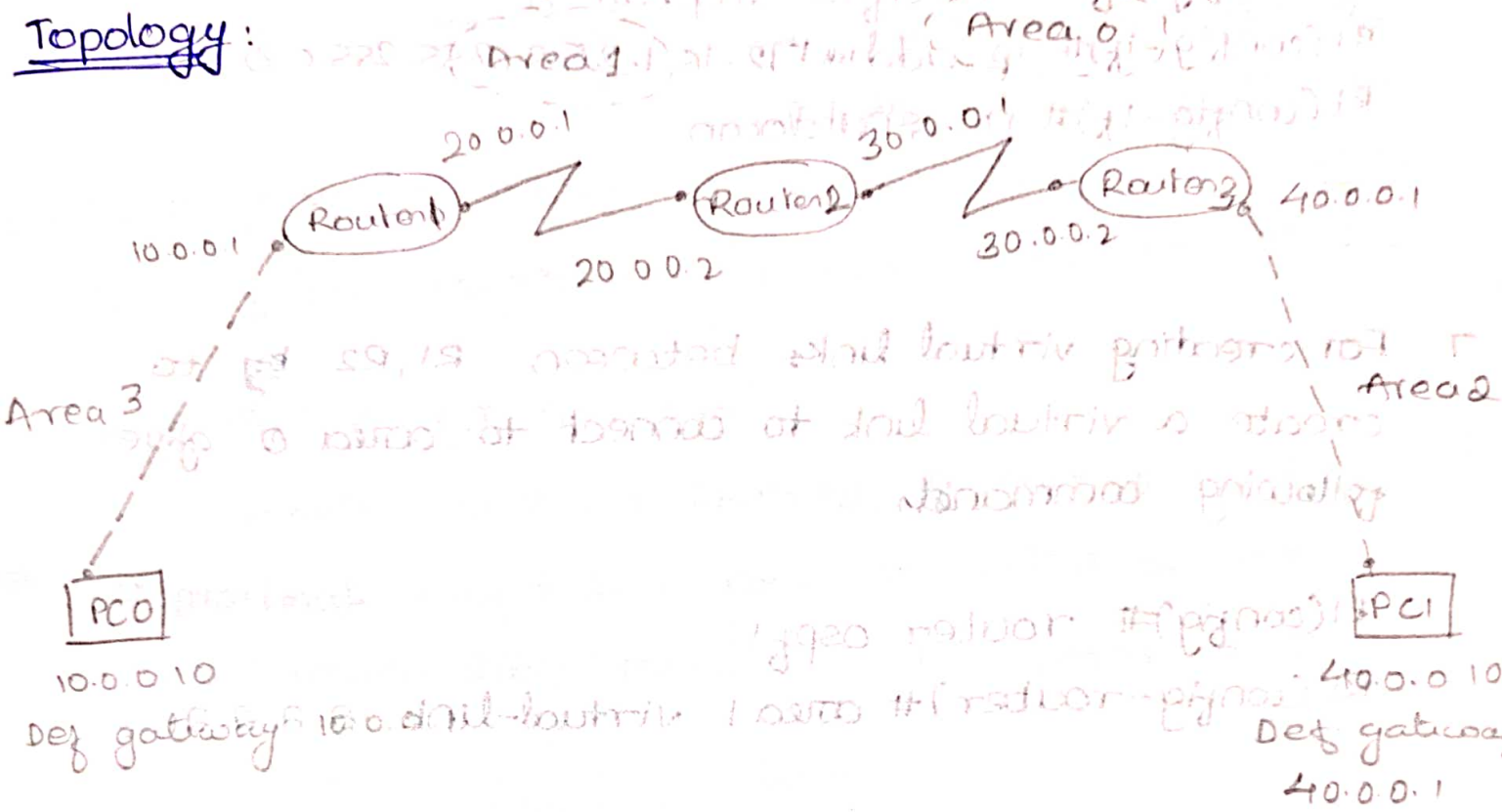
Experiment-7

Aim: To understand working of OSPF (open shortest path first)

Topology:



Procedure:

1. Configure the routers and PCs with IPs and gate-ways as per the topology.
2. Configure each of routers according to IP's shown in topology.
3. Encapsulation ppp and clock rate need to be set as done in RIP experiment.
4. Give the following commands

Router1 → Router(config)# router ospf 1
Router(config-router)# router-id 1.1.1.1
Router(config-router)# network 10.0.0.0 0.255.255.255 area
Router(config-router)# network 20.0.0.0 0.255.255.255 area

Router (config-router)# exit

5. Repeat same steps for all routers.
6. For loop backs give following commands

R2 serial 3/0
R3 serial 2/0

R1 (config)# interface serial 2/0
R1 (config-if)# interface loopback 0
R1 (config-if)# ip addr 172.16.1.252 255.255.0.0
R1 (config-if)# no shutdown

