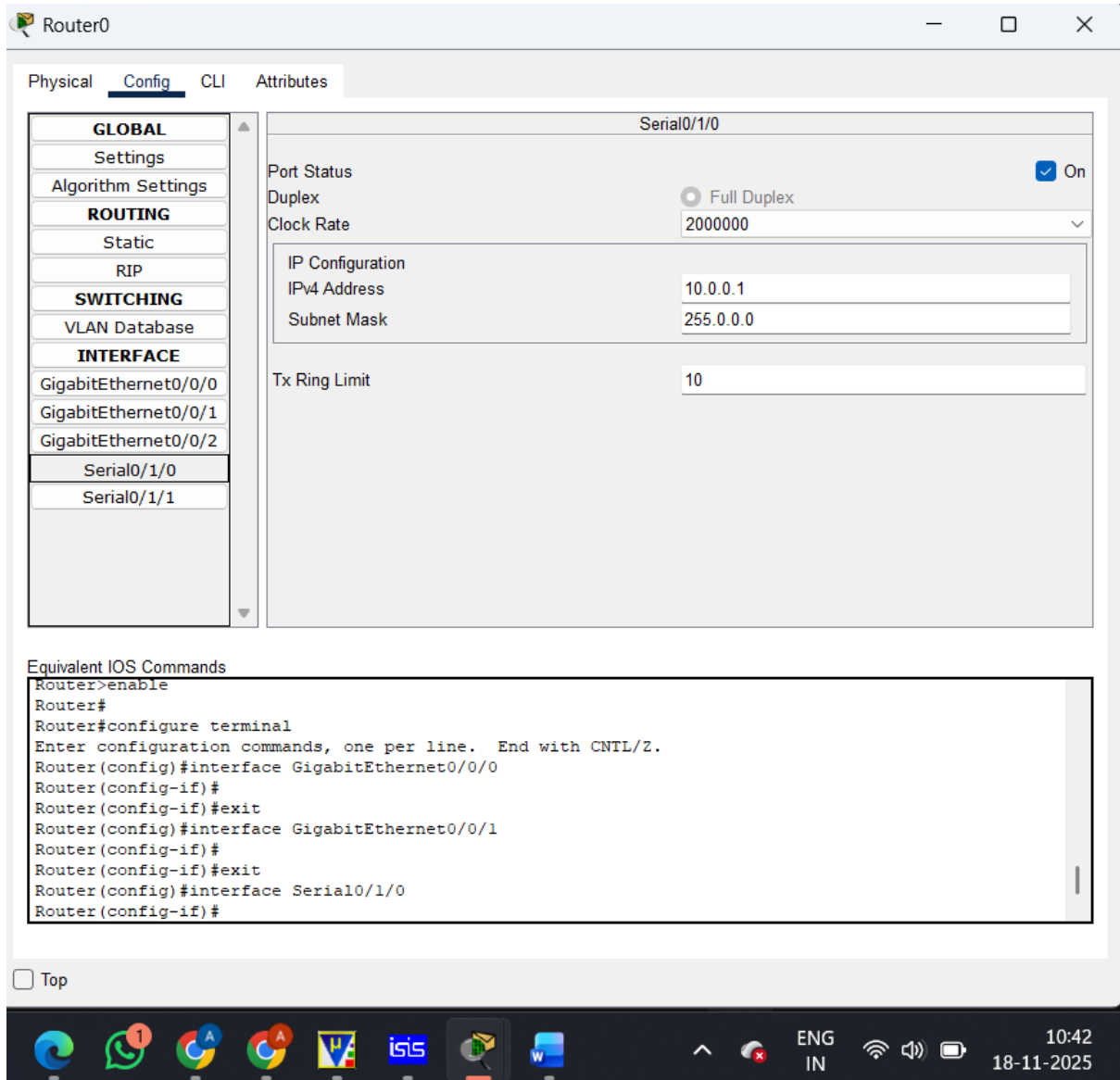
Tx Ring Limit 10

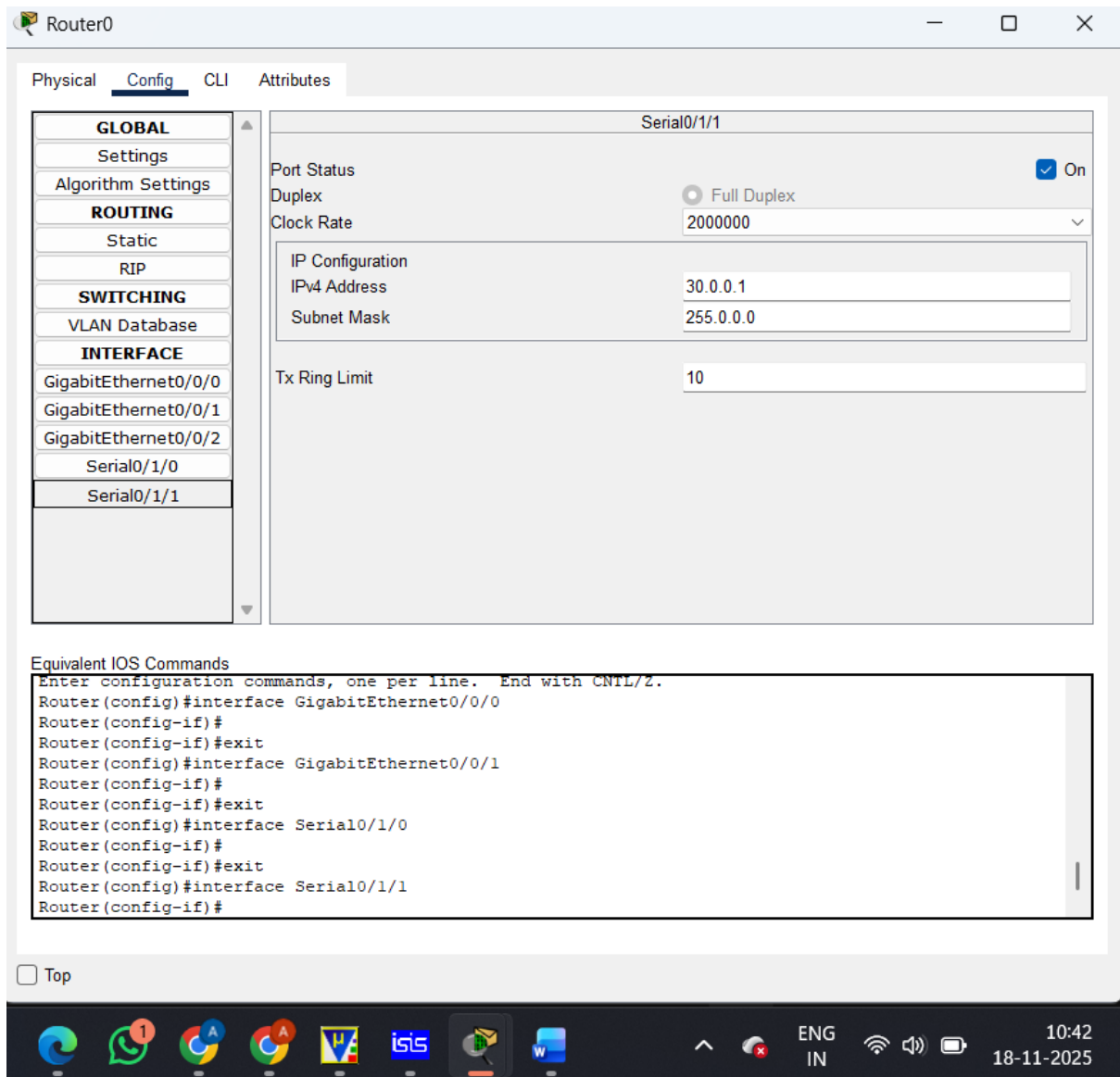
Equivalent IOS Commands

```
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)#
```

