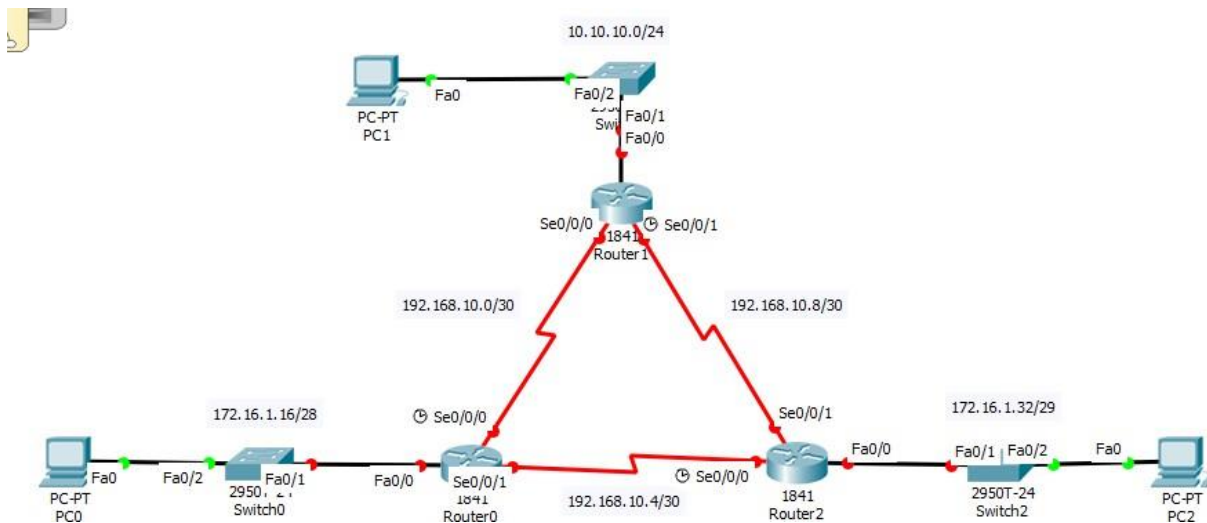
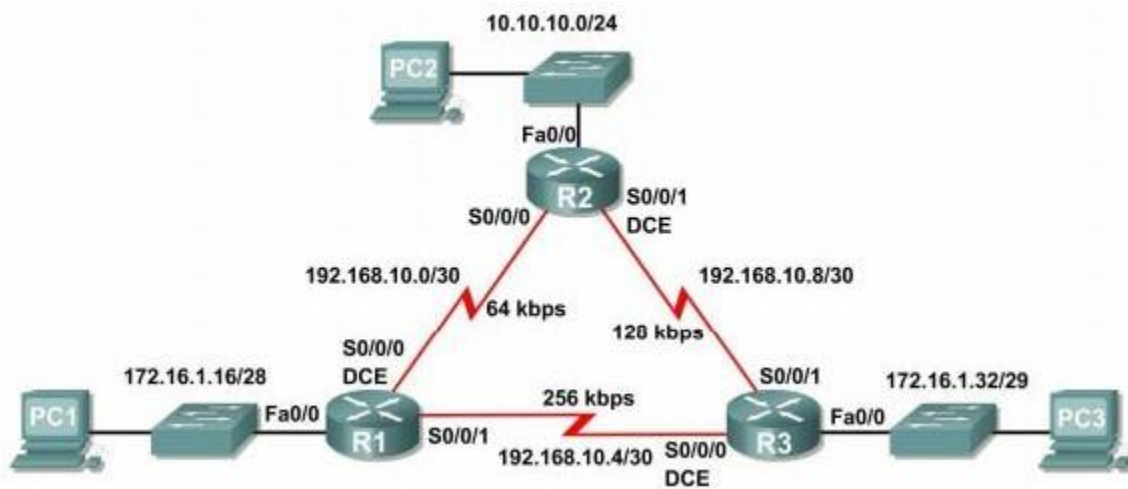


BÀI THỰC HÀNH SỐ 3 – THIẾT KẾ MẠNG

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Lab: Basic OSPF Configuration Lab



Device	Interface	IP Address	Subnet Mask	Default Gateway
R1	Fa0/0	172.16.1.17	255.255.255.240	N/A
	S0/0/0	192.168.10.1	255.255.255.252	N/A
	S0/0/1	192.168.10.5	255.255.255.252	N/A
R2	Fa0/0	10.10.10.1	255.255.255.0	N/A
	S0/0/0	192.168.10.2	255.255.255.252	N/A
	S0/0/1	192.168.10.9	255.255.255.252	N/A
R3	Fa0/0	172.16.1.33	255.255.255.248	N/A
	S0/0/0	192.168.10.6	255.255.255.252	N/A
	S0/0/1	192.168.10.10	255.255.255.252	N/A
PC1	NIC	172.16.1.20	255.255.255.240	172.16.1.17
PC2	NIC	10.10.10.10	255.255.255.0	10.10.10.1
PC3	NIC	172.16.1.35	255.255.255.248	172.16.1.33

- Cấu hình địa chỉ IP, Subnet Mask và Default Gateway cho các thiết bị
- Cấu hình Router R1

Router>en

Router#conf t

Enter configuration commands, one per line. End with CNTL/Z.

Router(config)#int f0/0

Router(config-if)#ip add 172.16.1.17 255.255.255.240

Router(config-if)#no shut

Router(config-if)#

%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up

Router(config-if)#exit

Router(config)#int s0/0/0

Router(config-if)#ip add 192.168.10.1 255.255.255.252

Router(config-if)#clock rate 56000

Router(config-if)#no shut

%LINK-5-CHANGED: Interface Serial0/0/0, changed state to down

Router(config-if)#

```
Router(config-if)#exit
Router(config)#int s0/0/1
Router(config-if)#ip add 192.168.10.5 255.255.255.252
Router(config-if)#no shut
```

```
%LINK-5-CHANGED: Interface Serial0/0/1, changed state to down
Router(config-if)#exit
Router(config)#hostname R1
R1(config)#exit
R1#
%SYS-5-CONFIG_I: Configured from console by console
```

```
R1#show ip int brief
Interface IP-Address OK? Method Status Protocol
FastEthernet0/0 172.16.1.17 YES manual up up
FastEthernet0/1 unassigned YES unset administratively down down
Serial0/0/0 192.168.10.1 YES manual down down
Serial0/0/1 192.168.10.5 YES manual down down
Vlan1 unassigned YES unset administratively down down
```

- **Cấu hình Router R2**

```
Router>en
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int f0/0
Router(config-if)#ip add 10.10.10.1 255.255.255.0
Router(config-if)#no shut
```

```
Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up
```

```
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
```

```
Router(config-if)#exit
Router(config)#int s0/0/1
Router(config-if)#ip add 192.168.10.9 255.255.255.252
Router(config-if)#clock rate 56000
Router(config-if)#no shut
```

```
%LINK-5-CHANGED: Interface Serial0/0/1, changed state to down
Router(config-if)#exit
Router(config)#int s0/0/0
Router(config-if)#ip add 192.168.10.2 255.255.255.252
Router(config-if)#no shut
```

```
Router(config-if)#
```

