Nhóm 9:

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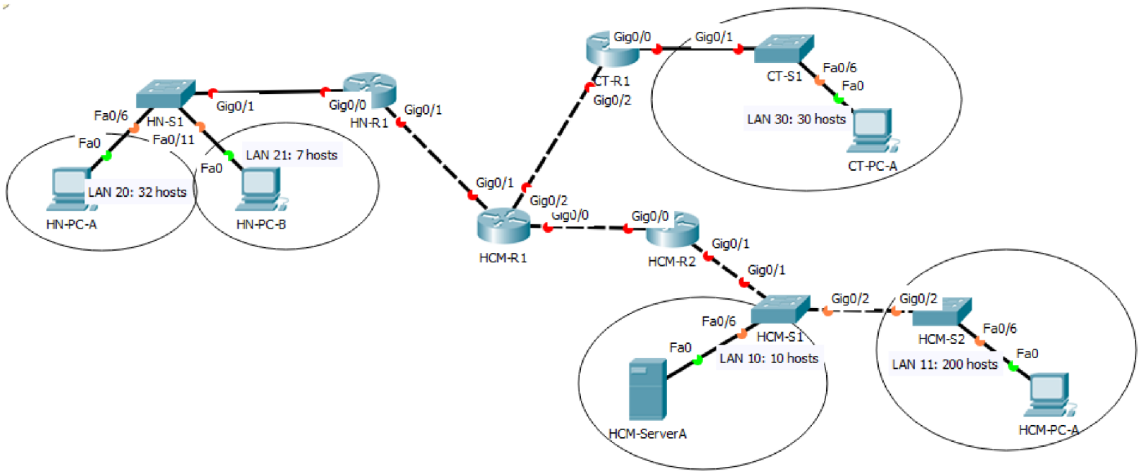


Hình 2. Mô hình mạng cho bài thực hành

Yêu cầu 1: Sử dụng lớp mạng 172.x.0.0/22, với x là số nhóm, để chia các mạng con và gắn IP cho các thiết bị theo yêu cầu bên dưới

Số host	Network	Subnet Mask	Dải IP	Broadcast
200	172.9.0.0/24	255.255.255.0	.0.1 - .0.254	.0.255
32	172.9.1.0/26	255.255.255.192	.1.1 - .1.62	.1.63
30	172.9.1.64/27	255.255.255.224	.1.65 - .1.94	.1.95
10	172.9.1.96/28	255.255.255.240	.1.97 - .1.110	.1.111
7	172.9.1.112/28	255.255.255.240	.1.113 - .1.126	.1.127
2	172.9.1.128/30	255.255.255.252	.1.129 - .1.130	.1.131
2	172.9.1.132/30	255.255.255.252	.1.133 - .1.134	.1.135
2	172.9.1.136/30	255.255.255.252	.1.137 - .1.138	.1.139

Thiết bị	Interface	Địa chỉ IP	Subnet Mask	Default Gateway
R1 (CT-R1)	G0/2	172.9.1.129	255.255.255.252	N/A
	G0/0.30	172.9.1.65	255.255.255.224	N/A
R2 (HN-R1)	G0/1	172.9.1.133	255.255.255.252	N/A
	G0/0.20	172.9.1.1	255.255.255.192	N/A
	G0/0.21	172.9.1.113	255.255.255.240	N/A
R3 (HCM-R1)	G0/1	172.9.1.134	255.255.255.252	N/A
	G0/2	172.9.1.130	255.255.255.252	N/A
	G/0/0	172.9.1.137	255.255.255.252	N/A
R4 (HCM-R2)	G0/0	172.9.1.138	255.255.255.252	N/A
	G0/1.10	172.9.1.97	255.255.255.240	N/A
	G0/1.11	172.9.0.1	255.255.255.0	N/A
S1 (CT-S1)	VLAN30	172.9.1.66	255.255.255.224	N/A
S2 (HN-S1)	VLAN20	172.9.1.2	255.255.255.192	N/A
	VLAN21	172.9.1.114	255.255.255.240	N/A
S3 (HCM-S1)	VLAN10	172.9.1.98	255.255.255.240	N/A
S4 (HCM-S2)	VLAN11	172.9.0.2	255.255.255.0	N/A
CT-PC-A	NIC	172.9.1.94	255.255.255.224	172.9.1.65
HN-PC-A	NIC	172.9.1.62	255.255.255.192	172.9.1.1

HN-PC-B	NIC	172.9.1.126	255.255.255.240	172.9.1.113
HCM-ServerA	NIC	172.9.1.110	255.255.255.240	172.9.1.97
HCM-PC-A	NIC	172.9.0.254	255.255.255.0	172.9.0.1

Yêu cầu 2: Thực hiện cấu hình VLAN và Trunking cho các thiết bị theo yêu cầu bên dưới