☐ Top

10:42
18-11-2025





ROUTER-1:

The screenshot shows the configuration window for Router1 in Cisco Packet Tracer. The window has tabs for Physical, Config, CLI, and Attributes. The Config tab is active, showing a tree on the left with categories: GLOBAL, ROUTING, SWITCHING, and INTERFACE. Under the INTERFACE category, GigabitEthernet0/0/0 is selected. The main area displays the configuration for GigabitEthernet0/0/0, including Port Status (On), Bandwidth (100 Mbps), Duplex (Full Duplex), MAC Address (00D0.BAC4.44CB), IP Configuration (IPv4 Address: 192.24.20.1, Subnet Mask: 255.255.255.0), and Tx Ring Limit (10). Below the configuration area, there is a section for Equivalent IOS Commands, which shows the following 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)#
```

At the bottom of the window, there is a 'Top' button and a taskbar with various application icons. The system tray shows the date and time as 10:43 on 18-11-2025.

Router1

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

Duplex

Clock Rate

IP Configuration

IPv4 Address

Subnet Mask

Tx Ring Limit

On

Full Duplex

2000000

10.0.0.2

255.0.0.0

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

1

A

A

W

IS

W

ENG

IN

10:43

18-11-2025

Router1

PhysicalConfigCLIAttributes

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

Serial0/1/1

Port Status

On

Duplex

Full Duplex

Clock Rate

2000000

IP Configuration

IPv4 Address

20.0.0.2

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-if)#exit

Router(config)#interface Serial0/1/1

Router(config-if)#

Top

10:43
18-11-2025

ROUTER-2:

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

GigabitEthernet0/0/0

Port Status ☒ On

Bandwidth ☐ 1000 Mbps ☒ 100 Mbps ☐ 10 Mbps ☒ Auto

Duplex ☐ Half Duplex ☒ Full Duplex ☒ Auto

MAC Address 0001.97E6.018A

IP Configuration

IPv4 Address 192.24.30.1

Subnet Mask 255.255.255.0

Tx Ring Limit 10

Equivalent IOS Commands

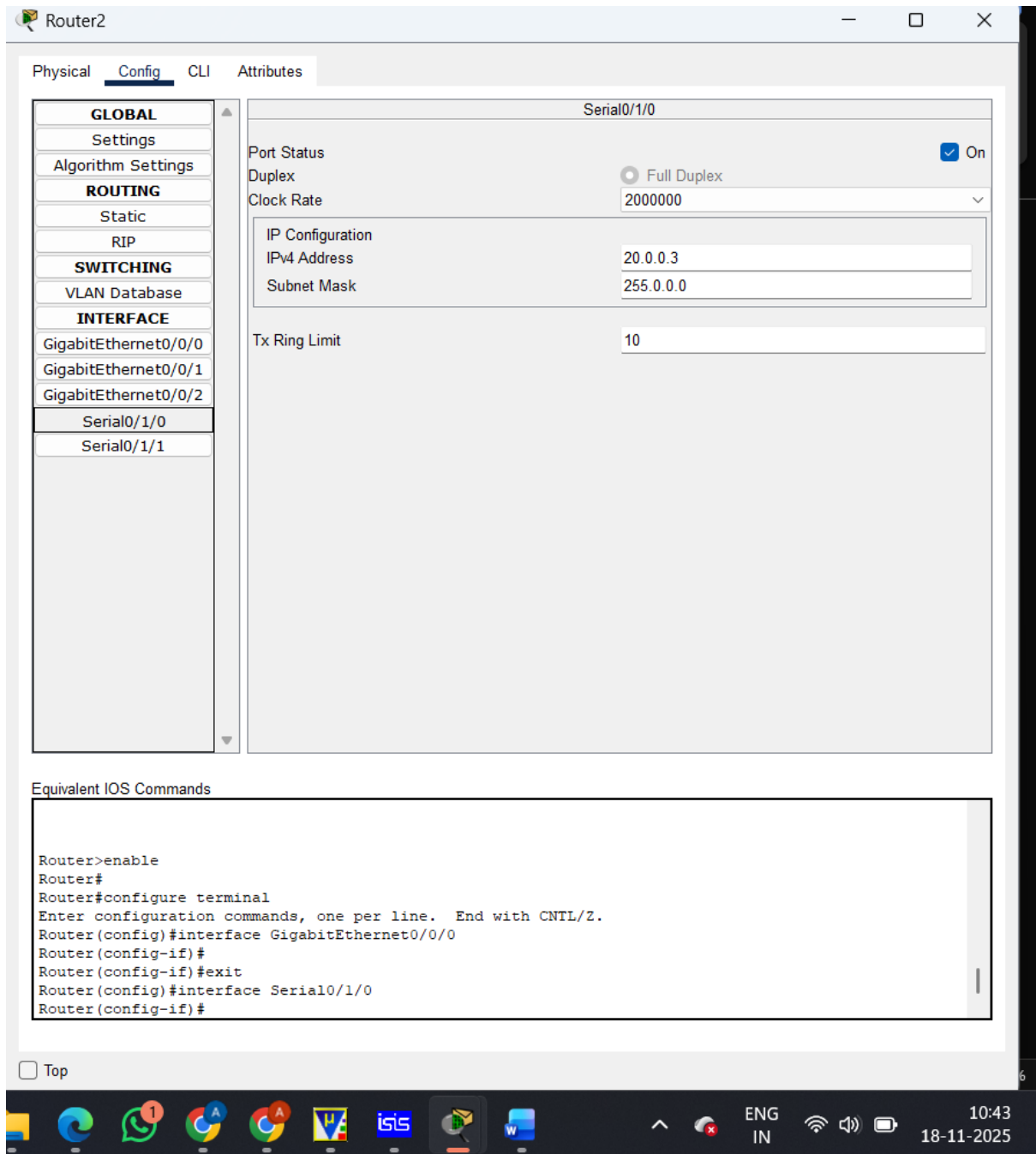
```
Router>enable
Router#
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface GigabitEthernet0/0/0
Router(config-if)#
```

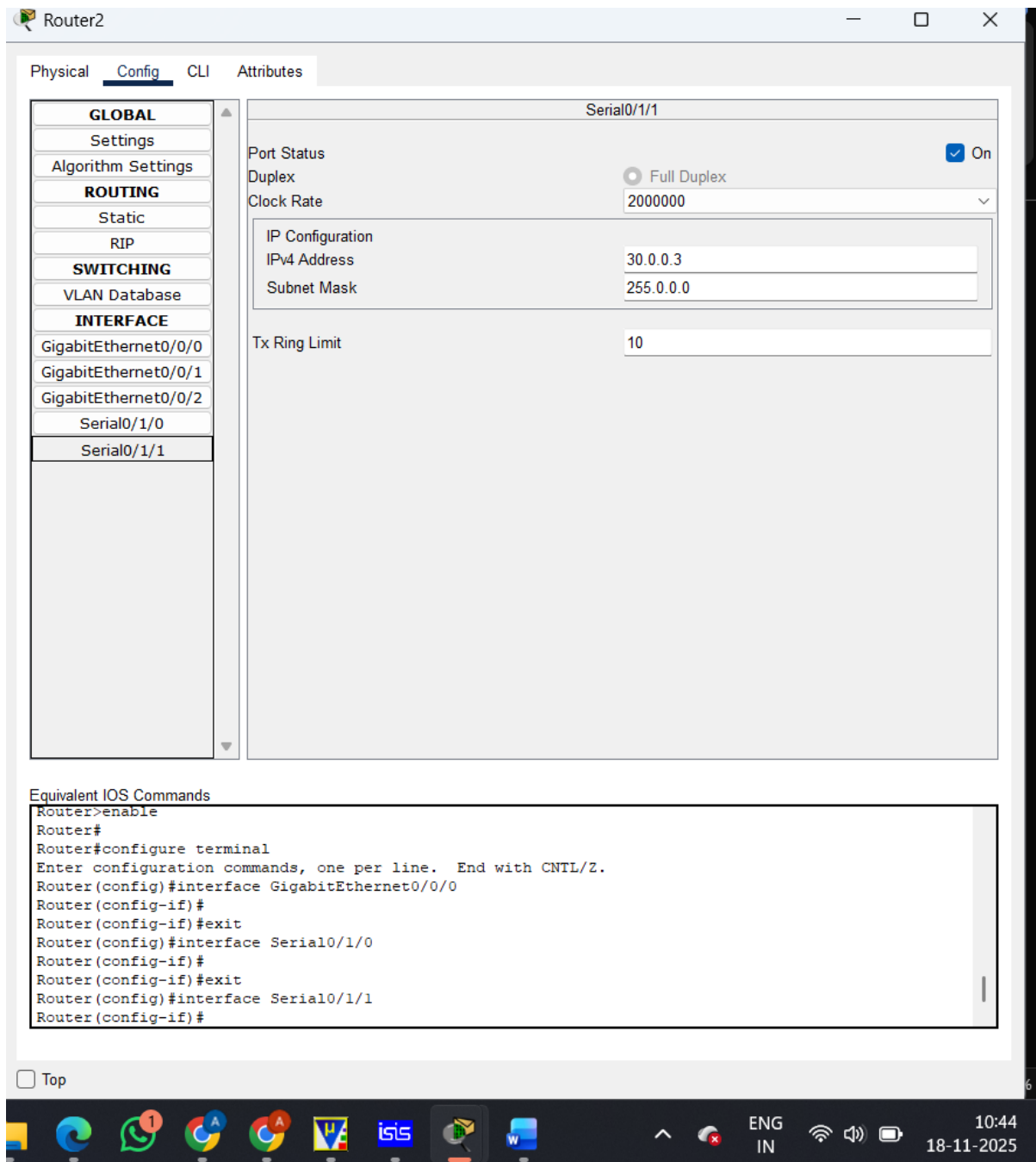
Top

6

ENG IN

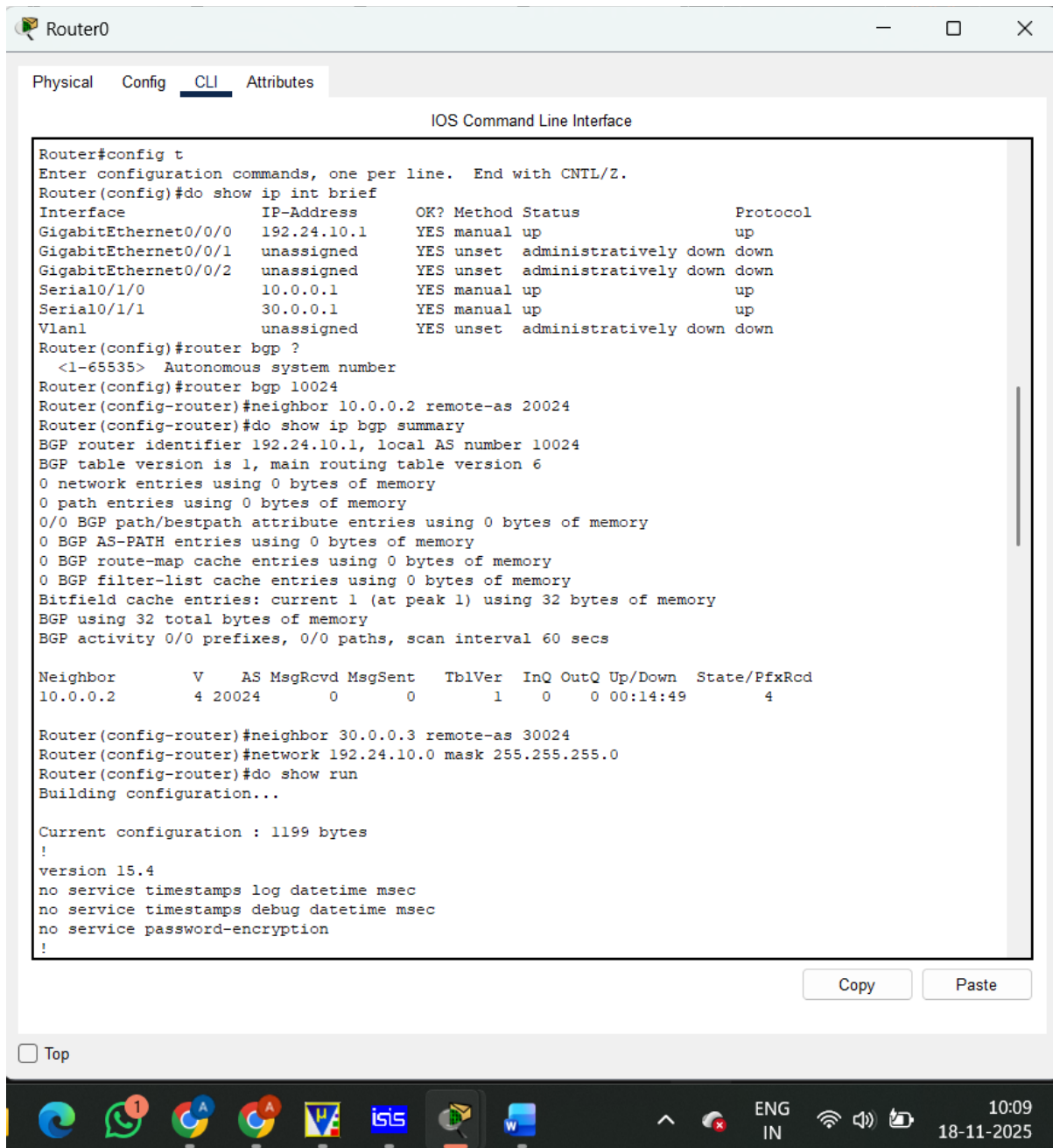
10:43
18-11-2025





3) Configure Border Gateway Protocol (BGP)

ROUTER-0



The screenshot shows a Windows desktop with a 'Router0' application window open. The window has tabs for 'Physical', 'Config', 'CLI', and 'Attributes', with 'CLI' selected. The title bar says 'Router0'. The main area is titled 'IOS Command Line Interface' and displays a series of commands and their outputs for configuring BGP on Router0.