%LINK-5-CHANGED: Interface Serial0/0/0, changed state to up

Router(config-if)#

%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/0, changed state to up

Router(config-if)#exit

Router(config)#hostname R2

R2(config)#exit

R2#

%SYS-5-CONFIG_I: Configured from console by console

R2#show ip int brief

Interface IP-Address OK? Method Status Protocol

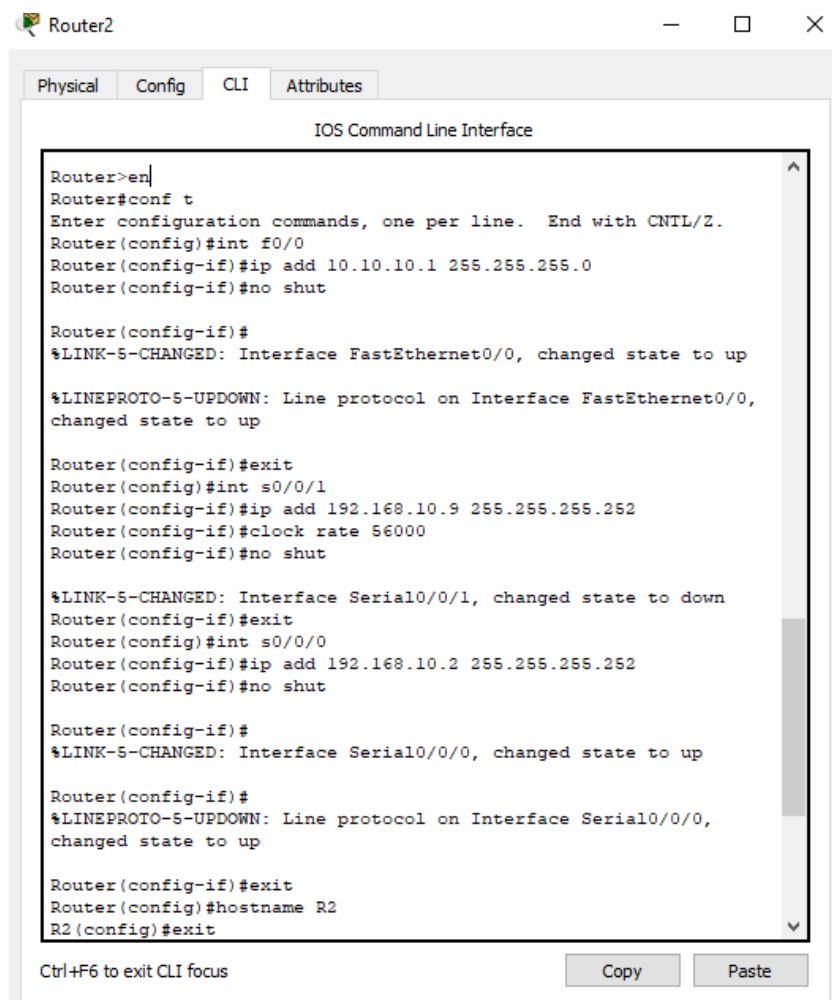
FastEthernet0/0 10.10.10.1 YES manual up up

FastEthernet0/1 unassigned YES unset administratively down down

Serial0/0/0 192.168.10.2 YES manual up up

Serial0/0/1 192.168.10.9 YES manual down down

Vlan1 unassigned YES unset administratively down down



- Cấu hình Router R3

```
Router>en
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int f0/0
Router(config-if)#ip add 172.16.1.33 255.255.255.248
Router(config-if)#no shut

Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up

Router(config-if)#exit
Router(config)#int s0/0/0
Router(config-if)#ip add 192.168.10.6 255.255.255.252
Router(config-if)#clock rate 56000
Router(config-if)#no shut

Router(config-if)#
%LINK-5-CHANGED: Interface Serial0/0/0, changed state to up

Router(config-if)#exit
Router(config)#int 192
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/0, changed state
Router(config)#int s0/0/1
Router(config-if)#ip add 192.168.10.10 255.255.255.252
Router(config-if)#no shut

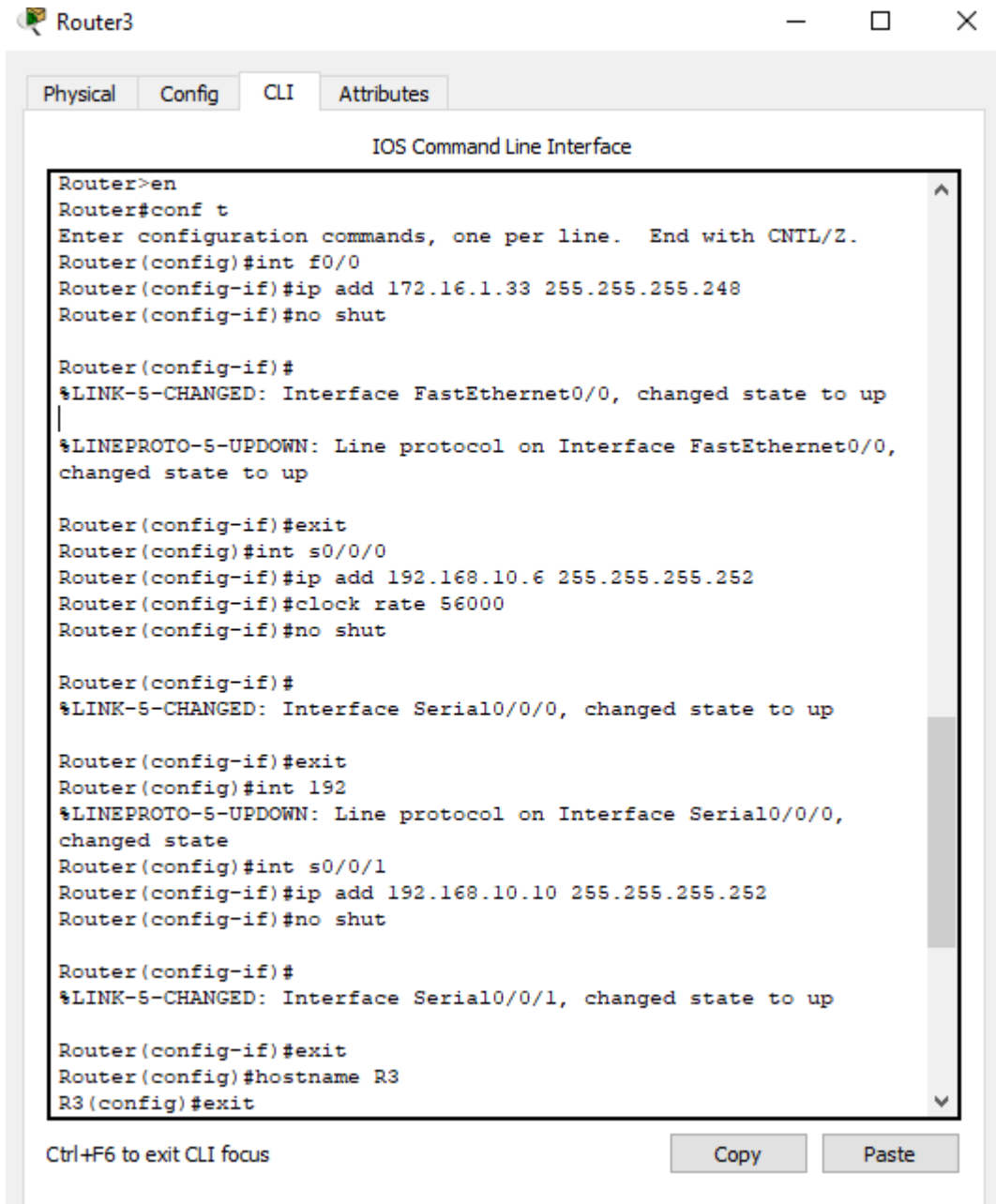
Router(config-if)#
%LINK-5-CHANGED: Interface Serial0/0/1, changed state to up

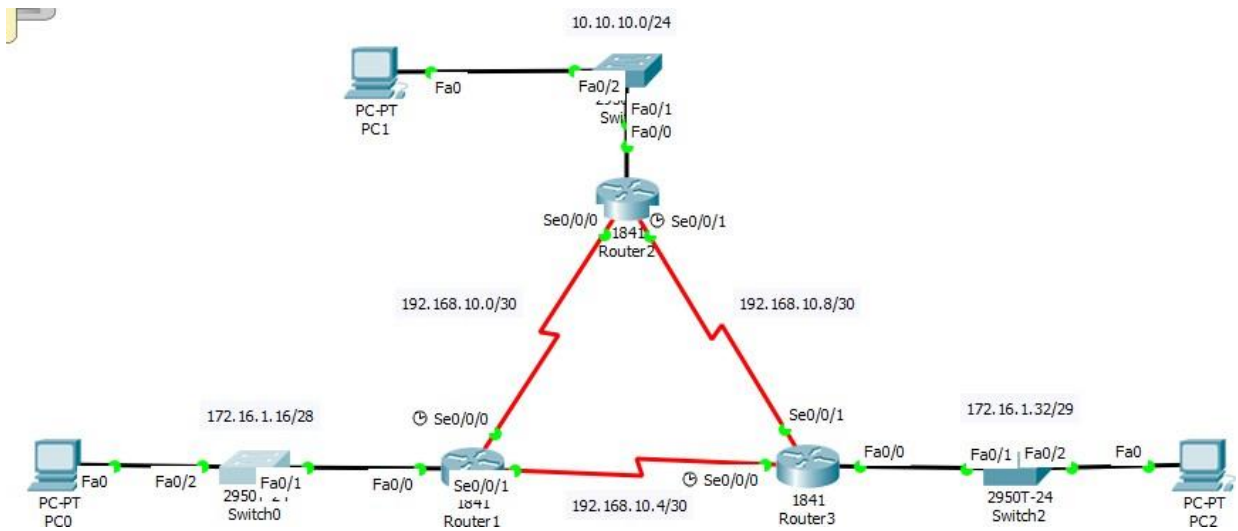
Router(config-if)#exit
Router(config)#hostname R3
R3(config)#exit
R3#
%SYS-5-CONFIG_I: Configured from console by console

R3#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/1, changed state to up

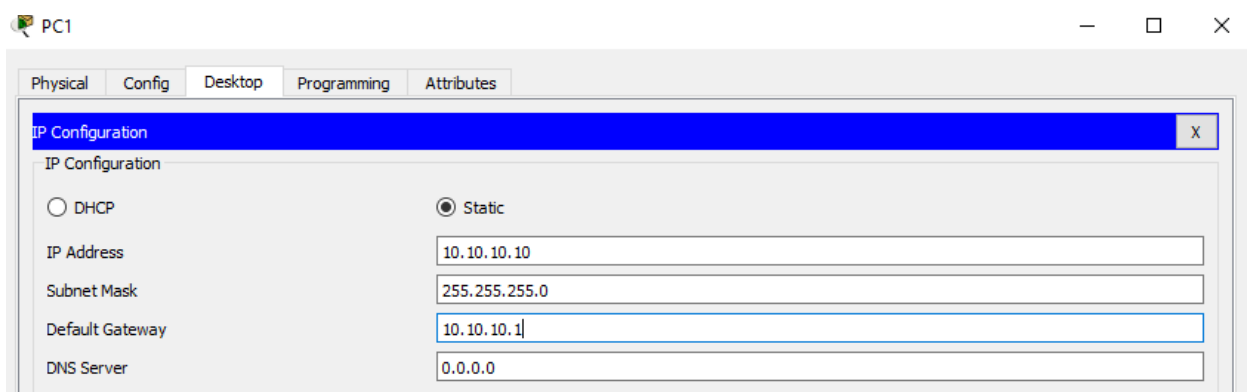
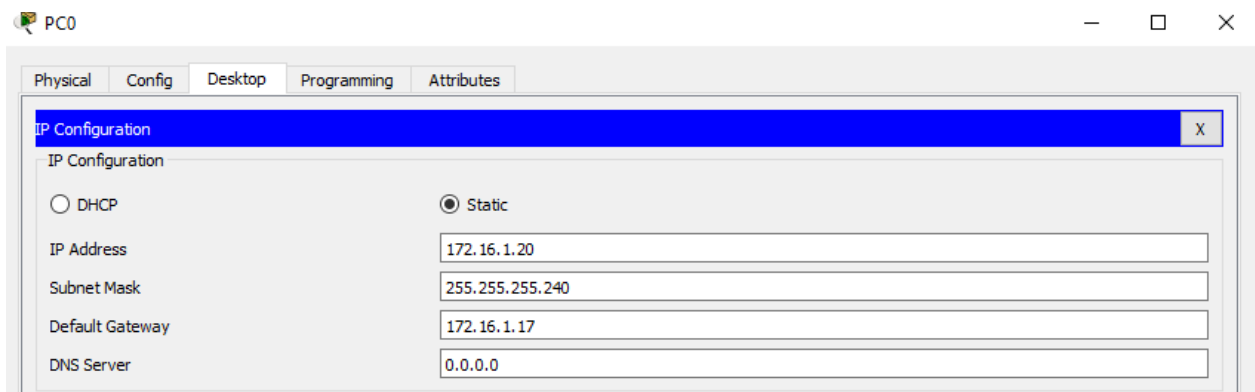
R3#show ip int brief
Interface IP-Address OK? Method Status Protocol
FastEthernet0/0 172.16.1.33 YES manual up up
FastEthernet0/1 unassigned YES unset administratively down down
```