R2 253
R3 254

remaining same

7. For creating virtual links between R1, R2 by to create a virtual link to connect to area 0 give following commands.

R1(config)# router ospf 1
R1 (config-router)# area 1 virtual-link 2.2.2.2
R2

area 1

R1(config-router)# exit

8. Show IP route. 30 and 40 are directly connected Make sure all networks are listed.

Output

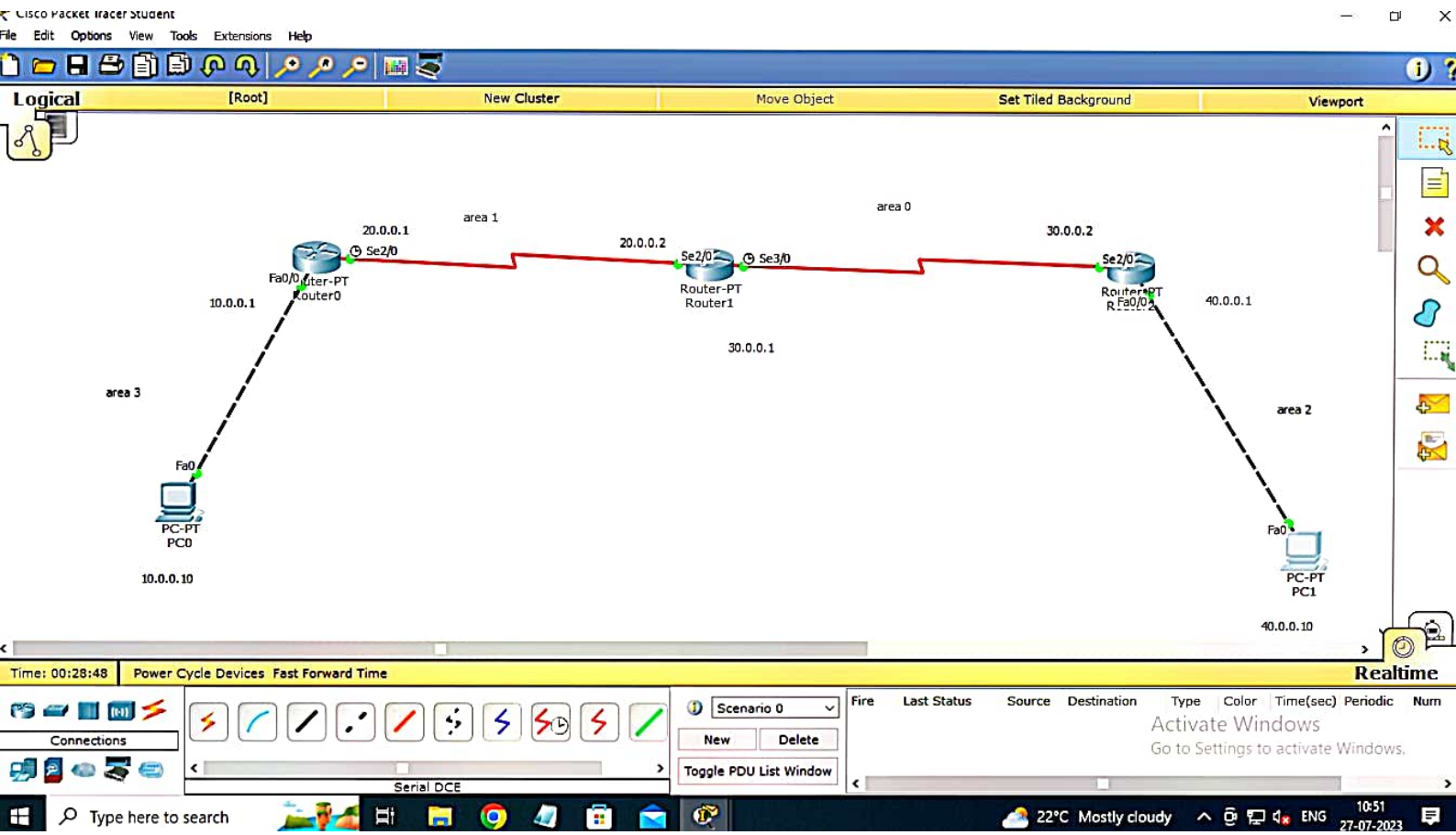
```
PC> ping 40.0.0.10

pinging 40.0.0.10 with 32 bytes of data:

Reply from 40.0.0.10 : bytes = 32 time= 2ms TTL=125
Reply from 40.0.0.10 : bytes = 32 time = 3ms TTL=125
Reply from 40.0.0.10 : bytes = 32 time = 22ms TTL=125
Reply from 40.0.0.10 : bytes = 32 time= 2ms TTL=125

ping statics for 40.0.0.10 :
    Packets : Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in millie-seconds:
    Minimum = 2ms, Maximum = 22ms, Average = 7ms
```