```
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#do show ip int brief
Interface      IP-Address      OK? Method Status      Protocol
GigabitEthernet0/0/0  192.24.10.1    YES manual up          up
GigabitEthernet0/0/1  unassigned     YES unset  administratively down down
GigabitEthernet0/0/2  unassigned     YES unset  administratively down down
Serial0/1/0         10.0.0.1       YES manual up          up
Serial0/1/1         30.0.0.1       YES manual up          up
Vlan1              unassigned     YES unset  administratively down down
Router(config)#router bgp ?
<1-65535> Autonomous system number
Router(config)#router bgp 10024
Router(config-router)#neighbor 10.0.0.2 remote-as 20024
Router(config-router)#do show ip bgp summary
BGP router identifier 192.24.10.1, local AS number 10024
BGP table version is 1, main routing table version 6
0 network entries using 0 bytes of memory
0 path entries using 0 bytes of memory
0/0 BGP path/bestpath attribute entries using 0 bytes of memory
0 BGP AS-PATH entries using 0 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 32 total bytes of memory
BGP activity 0/0 prefixes, 0/0 paths, scan interval 60 secs

Neighbor      V    AS MsgRcvd MsgSent  TblVer  InQ OutQ Up/Down  State/PfxRcd
10.0.0.2      4 20024      0       0        1    0    0 00:14:49      4

Router(config-router)#neighbor 30.0.0.3 remote-as 30024
Router(config-router)#network 192.24.10.0 mask 255.255.255.0
Router(config-router)#do show run
Building configuration...