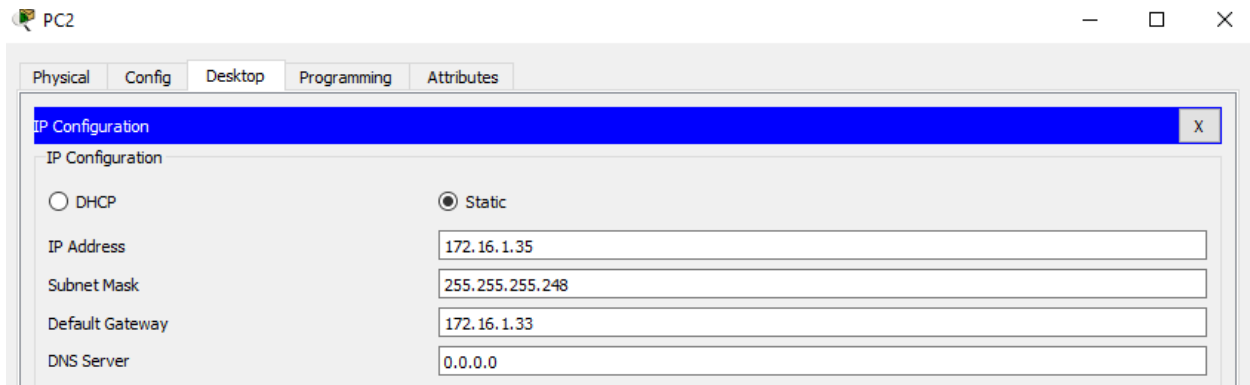
Serial0/0/0 192.168.10.6 YES manual up up
Serial0/0/1 192.168.10.10 YES manual up up
Vlan1 unassigned YES unset administratively down down





- Cấu hình các PC





- Mở cmd của 1 PC bất kỳ Ping thử

PC0

```
Packet Tracer PC Command Line 1.0
C:\>ping 172.16.1.20

Pinging 172.16.1.20 with 32 bytes of data:

Reply from 172.16.1.20: bytes=32 time=3ms TTL=128
Reply from 172.16.1.20: bytes=32 time<1ms TTL=128
Reply from 172.16.1.20: bytes=32 time=1ms TTL=128
Reply from 172.16.1.20: bytes=32 time=11ms TTL=128

Ping statistics for 172.16.1.20:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 11ms, Average = 3ms

C:\>
```


Ta thử kiểm tra xem tại PC 0 có ping được PC1 hoặc PC2 k?

```
C:\>ping 10.10.10.10

Pinging 10.10.10.10 with 32 bytes of data:

Reply from 172.16.1.17: Destination host unreachable.
Reply from 172.16.1.17: Destination host unreachable.
Reply from 172.16.1.17: Destination host unreachable.
Reply from 172.16.1.17: Destination host unreachable.

Ping statistics for 10.10.10.10:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>
```

=>Do đó ta cần cấu hình OSPF cho các Router để các PC có thể kết nối với nhau

- Ta thiết lập giao thức OSPF cho các Router nói chuyện với nhau

Thiết lập cho R1

```
R1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#router ospf 1
R1(config-router)#network 172.16.1.16 0.0.0.15 area 0
R1(config-router)#network 192.168.10.0 0.0.0.3 area 0
R1(config-router)#network 192.168.10.4 0.0.0.3 area 0
R1(config-router)#end
R1#
```