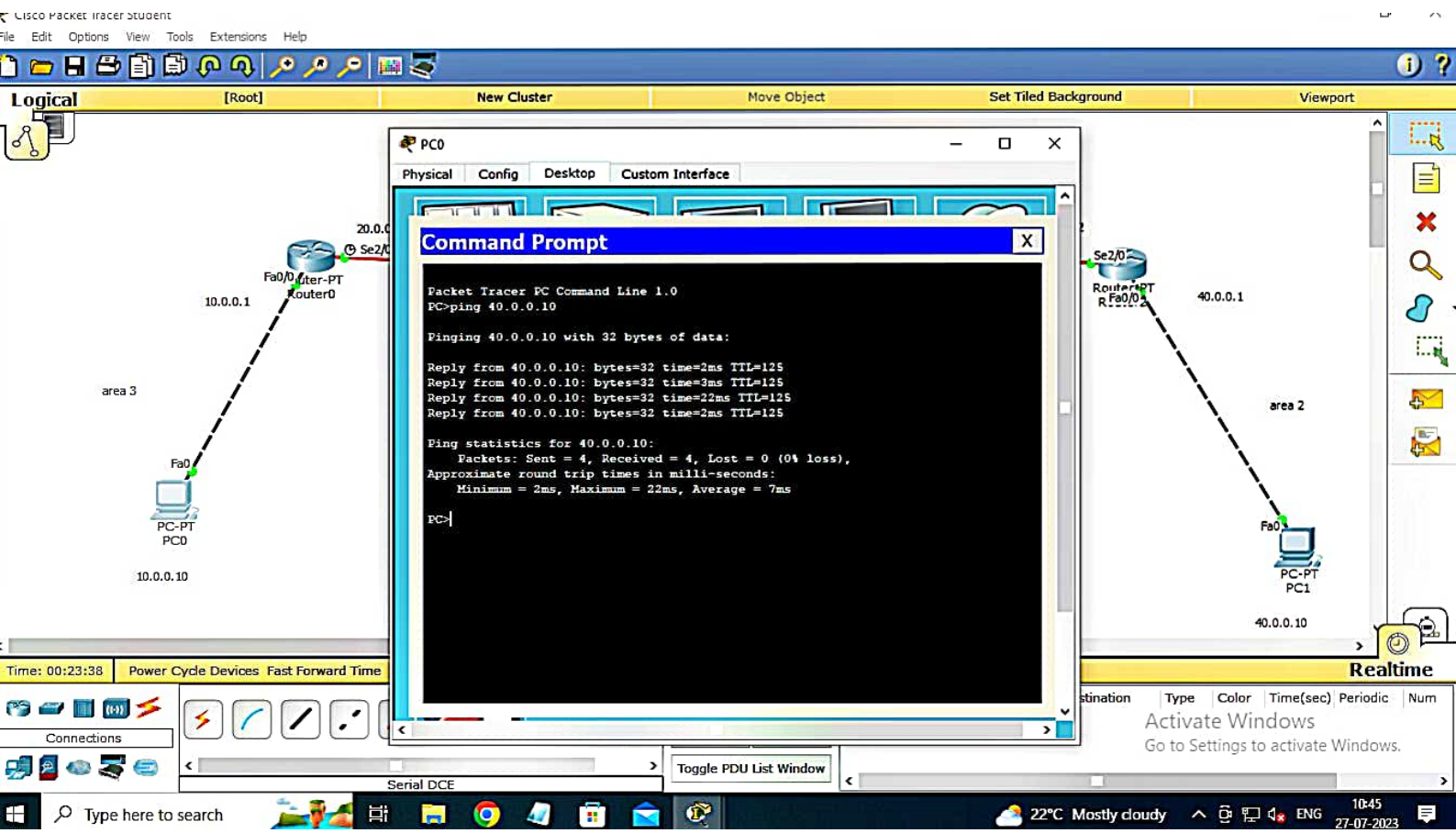
IP route =>

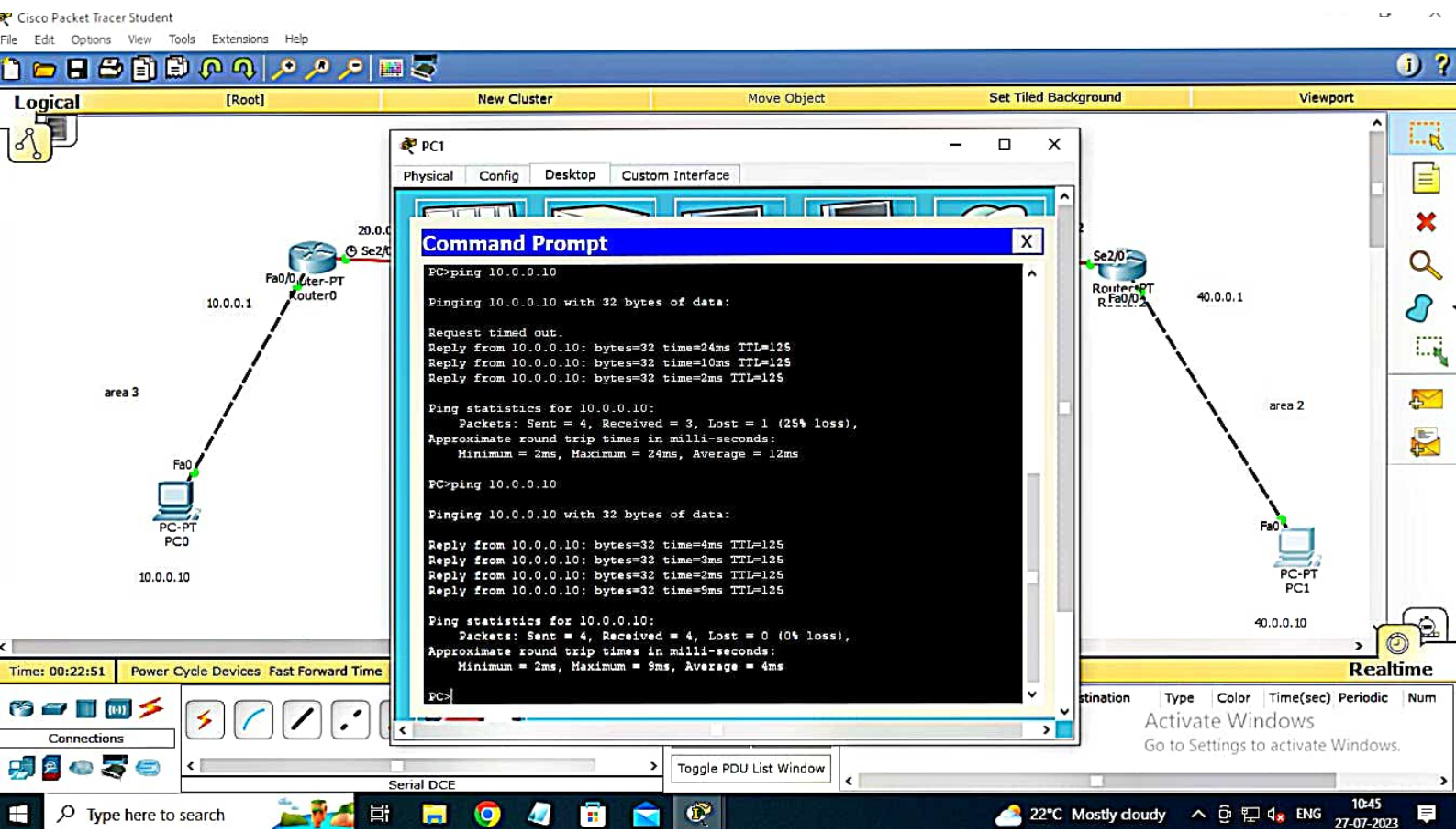
```
C    10.0.0.0/8 is directly connected, fastethernet 0/0
     20.0.0.0/8 is variably subnetted, 2 subnets, 2 mask
C       20.0.0.0/8 is directly connected, serial 2/0
C       20.0.0.2/32 is directly connected, serial 2/0
O    30.0.0.0/8 [110/128] via 20.0.0.2, 00:03:23, serial 2/
O IA 40.0.0.0/8 [110/129] via 20.0.0.2, 00:03:23, serial 2/0
C    127.16.0.0/16 is directly connected, Loopback 0
```