Current configuration : 1199 bytes
!
version 15.4
no service timestamps log datetime msec
no service timestamps debug datetime msec
no service password-encryption
!
```

At the bottom of the CLI window, there are 'Copy' and 'Paste' buttons. Below the window, a Windows taskbar is visible with various application icons and a system tray showing the date and time as 10:09 on 18-11-2025.

Router0

Physical

Config

CLI


Attributes

IOS Command Line Interface

```
interface GigabitEthernet0/0/1
no ip address
duplex auto
speed auto
shutdown
!
interface GigabitEthernet0/0/2
no ip address
duplex auto
speed auto
shutdown
!
interface Serial0/1/0
ip address 10.0.0.1 255.0.0.0
clock rate 2000000
!
interface Serial0/1/1
ip address 30.0.0.1 255.0.0.0
!
interface Vlan1
no ip address
shutdown
!
router ospf 1
router-id 1.1.1.1
log-adjacency-changes
network 192.24.10.0 0.0.0.255 area 0
network 10.0.0.0 0.0.0.3 area 0
network 30.0.0.0 0.0.0.3 area 0
network 10.0.0.0 0.255.255.255 area 0
network 30.0.0.0 0.255.255.255 area 0
!
router bgp 10024
bgp log-neighbor-changes
no synchronization
neighbor 10.0.0.2 remote-as 20024
neighbor 30.0.0.3 remote-as 30024
network 192.24.10.0
!
router rip
!
ip classless
!
ip flow-export version 9
!
```

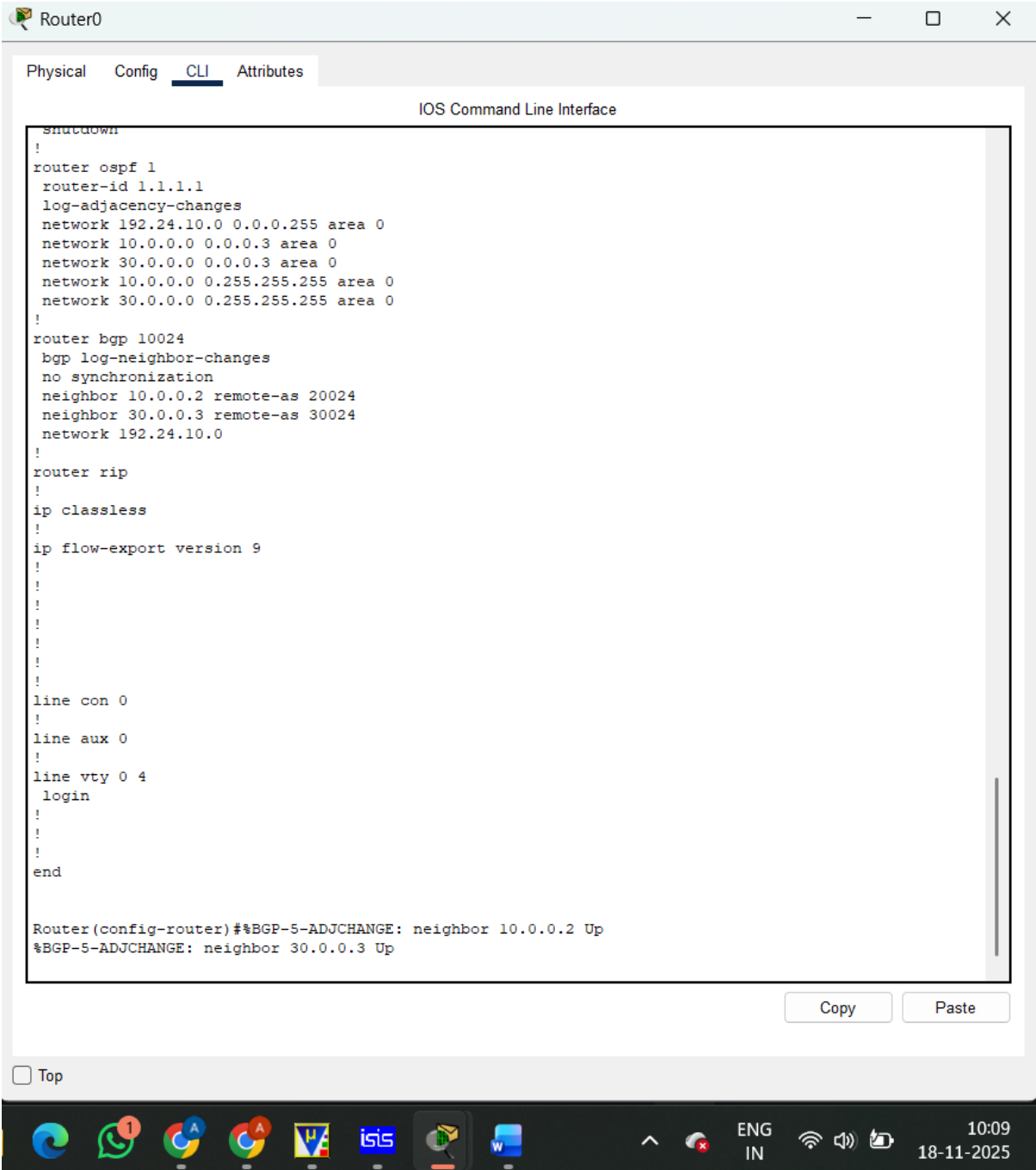
CopyPaste

☐ Top



ENG
IN

10:09
18-11-2025



Router0

Physical

Config

CLI

Attributes

IOS Command Line Interface

```
line vty 0 4
login
!
!
!
end

Router(config-router)#%BGP-5-ADJCHANGE: neighbor 10.0.0.2 Up
%BGP-5-ADJCHANGE: neighbor 30.0.0.3 Up

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, Serial0/1/0
L       10.0.0.1/32 is directly connected, Serial0/1/0
O       20.0.0.0/8 [110/128] via 10.0.0.2, 00:26:52, Serial0/1/0
        [110/128] via 30.0.0.3, 00:26:52, Serial0/1/1
    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       30.0.0.1/32 is directly connected, Serial0/1/1
    192.24.10.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.24.10.0/24 is directly connected, GigabitEthernet0/0/0
L       192.24.10.1/32 is directly connected, GigabitEthernet0/0/0
B       192.24.20.0/24 [20/0] via 10.0.0.2, 00:00:00
B       192.24.30.0/24 [20/0] via 30.0.0.3, 00:00:00

Router(config-router)#
Router(config-router)#
Router(config-router)#
Router(config-router)#
Router(config-router)#
Router(config-router)#
Router(config-router)#
Router(config-router)#
Router(config-router)#
```

Copy

Paste

☐ Top

ENG
IN

10:13
18-11-2025

Router0

Physical

Config

CLI

Attributes

IOS Command Line Interface

```
Router(config-router)#
Router(config-router)#
Router(config-router)#
Router(config-router)#
Router(config-router)#do show ip bgp summary
BGP router identifier 192.24.10.1, local AS number 10024
BGP table version is 6, main routing table version 6
5 network entries using 660 bytes of memory
5 path entries using 260 bytes of memory
4/4 BGP path/bestpath attribute entries using 736 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 1760 total bytes of memory
BGP activity 3/0 prefixes, 5/0 paths, scan interval 60 secs

Neighbor      V    AS MsgRcvd MsgSent  TblVer  InQ OutQ Up/Down  State/PfxRcd
10.0.0.2      4 20024    19     16      6    0   0 00:14:19      4
30.0.0.3      4 30024    16     13      6    0   0 00:11:25      4