Thiết lập cho R2

```
R2#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R2(config)#router ospf 1
R2(config-router)#network 10.10.10.0 0.0.0.255 area 0
R2(config-router)#network 192.168.10.0 0.0.0.3 area 0
R2(config-router)#network
00:12:30: %OSPF-5-ADJCHG: Process 1, Nbr 192.168.10.5 on
Serial0/0/0 from LOADING to FULL, Loading Done

% Incomplete command.
R2(config-router)#network 192.168.10.8 0.0.0.3
00:12:45: %OSPF-5-ADJCHG: Process 1, Nbr 192.168.10.5 on
Serial0/0/0 from LOADING to FULL, Loading Done
area 0
R2(config-router)#network 192.168.10.8 0.0.0.3 area 0
00:12:55: %OSPF-5-ADJCHG: Process 1, Nbr 192.168.10.5 on
Serial0/0/0 from LOADING to FULL, Loading Done

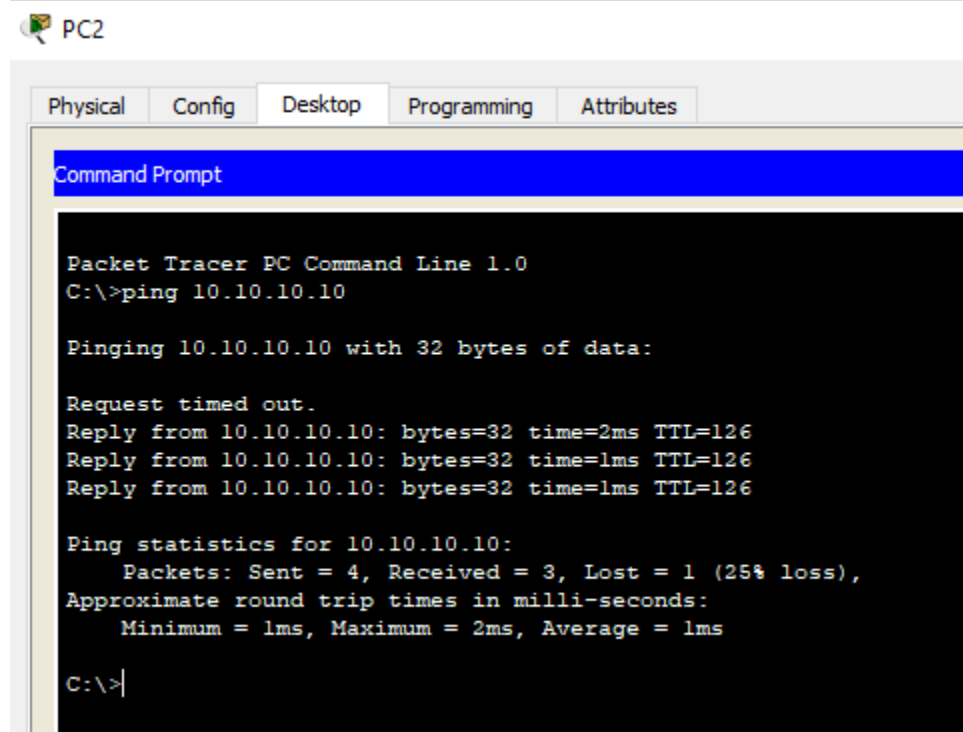
R2(config-router)#network 192.168.10.8 0.0.0.3 area 0
```

Thiết lập cho R3

```
R3#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R3(config)#router ospf 1
R3(config-router)#network 172.16.1.32 0.0.0.7 area 0
R3(config-router)#network 192.168.10.4 0.0.0.3 area 0
R3(config-router)#network 192
00:13:43: %OSPF-5-ADJCHG: Process 1, Nbr 192.168.10.1 on
Serial0/0/0 from LOADING to FULL, Loading Done
.168.10.8 0.0.0.3 area 0
R3(config-router)#network 192.168.10.8 0.0.0.3 area 0
00:13:58: %OSPF-5-ADJCHG: Process 1, Nbr 192.168.10.9 on
Serial0/0/1 from LOADING to FULL, Loading Done

R3(config-router)#network 192.168.10.8 0.0.0.3 area 0
R3(config-router)#end
---
```

- Sau khi cấu hình xong thì ta thử ở PC2 ping đến PC1 thử



- Ta thử gửi 1 gói tin từ PC0 đến PC2

Event List					
Vis.	Time(sec)	Last Device	At Device	Type	Info
	0.000	--	PC0	ICMP	
	0.001	PC0	Switch0	ICMP	
	0.002	Switch0	Router 1	ICMP	
	0.003	Router 1	Router3	ICMP	
	0.004	Router3	Switch2	ICMP	
	0.005	Switch2	PC2	ICMP	
	0.006	PC2	Switch2	ICMP	
	0.007	Switch2	Router3	ICMP	
	0.008	Router3	Router 1	ICMP	
	0.009	Router 1	Switch0	ICMP	
	0.010	Switch0	PC0	ICMP	

Ta thấy gói tin đã được gửi từ PC0->S0->R1->R3->S2->PC2 và trả ngược lại phản hồi gói tin đã được gửi thành công từ PC2->S2->R3->R1->S0->PC0

Task: Configure OSPF Router IDs

Step 1: Examine the current router IDs in the topology.

```
R3#show ip protocols

Routing Protocol is "ospf 1"
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Router ID 192.168.10.10
  Number of areas in this router is 1. 1 normal 0 stub 0 nssa
  Maximum path: 4
  Routing for Networks:
    172.16.1.32 0.0.0.7 area 0
    192.168.10.4 0.0.0.3 area 0
    192.168.10.8 0.0.0.3 area 0


R3#show ip ospf
Routing Process "ospf 1" with ID 192.168.10.10
Supports only single TOS(TOS0) routes
Supports opaque LSA
SPF schedule delay 5 secs, Hold time between two SPFs 10 secs


R3#show ip ospf interface

FastEthernet0/0 is up, line protocol is up
  Internet address is 172.16.1.33/29, Area 0
  Process ID 1, Router ID 192.168.10.10, Network Type BROADCAST,
Cost: 1
  Transmit Delay is 1 sec, State DR, Priority 1
  Designated Router (ID) 192.168.10.10, Interface address
172.16.1.33
  No backup designated router on this network
  Timer intervals configured, Hello 10, Dead 40, Wait 40,
Retransmit 5
    Hello due in 00:00:09
  Index 1/1, flood queue length 0
  Next 0x0(0)/0x0(0)
  Last flood scan length is 1, maximum is 1
  Last flood scan time is 0 msec, maximum is 0 msec
  Neighbor Count is 0, Adjacent neighbor count is 0
  Suppress hello for 0 neighbor(s)
```

Step 2: Use loopback addresses to change the router IDs of the routers in the topology.

```
R1(config)#interface loopback 0

R1(config-if)#ip add 10.1.1.1 255.255.255.255


R2(config)#int loopback 0

R2(config-if)#ip add 10.2.2.2 255.255.255.255
```

```

R3(config)#int loopback 0

R3(config-if)#
%LINK-5-CHANGED: Interface Loopback0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback0,
changed state to up

R3(config-if)#ip add 10.3.3.3 255.255.255.255
R3(config-if)#

```

Step 4: Use the show ip ospf neighbors command to verify that the router IDs have changed.

```
R1#show ip ospf neighbor
```

Neighbor ID	Pri	State	Dead Time	Address
Interface				
10.3.3.3	0	FULL/ -	00:00:30	192.168.10.6
Serial0/0/1				
10.2.2.2	0	FULL/ -	00:00:33	192.168.10.2
Serial0/0/0				

```
R2#show ip ospf neighbor
```

Neighbor ID	Pri	State	Dead Time	Address
Interface				
10.3.3.3	0	FULL/ -	00:00:36	192.168.10.10
Serial0/0/1				
10.1.1.1	0	FULL/ -	00:00:37	192.168.10.1
Serial0/0/0				

```
R3#show ip ospf neighbor
```

Neighbor ID	Pri	State	Dead Time	Address
Interface				
10.2.2.2	0	FULL/ -	00:00:34	192.168.10.9
Serial0/0/1				
10.1.1.1	0	FULL/ -	00:00:38	192.168.10.5
Serial0/0/0				

Step 5: Use the router-id command to change the router ID on the R1 router.

```

R1(config)#router ospf 1
R1(config-router)#router-id 10.4.4.4
Reload or use "clear ip ospf process" command, for this to take effect

```

```

R1#(config-router)#end
R1#clear ip ospf process
Reset ALL OSPF processes? [no]:yes
R1#

```

Step 6: Use the show ip ospf neighbor command on router R2 to verify that the router ID of R1 has been changed.

```
R2#show ip ospf neighbor
```

Neighbor ID	Pri	State	Dead Time	Address
Interface				
10.3.3.3	0	FULL/ -	00:00:36	192.168.10.10
Serial0/0/1				
10.4.4.4	0	FULL/ -	00:00:37	192.168.10.1
Serial0/0/0				

Step 7: Remove the configured router ID with the no form of the router-id command.

```
R1(config)#router ospf 1
R1(config-router)#router-id 10.4.4.4
Reload or use "clear ip ospf process" command, for this to take effect
```

Step 8: Restart the OSPF process using the clear ip ospf process command.

```
R1(config-router)#end
R1#clear ip ospf process
Reset ALL OSPF processes? [no]:yes
R1#
```