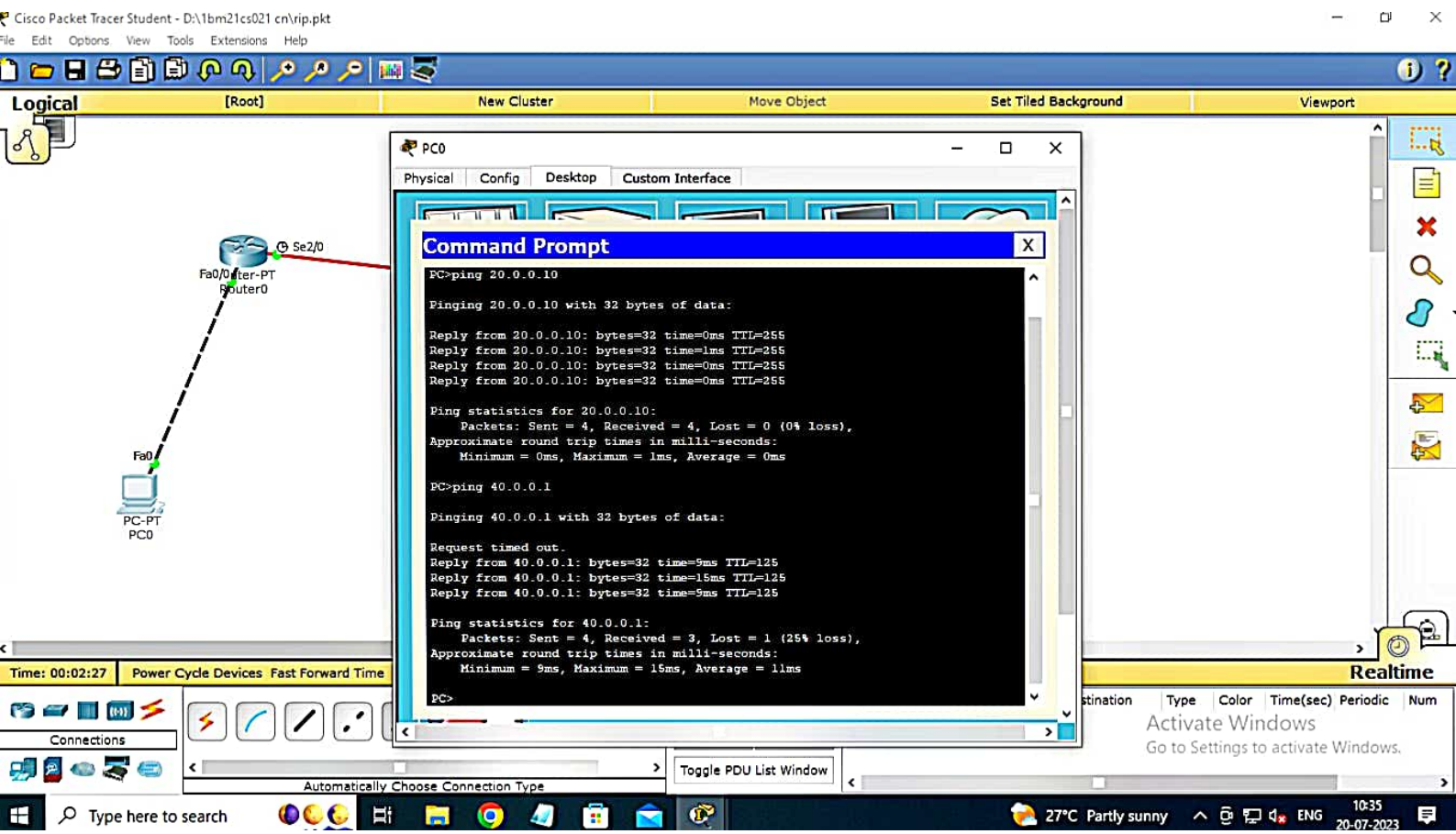
Observation:

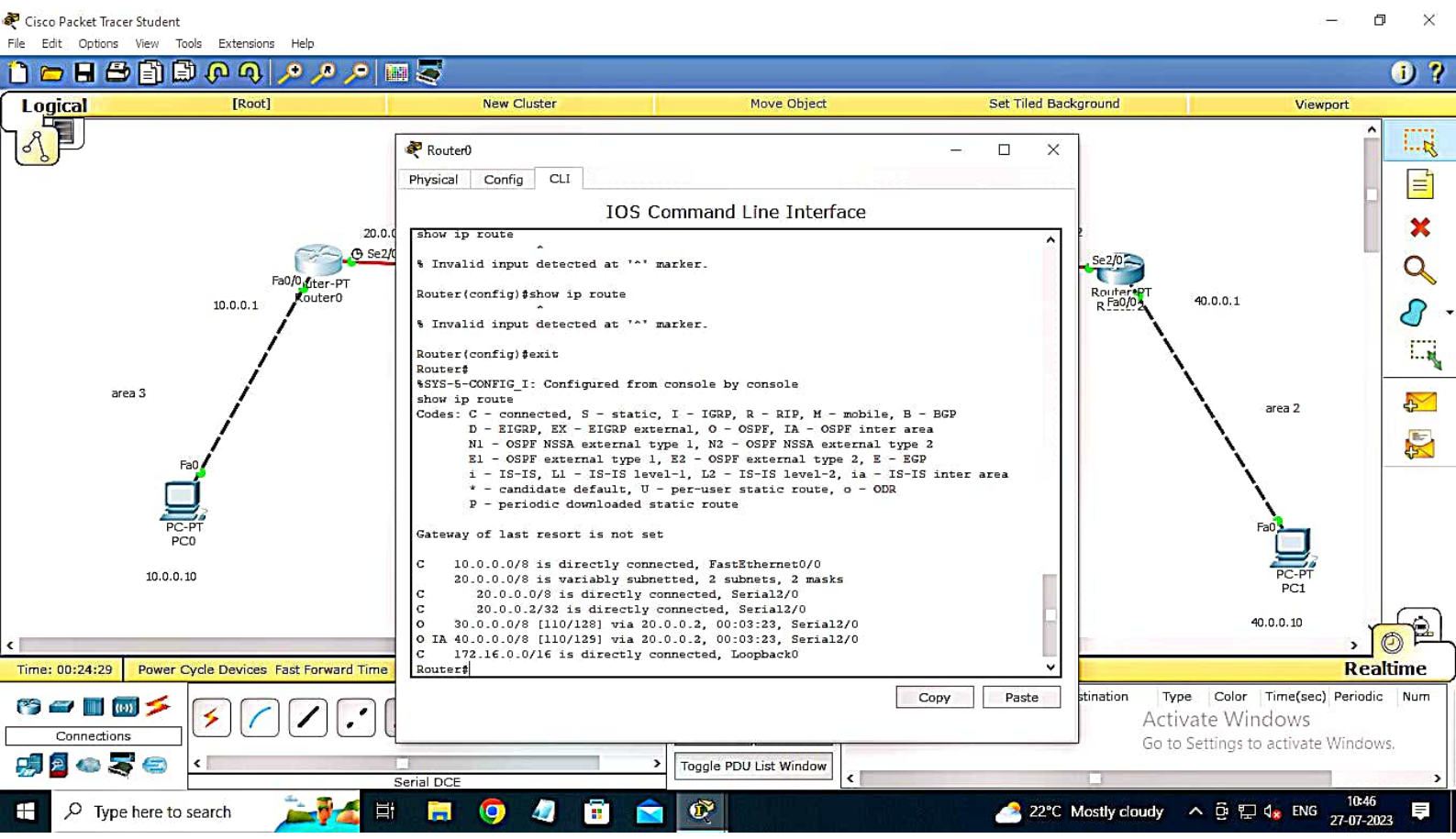
- OSPS (open shortest path first) is a link state routing protocol that is used to find the best path between the source and the destination router using its own shortest path first
- To keep routers active we have to configure the routers using loop back
- OSPF we virtual link to connect to the backbone through a non back bone area