Router(config-router)#do show ip bgp
BGP table version is 6, local router ID is 192.24.10.1
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
*> 192.24.10.0/24  0.0.0.0             0      0 32768 i
*> 192.24.20.0/24  10.0.0.2             0      0   0 20024 i
*                  30.0.0.3             0      0   0 30024 20024 i
*> 192.24.30.0/24  30.0.0.3             0      0   0 30024 i
*                  10.0.0.2             0      0   0 20024 30024 i

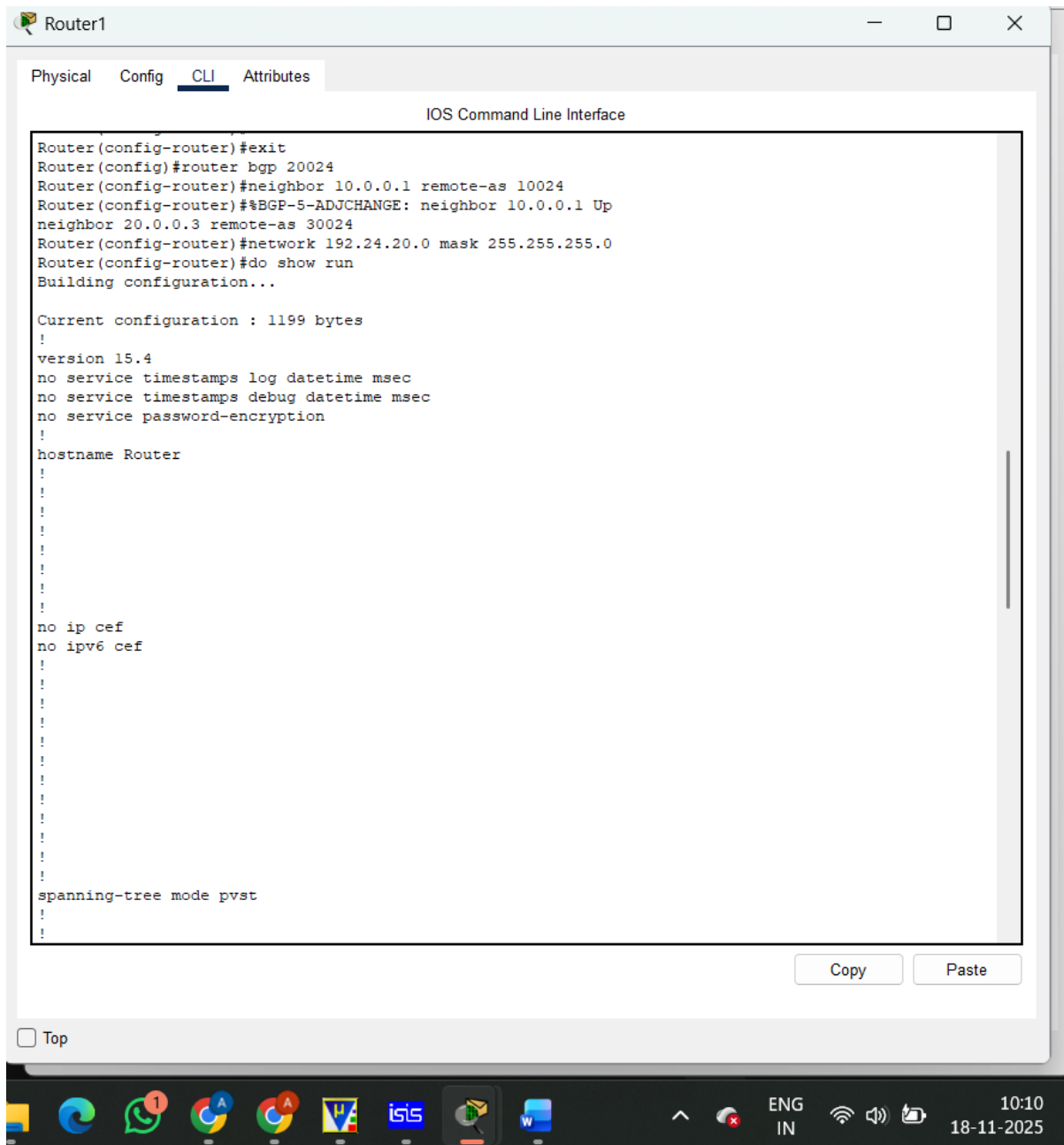
Router(config-router)#
```

Copy

Paste

☐ Top

ROUTER-1



Router1

Physical Config CLI Attributes

IOS Command Line Interface