Task: Verify OSPF Operation

Step 1: On the R1 router, Use the show ip ospf neighbor command to view the information about the OSPF neighbor routers R2 and R3.

```
R1#show ip ospf neighbor
```

Neighbor ID	Pri	State	Dead Time	Address
Interface				
10.2.2.2	0	FULL/-	00:00:32	192.168.10.2
Serial0/0/0				
10.3.3.3	0	FULL/-	00:00:32	192.168.10.6
Serial0/0/1				

```
R1#
```

Step 2: On the R1 router, use the show ip protocols command to view information about the routing protocol operation.

```
R1#show ip protocols
```

```
Routing Protocol is "ospf 1"
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Router ID 10.1.1.1
  Number of areas in this router is 1. 1 normal 0 stub 0 nssa
  Maximum path: 4
  Routing for Networks:
    172.16.1.16 0.0.0.15 area 0
    192.168.10.0 0.0.0.3 area 0
    192.168.10.4 0.0.0.3 area 0
  Routing Information Sources:
    Gateway         Distance      Last Update
    10.2.2.2         110          00:11:43
    10.3.3.3         110          00:11:43
  Distance: (default is 110)
```

```
R1#
```

Task: Examine OSPF Routes in the Routing Tables

```
R1#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
```

```
    10.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C       10.1.1.1/32 is directly connected, Loopback0
O       10.10.10.0/24 [110/65] via 192.168.10.2, 00:01:02, Serial0/0/0
    172.16.0.0/16 is variably subnetted, 2 subnets, 2 masks
C       172.16.1.16/28 is directly connected, FastEthernet0/0
O       172.16.1.32/29 [110/65] via 192.168.10.6, 00:01:12, Serial0/0/1
    192.168.10.0/30 is subnetted, 3 subnets
C       192.168.10.0 is directly connected, Serial0/0/0
C       192.168.10.4 is directly connected, Serial0/0/1
O       192.168.10.8 [110/128] via 192.168.10.6, 00:01:12, Serial0/0/1
        [110/128] via 192.168.10.2, 00:01:02, Serial0/0/0
```

```
R1#
```

Task: Configure OSPF Cost

Step 1: Use the show ip route command on the R1 router to view the OSPF cost to reach the 10.10.10.0/24 network.

```
R1#show ip route

<output omitted>

    10.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C       10.1.1.1/32 is directly connected, Loopback0
O       10.10.10.0/24 [110/65] via 192.168.10.2, 00:16:56, Serial0/0/0
    172.16.0.0/16 is variably subnetted, 2 subnets, 2 masks
C       172.16.1.16/28 is directly connected, FastEthernet0/0
O       172.16.1.32/29 [110/65] via 192.168.10.6, 00:17:06, Serial0/0/1
    192.168.10.0/30 is subnetted, 3 subnets
C       192.168.10.0 is directly connected, Serial0/0/0
C       192.168.10.4 is directly connected, Serial0/0/1
O       192.168.10.8 [110/128] via 192.168.10.6, 00:17:06, Serial0/0/1
                                [110/128] via 192.168.10.2, 00:16:56, Serial0/0/0
R1#
```

Step 2: Use the show interfaces serial0/0/0 command on the R1 router to view the bandwidth of the Serial 0/0/0 interface.

```
R1#show interfaces serial0/0/0
Serial0/0/0 is up, line protocol is up (connected)
  Hardware is HD64570
  Internet address is 192.168.10.1/30
  MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec, rely 255/255, load
  1/255
  Encapsulation HDLC, loopback not set, keepalive set (10 sec)
  Last input never, output never, output hang never
  Last clearing of "show interface" counters never
  Input queue: 0/75/0 (size/max/drops); Total output drops: 0
```

Step 3: Use the bandwidth command to change the bandwidth of the serial interfaces of the R1 and R2 routers to the actual bandwidth, 64 kbps.

```
R1 router:
R1(config)#interface serial0/0/0
R1(config-if)#bandwidth 64
R1(config-if)#interface serial0/0/1
R1(config-if)#bandwidth 64
```


R2 router:

```
R2(config)#interface serial0/0/0
R2(config-if)#bandwidth 64
R2(config)#interface serial0/0/1
R2(config-if)#bandwidth 64
```

Step 4: Use the show ip ospf interface command on the R1 router to verify the cost of the serial links.

```
R1#show ip ospf interface
```

<output omitted>

```
Serial0/0/0 is up, line protocol is up
  Internet address is 192.168.10.1/30, Area 0
  Process ID 1, Router ID 10.1.1.1, Network Type POINT-TO-POINT, Cost:
1562
  Transmit Delay is 1 sec, State POINT-TO-POINT,
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
  Hello due in 00:00:05
  Index 2/2, flood queue length 0
  Next 0x0(0)/0x0(0)
  Last flood scan length is 1, maximum is 1
  Last flood scan time is 0 msec, maximum is 0 msec
  Neighbor Count is 1 , Adjacent neighbor count is 1
    Adjacent with neighbor 10.2.2.2
  Suppress hello for 0 neighbor(s)
Serial0/0/1 is up, line protocol is up
  Internet address is 192.168.10.5/30, Area 0
  Process ID 1, Router ID 10.1.1.1, Network Type POINT-TO-POINT, Cost:
1562
  Transmit Delay is 1 sec, State POINT-TO-POINT,
```

Step 5: Use the ip ospf cost command to configure the OSPF cost on the R3 router.

```
R3(config)#interface serial0/0/0
R3(config-if)#ip ospf cost 1562
R3(config-if)#interface serial0/0/1
R3(config-if)#ip ospf cost 1562
```

Step 6: Use the show ip ospf interface command on the R3 router to verify that the cost of the link the cost of each of the Serial links is now 1562.

```
Serial0/0/1 is up, line protocol is up
  Internet address is 192.168.10.10/30, Area 0
  Process ID 1, Router ID 10.3.3.3, Network Type POINT-TO-POINT, Cost:
1562
  Transmit Delay is 1 sec, State POINT-TO-POINT,
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    Hello due in 00:00:06
  Index 2/2, flood queue length 0
  Next 0x0(0)/0x0(0)
  Last flood scan length is 1, maximum is 1
  Last flood scan time is 0 msec, maximum is 0 msec
  Neighbor Count is 1 , Adjacent neighbor count is 1
    Adjacent with neighbor 10.2.2.2
  Suppress hello for 0 neighbor(s)
Serial0/0/0 is up, line protocol is up
  Internet address is 192.168.10.6/30, Area 0
  Process ID 1, Router ID 10.3.3.3, Network Type POINT-TO-POINT, Cost:
1562
  Transmit Delay is 1 sec, State POINT-TO-POINT,
```

Task: Redistribute an OSPF Default Route

Step 1: Configure a loopback address on the R1 router to simulate a link to an ISP.

```
R1(config)#interface loopback1

%LINK-5-CHANGED: Interface Loopback1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback1, changed
state to up

R1(config-if)#ip address 172.30.1.1 255.255.255.252
```

Step 2: Configure a static default route on the R1 router.

```
R1(config)#ip route 0.0.0.0 0.0.0.0 loopback1
R1(config)#
```

Step 3: Use the default-information originate command to include the static route in the OSPF updates that are sent from the R1 router.

```
R1(config)#router ospf 1
R1(config-router)#default-information originate
R1(config-router)#
```

Step 4: View the routing table on the R2 router to verify that the static default route is being redistributed via OSPF.

```
R2#show ip route
```

```
<output omitted>
```

```
Gateway of last resort is 192.168.10.1 to network 0.0.0.0
```

```
10.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C    10.2.2.2/32 is directly connected, Loopback0
C    10.10.10.0/24 is directly connected, FastEthernet0/0
172.16.0.0/16 is variably subnetted, 2 subnets, 2 masks
O    172.16.1.16/28 [110/1563] via 192.168.10.1, 00:29:28,
Serial0/0/0
O    172.16.1.32/29 [110/1563] via 192.168.10.10, 00:29:28,
Serial0/0/1
192.168.10.0/30 is subnetted, 3 subnets
C    192.168.10.0 is directly connected, Serial0/0/0
O    192.168.10.4 [110/3124] via 192.168.10.10, 00:25:56,
Serial0/0/1
[110/3124] via 192.168.10.1, 00:25:56, Serial0/0/0
C    192.168.10.8 is directly connected, Serial0/0/1
O*E2 0.0.0.0/0 [110/1] via 192.168.10.1, 00:01:11, Serial0/0/0
R2#
```