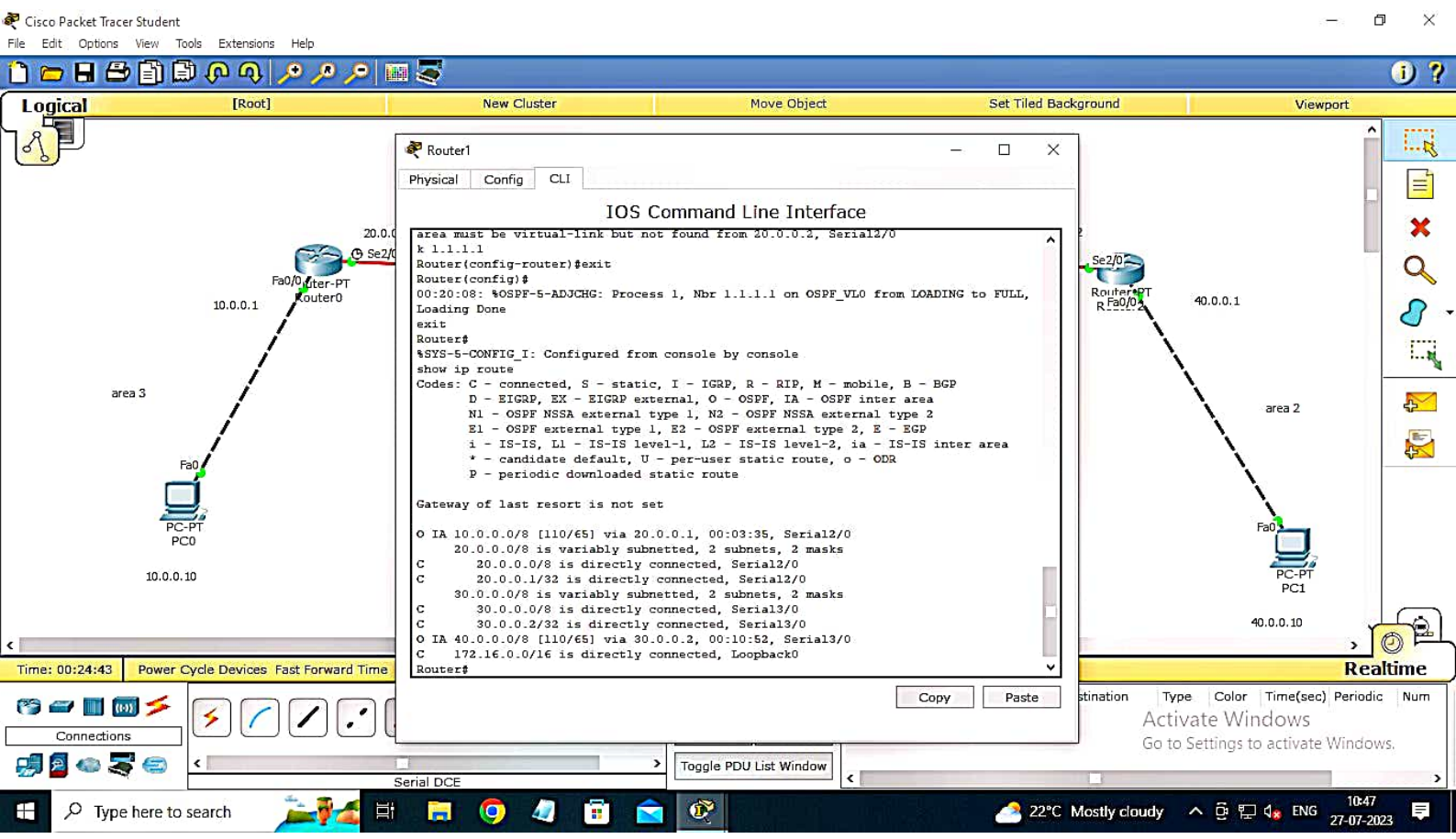

Cisco Packet Tracer Student
File Edit Options View Tools Extensions Help
Logical
[Root]
New Cluster
Move Object
Set Tiled Background
Viewport
area 1
area 0
20.0.0.1
20.0.0.2
30.0.0.2
Se2/0
Se2/0
Se3/0
Se2/0
Fa0/0
Router-PT
Router0
Router-PT
Router1
Router-PT
10.0.0.1
30.0.0.1
40.0.0.1
area 3
area 2
Fa0
PC-PT
PC0
10.0.0.10
Fa0
PC-PT
PC1
40.0.0.10
Time: 00:28:48
Power Cycle Devices
Fast Forward Time
Realtime
Connections
Serial DCE
Scenario 0
New
Delete
Toggle PDU List Window
Fire
Last Status
Source
Destination
Type
Color
Time(sec)
Periodic
Num
Activate Windows
Go to Settings to activate Windows.
Type here to search
22°C Mostly cloudy
ENG
10:51
27-07-2023