```
!
spanning-tree mode pvst
!
!
!
!
!
!
interface GigabitEthernet0/0/0
ip address 192.24.20.1 255.255.255.0
duplex auto
speed auto
!
interface GigabitEthernet0/0/1
no ip address
duplex auto
speed auto
shutdown
!
interface GigabitEthernet0/0/2
no ip address
duplex auto
speed auto
shutdown
!
interface Serial0/1/0
ip address 10.0.0.2 255.0.0.0
!
interface Serial0/1/1
ip address 20.0.0.2 255.0.0.0
clock rate 2000000
!
interface Vlan1
no ip address
shutdown
!
router ospf 1
router-id 2.2.2.2
log-adjacency-changes
network 10.0.0.0 0.0.0.3 area 0
network 20.0.0.0 0.0.0.3 area 0
network 192.24.20.0 0.0.0.255 area 0
network 10.0.0.0 0.0.0.255 area 0
```

☐ Top

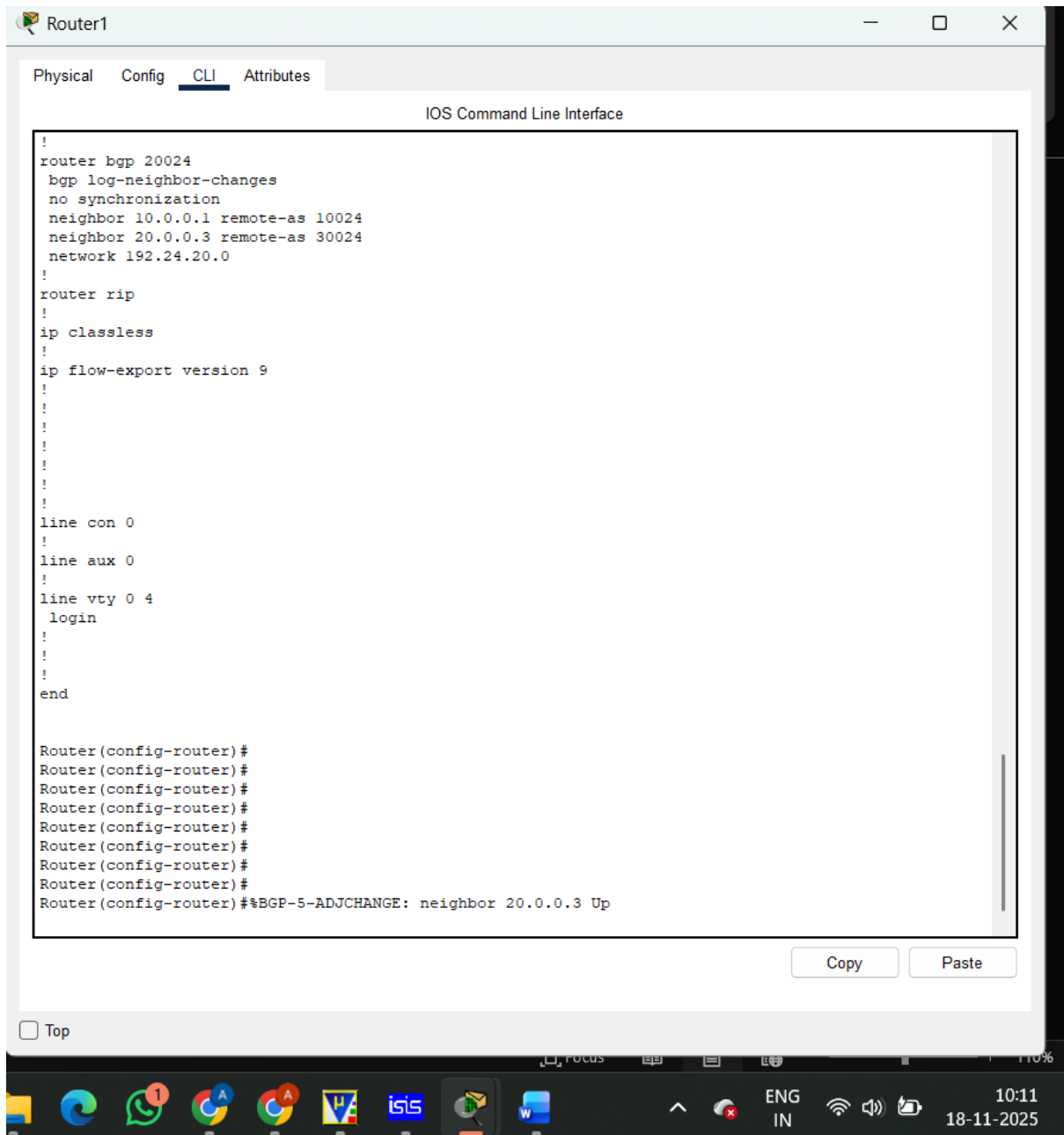
Copy Paste

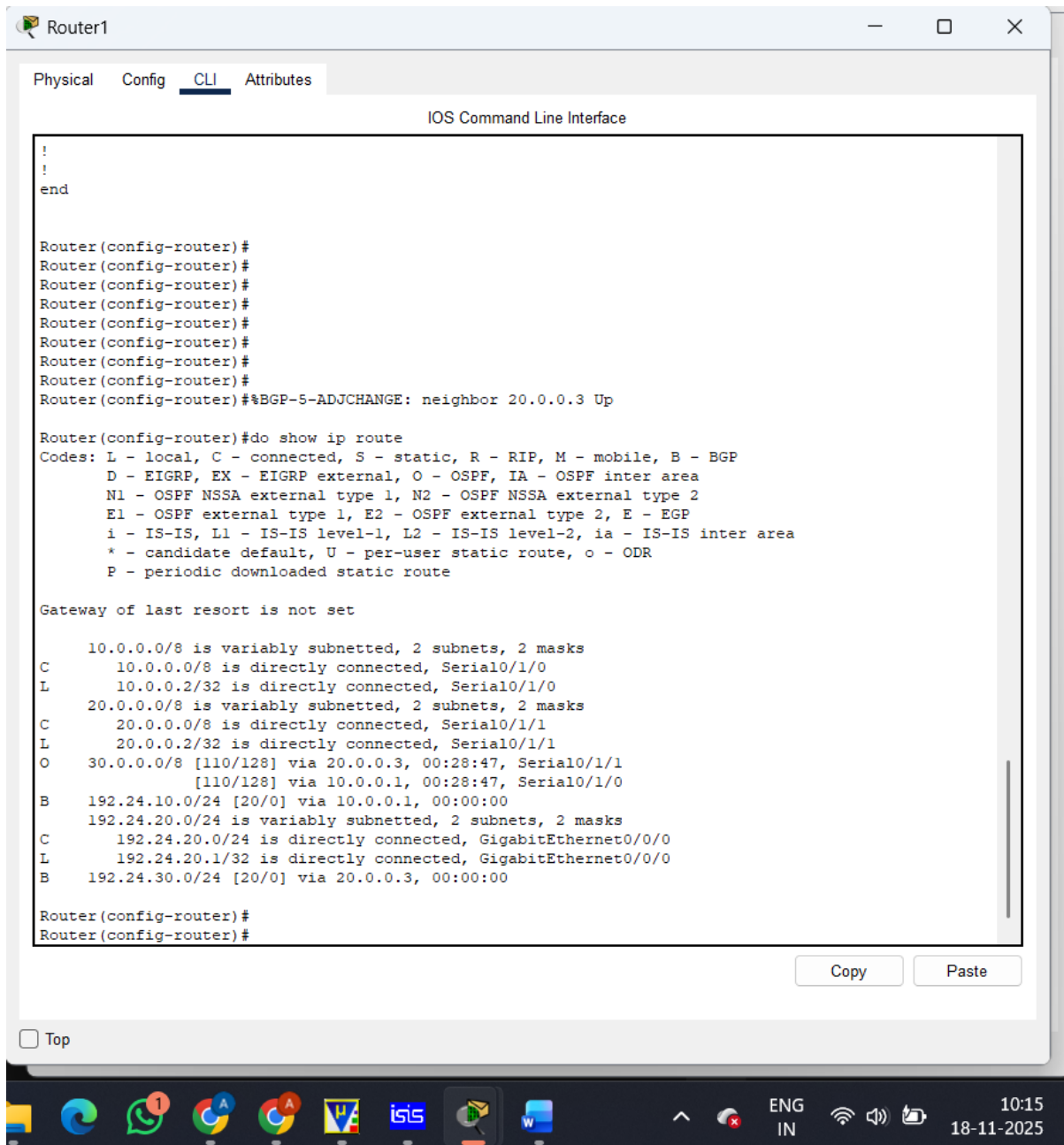
FOCUS

ENG IN

10:10
18-11-2025







Router1

Physical

Config

CLI

Attributes

IOS Command Line Interface

Router(config-router)#
Router(config-router)#do show ip bgp summary
BGP router identifier 192.24.20.1, local AS number 20024
BGP table version is 6, main routing table version 6
5 network entries using 660 bytes of memory
5 path entries using 260 bytes of memory
4/4 BGP path/bestpath attribute entries using 736 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 1760 total bytes of memory
BGP activity 3/0 prefixes, 5/0 paths, scan interval 60 secs