Task: Configure Additional OSPF Features

Step 1: Use the auto-cost reference-bandwidth command to adjust the reference bandwidth value.

```
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
```

```
R1(config-router)#auto-cost reference-bandwidth 10000
```

```
% OSPF: Reference bandwidth is changed.
```

```
    Please ensure reference bandwidth is consistent across all
routers.
```

```
R2(config-router)#auto-cost reference-bandwidth 10000
```

```
% OSPF: Reference bandwidth is changed.
```

```
    Please ensure reference bandwidth is consistent across all
routers.
```

```
R3(config-router)#auto-cost reference-bandwidth 10000
```

```
% OSPF: Reference bandwidth is changed.
```

```
    Please ensure reference bandwidth is consistent across all
routers.
```

Step 2: Examine the routing table on the R1 router to verify the change in the OSPF cost metric.

```
Gateway of last resort is 0.0.0.0 to network 0.0.0.0

    10.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C       10.1.1.1/32 is directly connected, Loopback0
O       10.10.10.0/24 [110/65635] via 192.168.10.2, 00:01:01,
Serial0/0/0
    172.16.0.0/16 is variably subnetted, 2 subnets, 2 masks
C       172.16.1.16/28 is directly connected, FastEthernet0/0
O       172.16.1.32/29 [110/65635] via 192.168.10.6, 00:00:51,
Serial0/0/1
    172.30.0.0/30 is subnetted, 1 subnets
C       172.30.1.0 is directly connected, Loopback1
    192.168.10.0/30 is subnetted, 3 subnets
C       192.168.10.0 is directly connected, Serial0/0/0
C       192.168.10.4 is directly connected, Serial0/0/1
O       192.168.10.8 [110/67097] via 192.168.10.2, 00:01:01,
Serial0/0/0
S*    0.0.0.0/0 is directly connected, Loopback1
R1#
```

Step 3: Use the show ip ospf neighbor command on R1 to view the Dead Time counter.

```
R1#show ip ospf neighbor
Neighbor ID      Pri   State           Dead Time   Address
Interface
10.2.2.2         0    FULL/-         00:00:34    192.168.10.2
Serial0/0/0
10.3.3.3         0    FULL/-         00:00:34    192.168.10.6
Serial0/0/1
```

Step 4: Configure the OSPF Hello and Dead intervals.

```
R1(config)#interface serial0/0/0
R1(config-if)#ip ospf hello-interval 5
R1(config-if)#ip ospf dead-interval 20
R1(config-if)#
01:09:04: %OSPF-5-ADJCHG: Process 1, Nbr 10.2.2.2 on Serial0/0/0 from
FULL to DOWN, Neighbor Down: Dead timer expired
01:09:04: %OSPF-5-ADJCHG: Process 1, Nbr 10.2.2.2 on Serial0/0/0 from
FULL to Down: Interface down or detached
```

Step 5: Modify the Dead Timer and Hello Timer intervals.

```
R2(config)#interface serial0/0/0
R2(config-if)#ip ospf hello-interval 5
R2(config-if)#ip ospf dead-interval 20
R2(config-if)#
01:12:10: %OSPF-5-ADJCHG: Process 1, Nbr 10.1.1.1 on Serial0/0/0 from
EXCHANGE to FULL, Exchange Done
```

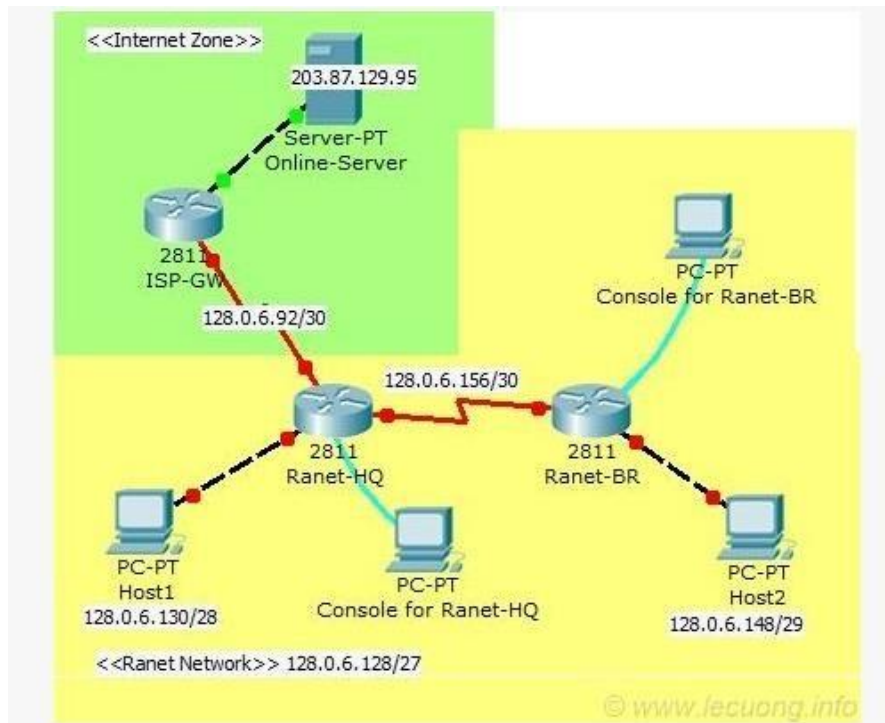
Step 5: Use the show ip ospf interface serial0/0/0 command to verify that the Hello Timer and Dead Timer intervals have been modified.

```
R2#show ip ospf interface serial0/0/0
Serial0/0/0 is up, line protocol is up
  Internet address is 192.168.10.2/30, Area 0
  Process ID 1, Router ID 10.2.2.2, Network Type POINT-TO-POINT, Cost:
1562
  Transmit Delay is 1 sec, State POINT-TO-POINT,
  Timer intervals configured, Hello 5, Dead 20, Wait 20, Retransmit 5
    Hello due in 00:00:00
  Index 3/3, flood queue length 0
  Next 0x0(0)/0x0(0)
  Last flood scan length is 1, maximum is 1
  Last flood scan time is 0 msec, maximum is 0 msec
  Neighbor Count is 1 , Adjacent neighbor count is 1
    Adjacent with neighbor 10.1.1.1
  Suppress hello for 0 neighbor(s)
R2#
```

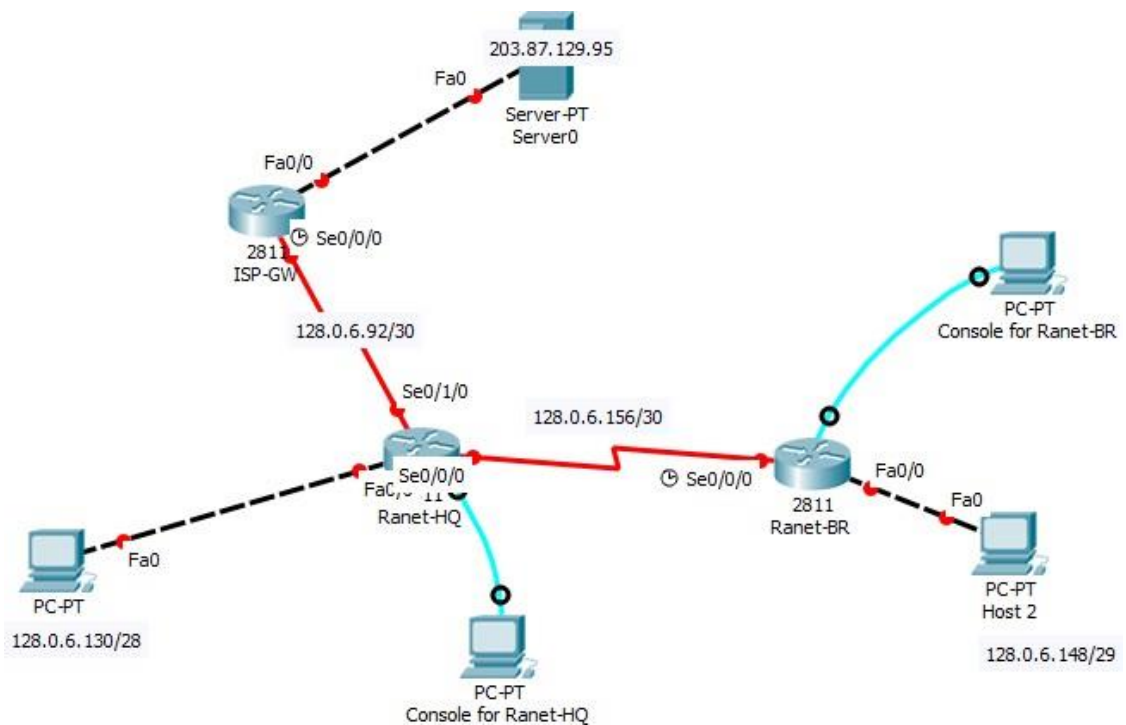
Step 6: Use the show ip ospf neighbor command on R1 to verify that the neighbor adjacency with R2 has been restored.

```
R1#show ip ospf neighbor
Neighbor ID    Pri   State           Dead Time   Address
Interface
10.2.2.2        0    FULL/-          00:00:19    192.168.10.2
Serial0/0/0
10.3.3.3        0    FULL/-          00:00:34    192.168.10.6
Serial0/0/1
R1#
```