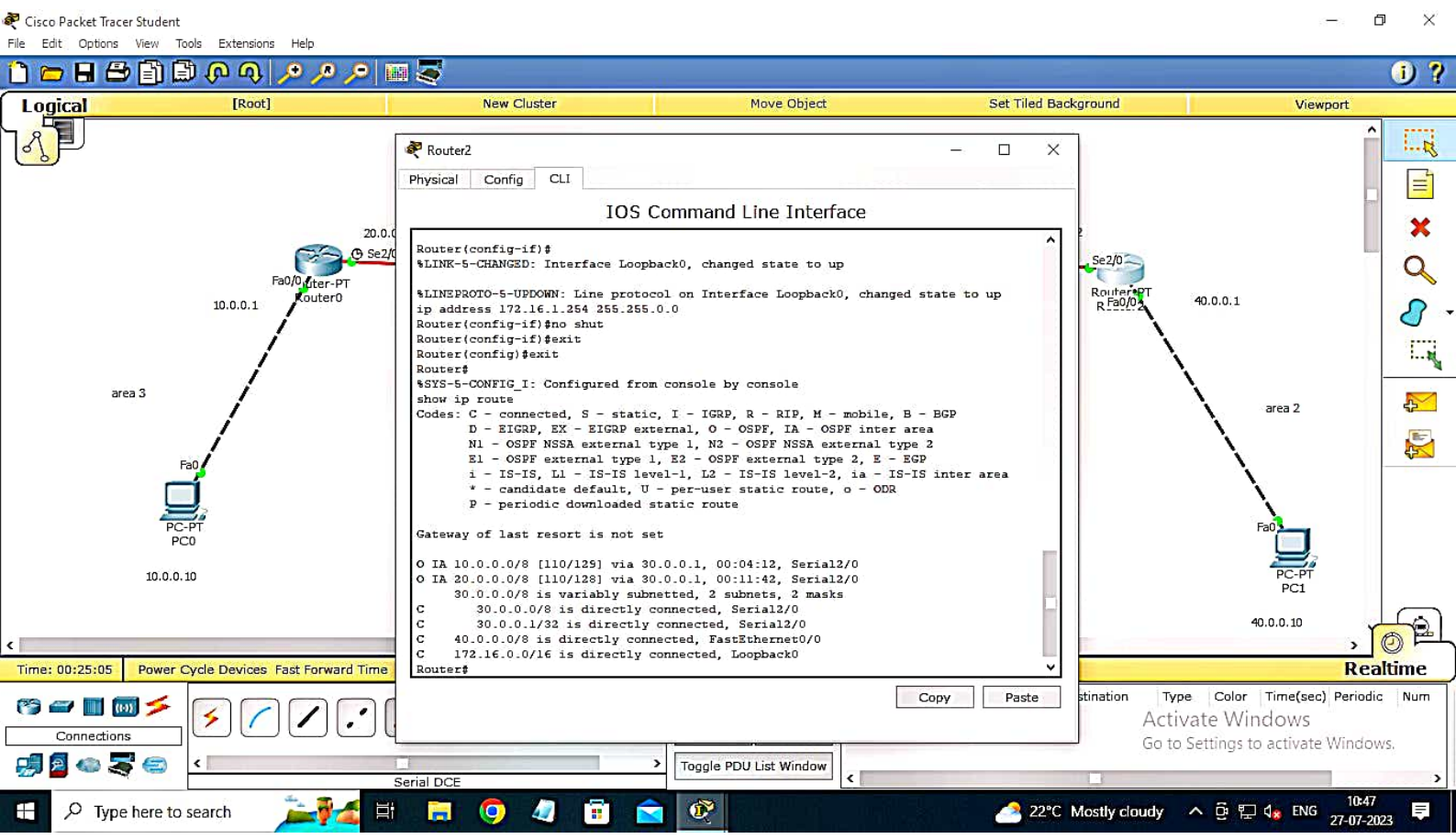

Cisco Packet Tracer Student
File Edit Options View Tools Extensions Help
Logical
[Root]
New Cluster
Move Object
Set Tiled Background
Viewport
PC0
Physical
Config
Desktop
Custom Interface
Command Prompt
Packet Tracer PC Command Line 1.0
PC>ping 40.0.0.10
Pinging 40.0.0.10 with 32 bytes of data:
Reply from 40.0.0.10: bytes=32 time=2ms TTL=125
Reply from 40.0.0.10: bytes=32 time=3ms TTL=125
Reply from 40.0.0.10: bytes=32 time=22ms TTL=125
Reply from 40.0.0.10: bytes=32 time=2ms TTL=125
Ping statistics for 40.0.0.10:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 2ms, Maximum = 22ms, Average = 7ms
PC>
Router-PT
Router0
Fa0/0
10.0.0.1
area 3
Fa0
PC-PT
PC0
10.0.0.10
Se2/0
40.0.0.1
area 2
PC-PT
PC1
40.0.0.10
Time: 00:23:38
Power Cycle Devices Fast Forward Time
Realtime
Connections
Serial DCE
Toggle PDU List Window
Type
Color
Time(sec)
Periodic
Num
Activate Windows
Go to Settings to activate Windows.
Type here to search
22°C Mostly cloudy
ENG
10:45
27-07-2023


Cisco Packet Tracer Student
File Edit Options View Tools Extensions Help
Logical
[Root]
New Cluster
Move Object
Set Tiled Background
Viewport
PC1
Physical
Config
Desktop
Custom Interface
Command Prompt
PC>ping 10.0.0.10
Pinging 10.0.0.10 with 32 bytes of data:
Request timed out.
Reply from 10.0.0.10: bytes=32 time=24ms TTL=125
Reply from 10.0.0.10: bytes=32 time=10ms TTL=125
Reply from 10.0.0.10: bytes=32 time=2ms TTL=125
Ping statistics for 10.0.0.10:
Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
Minimum = 2ms, Maximum = 24ms, Average = 12ms
PC>ping 10.0.0.10
Pinging 10.0.0.10 with 32 bytes of data:
Reply from 10.0.0.10: bytes=32 time=4ms TTL=125
Reply from 10.0.0.10: bytes=32 time=3ms TTL=125
Reply from 10.0.0.10: bytes=32 time=2ms TTL=125
Reply from 10.0.0.10: bytes=32 time=9ms TTL=125
Ping statistics for 10.0.0.10:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 2ms, Maximum = 9ms, Average = 4ms
PC>
Fa0/0
Router-PT
Router0
10.0.0.1
area 3
Fa0
PC-PT
PC0
10.0.0.10
Se2/0
Router-PT
Fa0/0
40.0.0.1
area 2
Fa0
PC-PT
PC1
40.0.0.10
Time: 00:22:51
Power Cycle Devices
Fast Forward Time
Realtime
Connections
Serial DCE
Toggle PDU List Window
Type
Color
Time(sec)
Periodic
Num
Activate Windows
Go to Settings to activate Windows.
Type here to search
22°C Mostly cloudy
ENG
10:45
27-07-2023


Cisco Packet Tracer Student - D:\1bm21cs021 cn\rip.pkt
File Edit Options View Tools Extensions Help
Logical
[Root]
New Cluster
Move Object
Set Tiled Background
Viewport
PC0
Physical
Config
Desktop
Custom Interface
Command Prompt
PC>ping 20.0.0.10
Pinging 20.0.0.10 with 32 bytes of data:
Reply from 20.0.0.10: bytes=32 time=0ms TTL=255
Reply from 20.0.0.10: bytes=32 time=1ms TTL=255
Reply from 20.0.0.10: bytes=32 time=0ms TTL=255
Reply from 20.0.0.10: bytes=32 time=0ms TTL=255
Ping statistics for 20.0.0.10:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 0ms, Maximum = 1ms, Average = 0ms
PC>ping 40.0.0.1
Pinging 40.0.0.1 with 32 bytes of data:
Request timed out.
Reply from 40.0.0.1: bytes=32 time=9ms TTL=125
Reply from 40.0.0.1: bytes=32 time=15ms TTL=125
Reply from 40.0.0.1: bytes=32 time=9ms TTL=125
Ping statistics for 40.0.0.1:
Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
Minimum = 9ms, Maximum = 15ms, Average = 11ms
PC>
Se2/0
Fa0
PC-PT
PC0
Time: 00:02:27
Power Cycle Devices
Fast Forward Time
Realtime
Connections
Automatically Choose Connection Type
Toggle PDU List Window
Type
Color
Time(sec)
Periodic
Num
Activate Windows
Go to Settings to activate Windows.
Type here to search
27°C Partly sunny
ENG
10:35
20-07-2023