Neighbor V AS MsgRcvd MsgSent TblVer InQ OutQ Up/Down State/PfxRcd
10.0.0.1 4 10024 20 17 6 0 0 00:15:22 4
20.0.0.3 4 30024 18 14 6 0 0 00:12:09 4

Router(config-router)#do show ip bgp
BGP table version is 6, local router ID is 192.24.20.1
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
*> 192.24.10.0/24 10.0.0.1 0 0 0 10024 i
* 20.0.0.3 0 0 0 30024 10024 i
*> 192.24.20.0/24 0.0.0.0 0 0 32768 i
* 192.24.30.0/24 10.0.0.1 0 0 0 10024 30024 i
*> 20.0.0.3 0 0 0 30024 i

Router(config-router)#

Copy

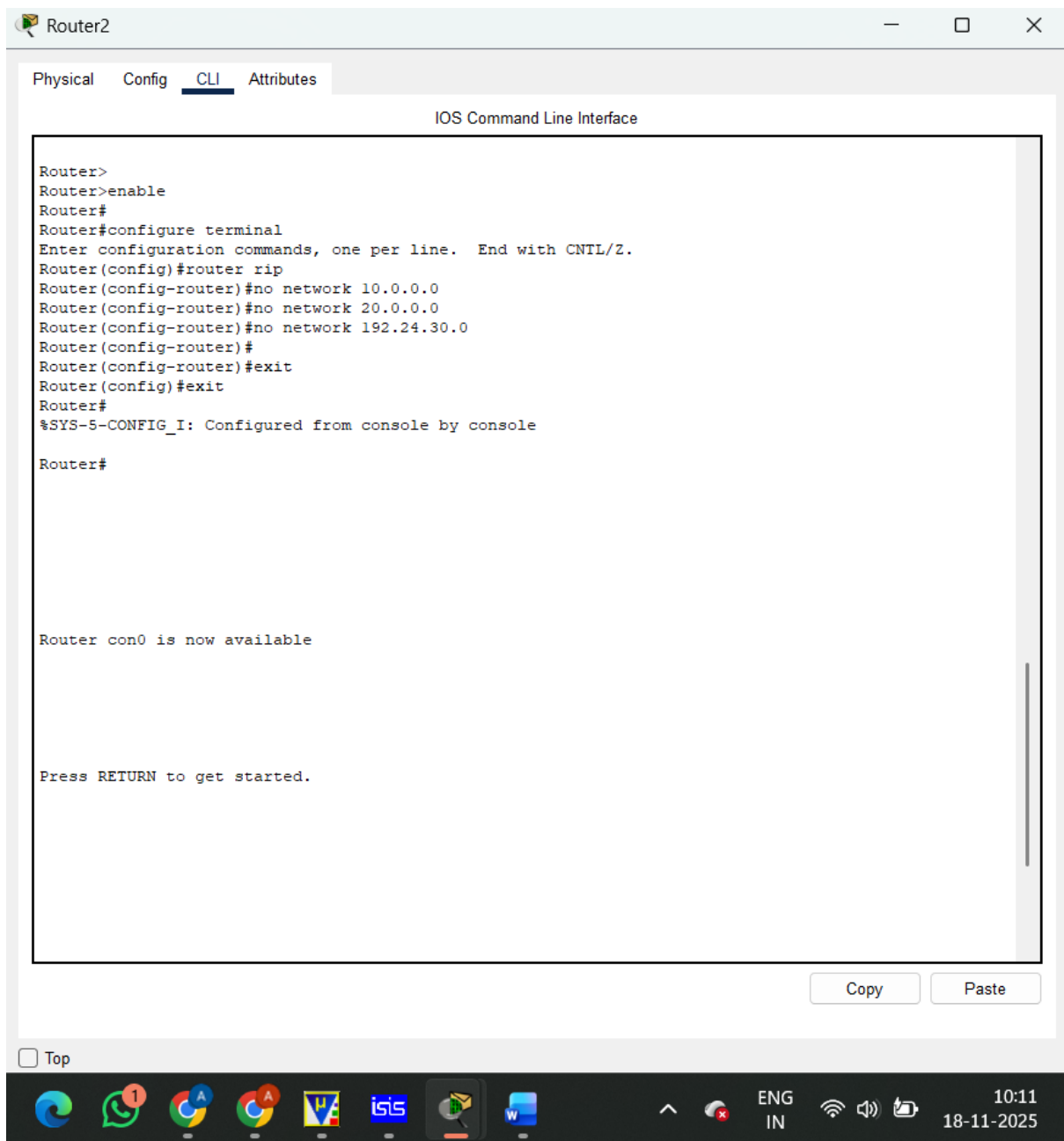
Paste

☐ Top

ENG
IN

10:20
18-11-2025

ROUTER-2



The screenshot shows a Cisco Packet Tracer window titled "Router2". The window has four tabs: "Physical", "Config", "CLI", and "Attributes". The "CLI" tab is selected, displaying the "IOS Command Line Interface". The terminal output shows the following commands and responses:

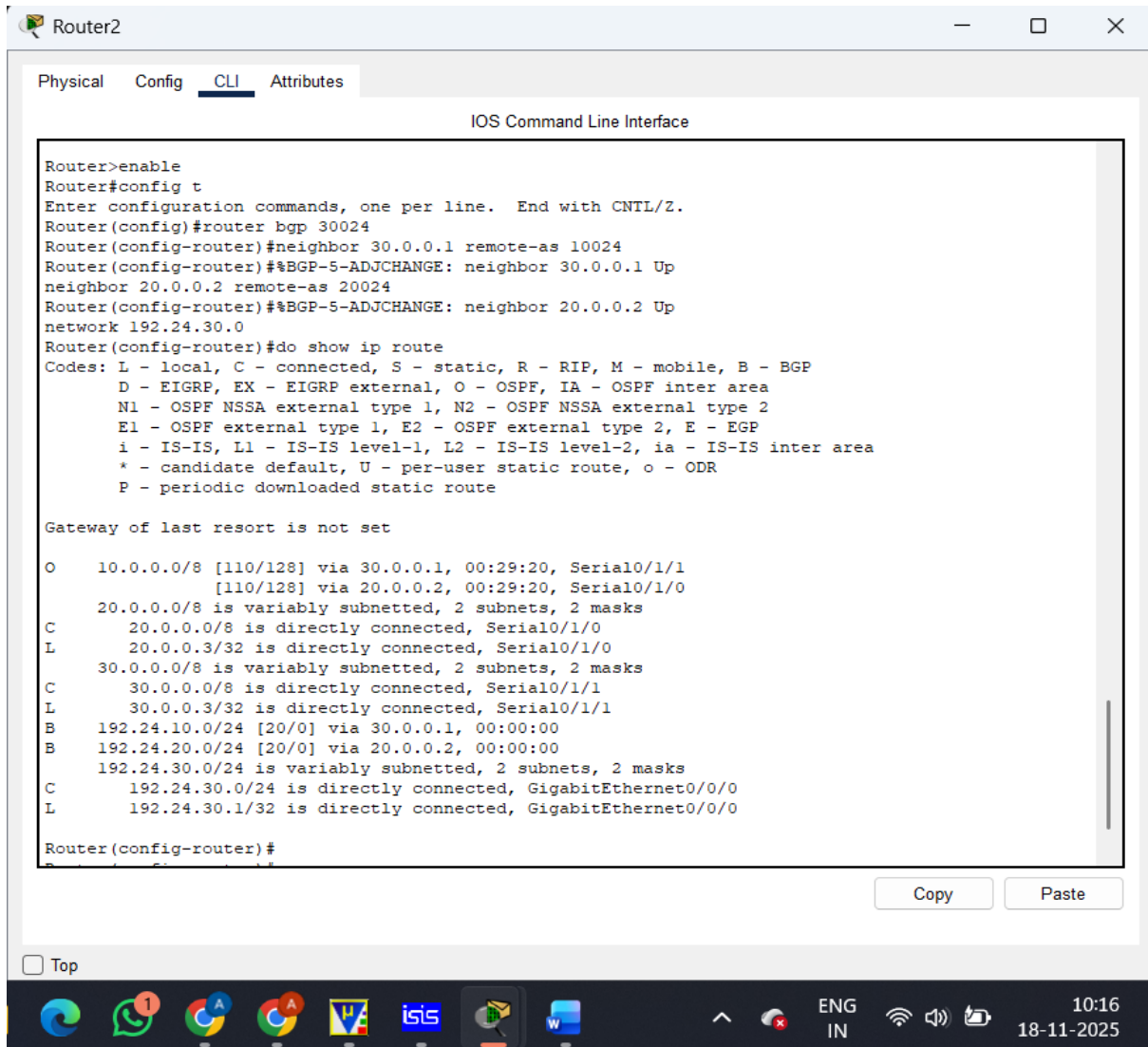
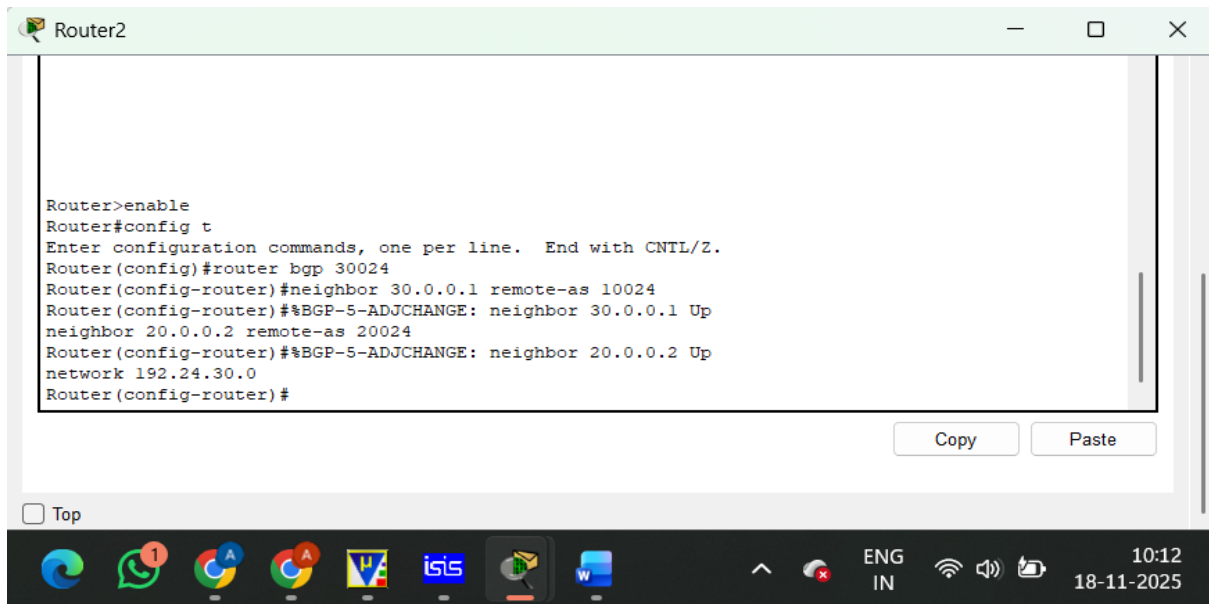
```
Router>
Router>enable
Router#
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#router rip
Router(config-router)#no network 10.0.0.0
Router(config-router)#no network 20.0.0.0
Router(config-router)#no network 192.24.30.0
Router(config-router)#
Router(config-router)#exit
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console