LAB - 4.3 IP Routing – OSPF

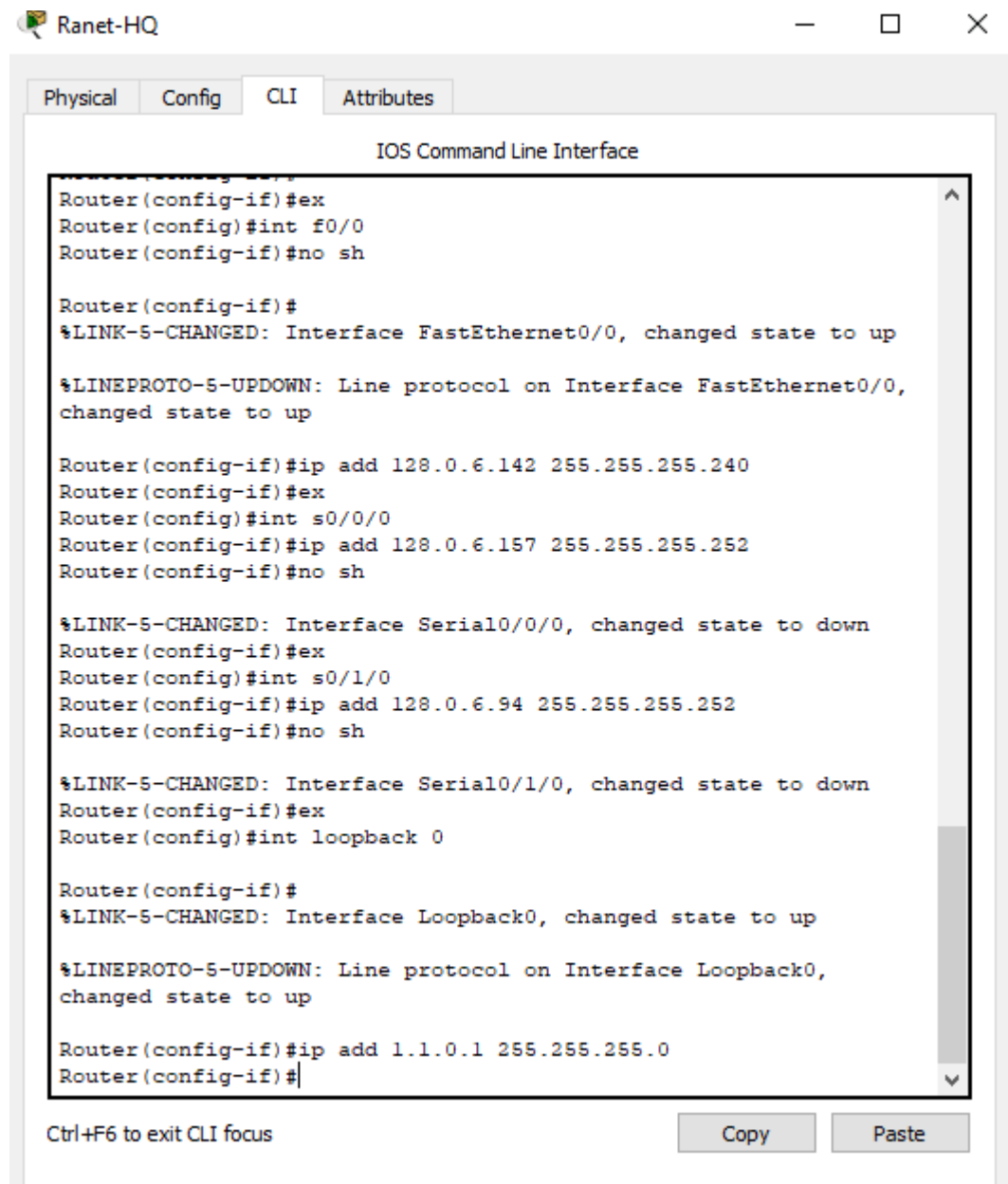


Phác thảo mô hình



Cấu hình các router, server, pc

Cấu hình Ranet-HQ



Cấu hình Ranet-BR

IOS Command Line Interface

Enter configuration commands, one per line. End with Ctrl+Z.
Router(config)#int f0/0
Router(config-if)#ip add 128.0.6.150 255.255.255.248
Router(config-if)#no sh

Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0,
changed state to up

Router(config-if)#ex
Router(config)#int s0/0/0
Router(config-if)#clockrate 64000
^
% Invalid input detected at '^' marker.

Router(config-if)#clock rate 64000
Router(config-if)#ip add 128.0.6.158 255.255.255.252
Router(config-if)#no sh

Router(config-if)#
%LINK-5-CHANGED: Interface Serial0/0/0, changed state to up

Router(config-if)#ex
Router(config)#int loopbac
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/0,
changed state to
% Incomplete command.
Router(config)#int loopback 0

Router(config-if)#
%LINK-5-CHANGED: Interface Loopback0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback0,
changed state to up


Router(config-if)#ip add 1.1.1.1 255.255.255.0
Router(config-if)#

Ctrl+F6 to exit CLI focus

Copy

Paste

Cấu hình ISP-GW

 ISP-GW

—

□

×

Physical

Config

CLI

Attributes

IOS Command Line Interface

Press RETURN to get started!

Router>en

Router#conf t

Enter configuration commands, one per line. End with CNTL/Z.

Router(config)#int s0/0/0

Router(config-if)#clock rate 64000

Router(config-if)#ip add 128.0.6.90 255.255.255.252

Router(config-if)#no sh

Router(config-if)#

%LINK-5-CHANGED: Interface Serial0/0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/0, changed state to up