Cisco Packet Tracer Student
File Edit Options View Tools Extensions Help
Logical
[Root]
New Cluster
Move Object
Set Tiled Background
Viewport
Router0
Physical
Config
CLI
IOS Command Line Interface
show ip route
% Invalid input detected at '^' marker.
Router(config)$show ip route
% Invalid input detected at '^' marker.
Router(config)$exit
Router#
%SYS-5-CONFIG_I: Configured from console by console
show ip route
Codes: C - connected, S - static, I - IGRP, 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
C 10.0.0.0/8 is directly connected, FastEthernet0/0
20.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C 20.0.0.0/8 is directly connected, Serial2/0
C 20.0.0.2/32 is directly connected, Serial2/0
O 30.0.0.0/8 [110/128] via 20.0.0.2, 00:03:23, Serial2/0
O IA 40.0.0.0/8 [110/129] via 20.0.0.2, 00:03:23, Serial2/0
C 172.16.0.0/16 is directly connected, Loopback0
Router#
Copy
Paste
Fa0/0
Router-PT
Router0
10.0.0.1
area 3
Fa0
PC-PT
PC0
10.0.0.10
Se2/0
Router-PT
Fa0/0
40.0.0.1
area 2
Fa0
PC-PT
PC1
40.0.0.10
Time: 00:24:29
Power Cycle Devices
Fast Forward Time
Realtime
Connections
Serial DCE
Toggle PDU List Window
Type
Color
Time(sec)
Periodic
Num
Activate Windows
Go to Settings to activate Windows.
Type here to search
22°C Mostly cloudy
ENG
10:46
27-07-2023


Cisco Packet Tracer Student
File Edit Options View Tools Extensions Help
Logical
[Root]
New Cluster
Move Object
Set Tiled Background
Viewport
Router1
Physical
Config
CLI
IOS Command Line Interface
area must be virtual-link but not found from 20.0.0.2, Serial2/0
k 1.1.1.1
Router(config-router)#exit
Router(config)#
00:20:08: %OSPF-5-ADJCHG: Process 1, Nbr 1.1.1.1 on OSPF_VL0 from LOADING to FULL,
Loading Done
exit
Router#
%SYS-5-CONFIG_I: Configured from console by console
show ip route
Codes: C - connected, S - static, I - IGRP, 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
O IA 10.0.0.0/8 [110/65] via 20.0.0.1, 00:03:35, Serial2/0
20.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C 20.0.0.0/8 is directly connected, Serial2/0
C 20.0.0.1/32 is directly connected, Serial2/0
30.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C 30.0.0.0/8 is directly connected, Serial3/0
C 30.0.0.2/32 is directly connected, Serial3/0
O IA 40.0.0.0/8 [110/65] via 30.0.0.2, 00:10:52, Serial3/0
C 172.16.0.0/16 is directly connected, Loopback0
Router#
Copy
Paste
10.0.0.1
area 3
Fa0
PC-PT
PC0
10.0.0.10
Se2/0
Router-PT
Router0
Fa0/0
Se2/0
Router-PT
Fa0/0
40.0.0.1
area 2
Fa0
PC-PT
PC1
40.0.0.10
Time: 00:24:43
Power Cycle Devices
Fast Forward Time
Realtime
Connections
Serial DCE
Toggle PDU List Window
Type
Color
Time(sec)
Periodic
Num
Activate Windows
Go to Settings to activate Windows.
Type here to search
22°C Mostly cloudy
ENG
10:47
27-07-2023


Cisco Packet Tracer Student
File Edit Options View Tools Extensions Help
Logical
[Root]
New Cluster
Move Object
Set Tiled Background
Viewport
Router2
Physical
Config
CLI
IOS Command Line Interface
Router(config-if)$
%LINK-5-CHANGED: Interface Loopback0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback0, changed state to up
ip address 172.16.1.254 255.255.0.0
Router(config-if)$no shut
Router(config-if)$exit
Router(config)$exit
Router$
%SYS-5-CONFIG_I: Configured from console by console
show ip route
Codes: C - connected, S - static, I - IGRP, 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
O IA 10.0.0.0/8 [110/129] via 30.0.0.1, 00:04:12, Serial2/0
O IA 20.0.0.0/8 [110/128] via 30.0.0.1, 00:11:42, Serial2/0
30.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C 30.0.0.0/8 is directly connected, Serial2/0
C 30.0.0.1/32 is directly connected, Serial2/0
C 40.0.0.0/8 is directly connected, FastEthernet0/0
C 172.16.0.0/16 is directly connected, Loopback0
Router$
Copy
Paste
10.0.0.1
area 3
Fa0
PC-PT
PC0
10.0.0.10
Se2/0
Fa0/0
Router-PT
Router0
40.0.0.1
area 2
PC-PT
PC1
40.0.0.10
Time: 00:25:05
Power Cycle Devices
Fast Forward Time
Realtime
Connections
Toggle PDU List Window
Serial DCE
Type
Color
Time(sec)
Periodic
Num
Activate Windows
Go to Settings to activate Windows.
Type here to search
22°C Mostly cloudy
ENG
10:47
27-07-2023