Router#

Router con0 is now available

Press RETURN to get started.
```

Below the terminal window, there are "Copy" and "Paste" buttons. At the bottom left of the window, there is a "Top" button. The bottom of the image shows a Windows taskbar with various application icons, including Edge, WhatsApp, Google Chrome, and Word, along with system tray icons for network, volume, and date/time (10:11, 18-11-2025).



Router2

Physical

Config

CLI

Attributes

IOS Command Line Interface

Router(config-router)#
Router(config-router)#do show ip bgp summary
BGP router identifier 192.24.30.1, local AS number 30024
BGP table version is 6, main routing table version 6
5 network entries using 660 bytes of memory
5 path entries using 260 bytes of memory
4/4 BGP path/bestpath attribute entries using 736 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 1760 total bytes of memory
BGP activity 3/0 prefixes, 5/0 paths, scan interval 60 secs

Neighbor V AS MsgRcvd MsgSent TblVer InQ OutQ Up/Down State/PfxRcd
30.0.0.1 4 10024 18 15 6 0 0 00:13:00 4
20.0.0.2 4 20024 17 14 6 0 0 00:12:41 4

Router(config-router)#do show ip bgp
BGP table version is 6, local router ID is 192.24.30.1
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
*> 192.24.10.0/24 30.0.0.1 0 0 0 10024 i
* 20.0.0.2 0 0 0 20024 10024 i
* 192.24.20.0/24 30.0.0.1 0 0 0 10024 20024 i
*> 20.0.0.2 0 0 0 20024 i
*> 192.24.30.0/24 0.0.0.0 0 0 32768 i

Router(config-router)#

Copy

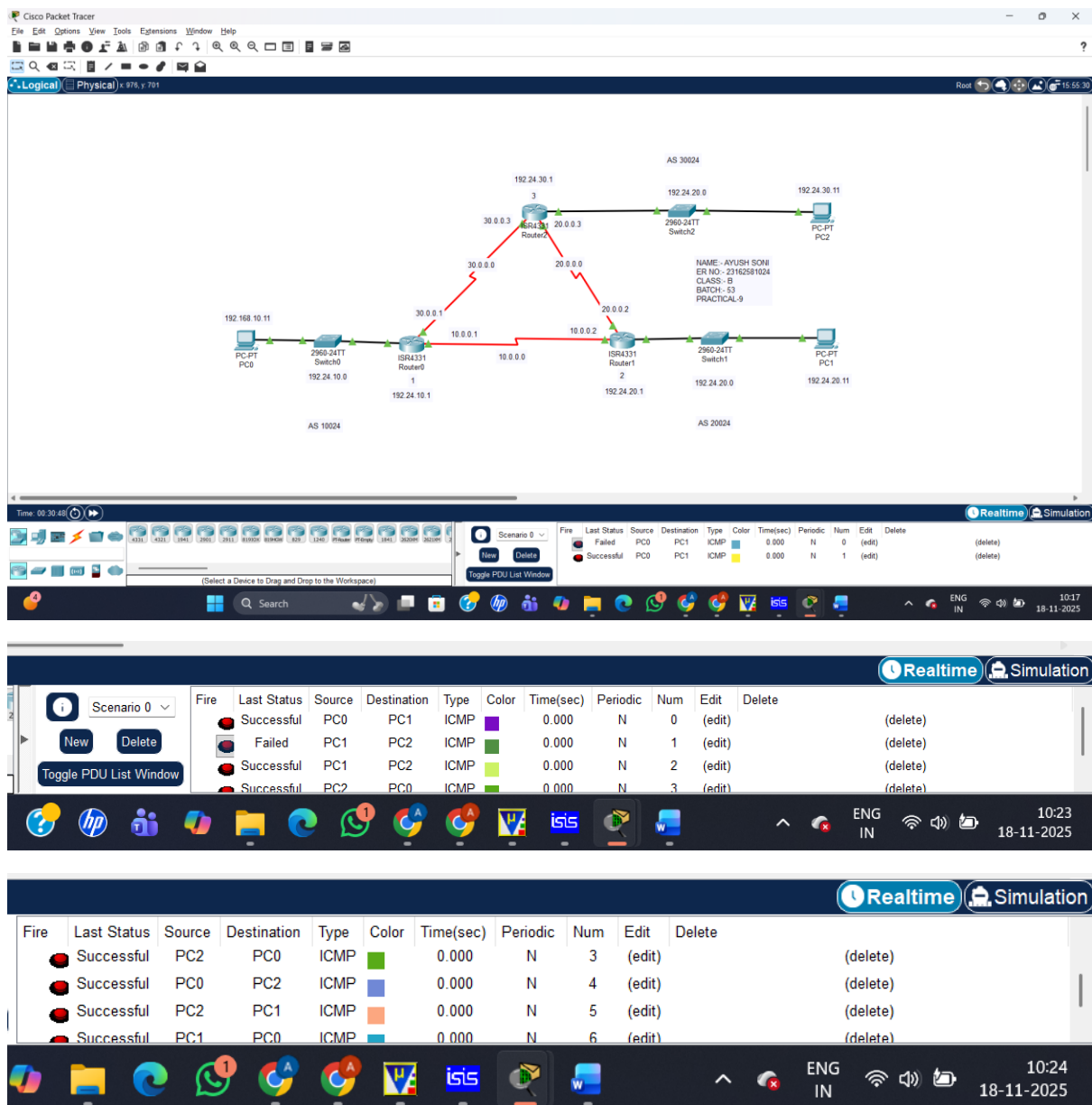
Paste

☐ Top

ENG
IN

10:20
18-11-2025

PACKET TRANSFER SUCCESSFUL



Conclusion:-

The network was successfully designed and configured using Border Gateway Protocol (BGP) to enable communication between all three departments. BGP routing was implemented correctly on each router, and route exchange occurred smoothly across the autonomous systems. The final setup demonstrated stable connectivity and efficient inter-department communication.

Note:

Make sure last two digits of your enrollment numbers appears in network IP address that must be visible in snapshot of the cisco packet tracer. i.e. 192.XX.10.1 (XX indicates last two digits of your enrollment no.)