Router(config-if)#ex

Router(config)#int f0/0

Router(config-if)#ip add 203.87.129.96 255.255.255.0

Router(config-if)#no sh

Router(config-if)#

%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up

|

Ctrl+F6 to exit CLI focus

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Cấu hình Server

Online-Server

Physical Config Services Desktop Programming Attributes

IP Configuration

IP Configuration

☐ DHCP ☒ Static

IP Address 203.87.129.95

Subnet Mask 255.255.255.0

Default Gateway 203.87.129.96

DNS Server 0.0.0.0

IPv6 Configuration

☐ DHCP ☐ Auto Config ☒ Static

IPv6 Address /

Link Local Address FE80::201:43FF:FEBE:CC01

IPv6 Gateway

IPv6 DNS Server

Cấu hình host 1

Host 1

Physical Config Desktop Programming Attributes

IP Configuration

IP Configuration

☐ DHCP ☒ Static

IP Address 128.0.6.130

Subnet Mask 255.255.255.240

Default Gateway 128.0.6.142

DNS Server 0.0.0.0

IPv6 Configuration

Cấu hình host 2

Host 2

Physical Config Desktop Programming Attributes

IP Configuration

IP Configuration

☐ DHCP ☒ Static

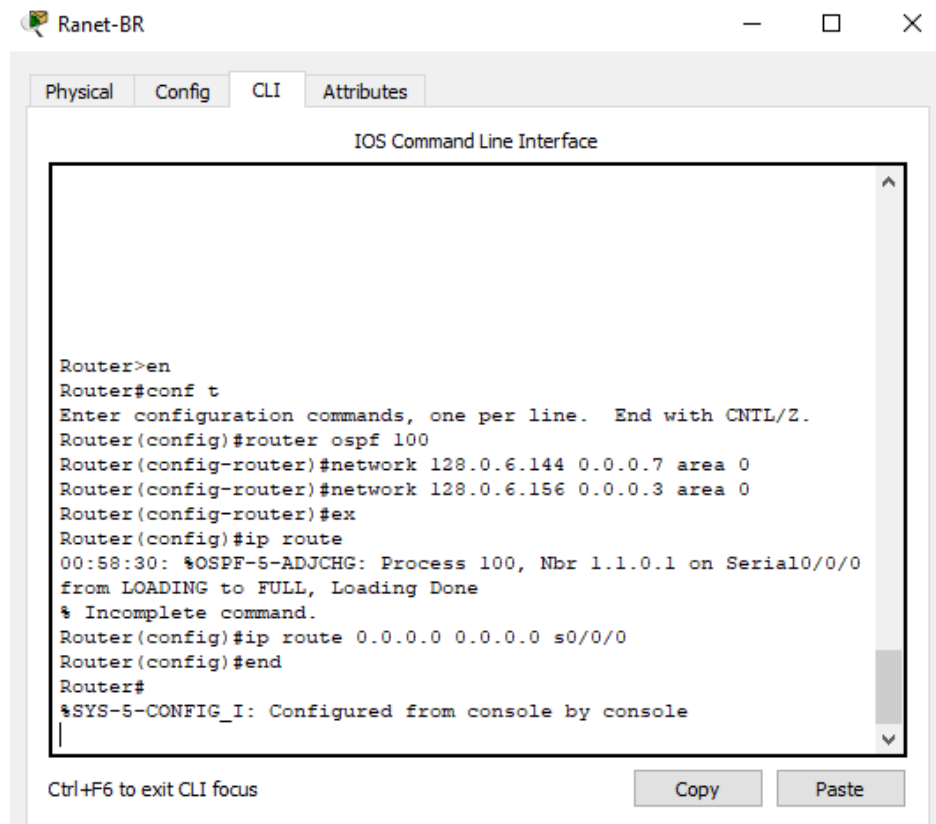
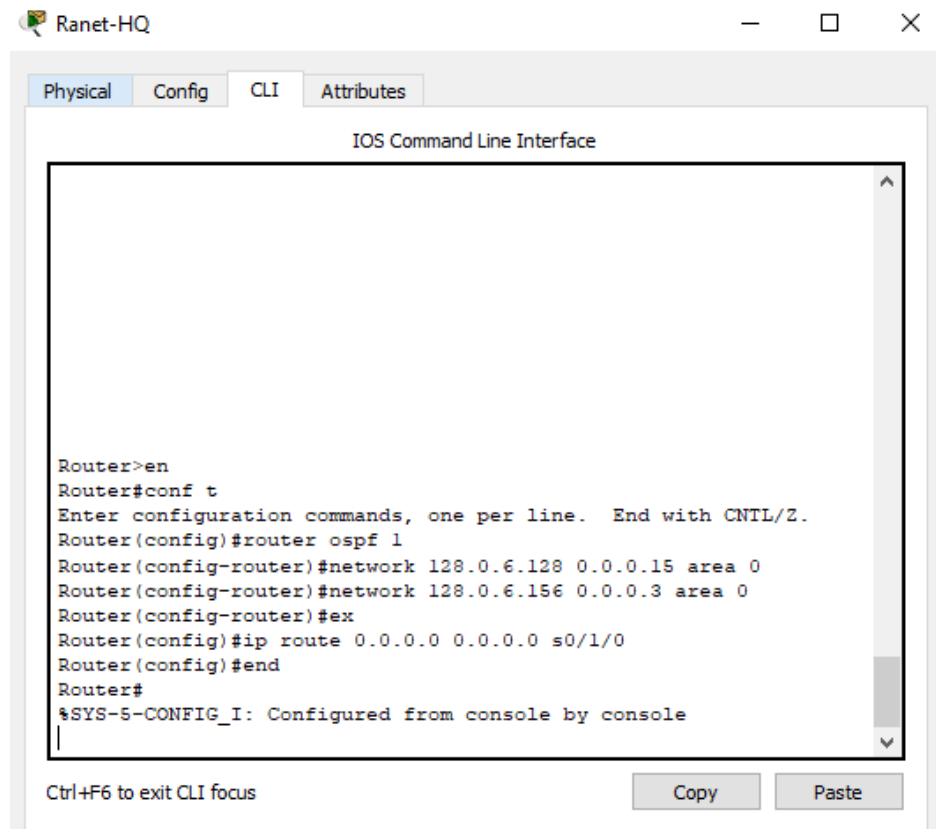
IP Address 128.0.6.148

Subnet Mask 255.255.255.248

Default Gateway 128.0.6.150

DNS Server 0.0.0.0

Cấu hình ospf cho các router



Host 1

Physical Config Desktop Programming Attributes

Command Prompt

```
Packet Tracer PC Command Line 1.0
C:\>ping 128.0.6.150

Pinging 128.0.6.150 with 32 bytes of data:

Reply from 128.0.6.150: bytes=32 time=2ms TTL=254
Reply from 128.0.6.150: bytes=32 time=1ms TTL=254
Reply from 128.0.6.150: bytes=32 time=1ms TTL=254
Reply from 128.0.6.150: bytes=32 time=1ms TTL=254

Ping statistics for 128.0.6.150:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 2ms, Average = 1ms

C:\>|
```

ISP-GW

Physical Config CLI Attributes

IOS Command Line Interface

```
Press RETURN to get started.

Router>en
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#ip route 0.0.0.0 0.0.0.0 s0/0/0
Router(config)#|
```

Ctrl+F6 to exit CLI focus

Copy Paste

Ta ping thử lên server

```
C:\>ping 203.87.129.95

Pinging 203.87.129.95 with 32 bytes of data:

Request timed out.
Reply from 203.87.129.95: bytes=32 time=2ms TTL=126
Reply from 203.87.129.95: bytes=32 time=1ms TTL=126
Reply from 203.87.129.95: bytes=32 time=1ms TTL=126

Ping statistics for 203.87.129.95:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 2ms, Average = 1ms

C:\>
```

Và đã ping được

Ta thử gửi thư

2.302	ISP-GW	Ranet-HQ	CDP	
2.639	--	Ranet-BR	OSPF	
2.640	Ranet-BR	Host 2	OSPF	
3.604	--	Ranet-HQ	OSPF	
3.605	Ranet-HQ	Ranet-BR	OSPF	
5.822	--	Ranet-HQ	OSPF	
5.823	Ranet-HQ	Host 1	OSPF	
6.179	--	Ranet-BR	OSPF	
6.180	Ranet-BR	Ranet-HQ	OSPF	

Giải thích các câu lệnh trong CLI

- + Router>en: Để mở Router và cấu hình
- + Router#conf t: Mở terminal để cấu hình
- + Router(config)#int f0/0: Int là Interface, dùng để đi vào cổng fast ethernet
- + Router(config-int)#ip add 10.1.1.1 255.255.255.252: Dùng để cấu hình địa chỉ ip và subnet mask của router
- + Router(config-int)#no shut: Có nghĩa là không tắt router đó đi và tiếp tục cấu hình
- + Router(config-int)#clock rate 56000: Dùng để cấu hình clock rate cho các DCE
- + Router(config-int)#exit: Dùng để thoát khỏi một cổng hay terminal (dạng giống như nút back của thư mục cây)
- + Router(config)#hostname ISP: Có nghĩa là đặt tên cho Router đó là ISP sau khi thực hiện lệnh đó thì sẽ thành ISP(config)#

- + Router#show ip int brief: Có nghĩa là cho xem các địa chỉ IP của switch hay địa chỉ các cổng của router,...
- + Switch#int vlan 1: Dùng để cấu hình địa chỉ IP cho switch
- + Router (config)#router rip: Dùng để thiết lập giao thức RIP cho các router
- + Router (config-router)#network 172.30.3.0: Dùng để bật local nào có địa chỉ IP bắt đầu bằng 172.30.3.x
- + Router(config)#int loopback : Người quản trị mạng thường sử dụng loop back int để đơn giản hóa việc quản trị và để một số feature hoạt động dựa trên tình trạng up, down của interface hoạt động ổn định hơn