- Cấu hình VLAN

- CT-S1

```
S1>enable
S1#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
S1(config)#vlan 30
S1(config-vlan)#name VLAN30
```

```
S1(config-if)#interface f0/6
S1(config-if)#switchport mode access
S1(config-if)#switchport access vlan 30
```

```
S1#show vlan brief

VLAN Name                             Status    Ports
---- -------------------------------- --------- -------------------------------
1    default                          active    Fa0/1, Fa0/2, Fa0/3, Fa0/4
                                                Fa0/5, 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
30   VLAN30                           active    Fa0/6
1002 fddi-default                     active
1003 token-ring-default               active
1004 fddinet-default                  active
1005 trnet-default                    active
S1#
```

- HN-S1

```
S2>enable
S2#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
S2(config)#interface f0/6
S2(config-if)#switchport mode access
S2(config-if)#switchport access vlan 20
S2(config-if)#exit
S2(config)#interface f0/11
S2(config-if)#switchport mode access
S2(config-if)#switchport access vlan 21
S2(config-if)#exit
S2(config)#exit
S2#
%SYS-5-CONFIG_I: Configured from console by console

S2#show vlan brief

VLAN Name                              Status    Ports
---- --------------------------------- --------- -------------------------------
1    default                           active    Fa0/1, Fa0/2, Fa0/3, Fa0/4
                                                 Fa0/5, Fa0/7, Fa0/8, Fa0/9
                                                 Fa0/10, 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
20   VLAN20                            active    Fa0/6
21   VLAN21                            active    Fa0/11
1002 fddi-default                      active
1003 token-ring-default                active
1004 fddinet-default                   active
1005 trnet-default                     active
```

- HCM-S1

```
S3>enable
S3#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
S3(config)#vlan 10
S3(config-vlan)#name VLAN10
```

```
S3>enable
S3#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
S3(config)#interface f0/6
S3(config-if)#switchport mode access
S3(config-if)#switchport access vlan 10
S3(config-if)#exit
S3(config)#exit
S3#
%SYS-5-CONFIG_I: Configured from console by console

S3#show vlan brief

VLAN Name                             Status    Ports
---- -------------------------------- --------- -------------------------------
1    default                          active    Fa0/1, Fa0/2, Fa0/3, Fa0/4
                                                Fa0/5, 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   VLAN10                           active    Fa0/6
1002 fddi-default                     active
1003 token-ring-default               active
1004 fddinet-default                  active
1005 trnet-default                    active
```

- HCM-S2

```
S4>enable
S4#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
S4(config)#vlan 11
S4(config-vlan)#name VLAN11
```

```
S4>enable
S4#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
S4(config)#interface f0/6
S4(config-if)#switchport mode access
S4(config-if)#switchport access vlan 11
S4(config-if)#exit
S4(config)#exit
S4#
%SYS-5-CONFIG_I: Configured from console by console

S4#show vlan brief

VLAN Name                              Status    Ports
---- --------------------------------- --------- -------------------------------
1    default                           active    Fa0/1, Fa0/2, Fa0/3, Fa0/4
                                                 Fa0/5, 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
11   VLAN11                            active    Fa0/6
1002 fddi-default                      active
1003 token-ring-default                active
1004 fddinet-default                   active
1005 trnet-default                     active
```

- Cấu hình trunking

* Các interface trên các router đã no shutdown

- CT-S1 && CT-R1

```
S1(config-if)#exit
S1(config)#interface GigabitEthernet0/2
S1(config-if)#
S1(config-if)#switchport mode trunk
S1(config-if)#
```

- HN-S1 && HN-R1

```
S2(config)#interface g0/1
S2(config-if)#switchport mode trunk
S2(config-if)#exit
```

```
S2#show int trunk
Port        Mode         Encapsulation  Status        Native vlan
Gig0/1      on           802.1q         trunking      1

Port        Vlans allowed on trunk
Gig0/1      1-1005

Port        Vlans allowed and active in management domain
Gig0/1      1,20,21

Port        Vlans in spanning tree forwarding state and not pruned
Gig0/1      1,20,21
```

- HCM-R2 && HCM-S1

```
Enter configuration commands, one per line.  End with CNTL/Z.
S3(config)#interface g0/1
S3(config-if)#switchport mode trunk
```

- HCM-S1 && HCM-S2

```
S3(config-if)#interface g0/2
S3(config-if)#switchport mode trunk
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/1, changed state to down

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/1, changed state to up


S3(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/2, changed state to down

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/2, changed state to up

S3(config-if)#exit
S3(config)#exit
S3#
%SYS-5-CONFIG_I: Configured from console by console

S3#show int trunk
Port        Mode         Encapsulation  Status        Native vlan
Gig0/1      on           802.1q         trunking      1
Gig0/2      on           802.1q         trunking      1

Port        Vlans allowed on trunk
Gig0/1      1-1005
Gig0/2      1-1005

Port        Vlans allowed and active in management domain
Gig0/1      1,10
Gig0/2      1,10

Port        Vlans in spanning tree forwarding state and not pruned
Gig0/1      none
Gig0/2      none
```

```
S4>enable
S4#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
S4(config)#interface g0/2
S4(config-if)#switchport mode trunk
S4(config-if)#exit
S4(config)#exit
S4#
%SYS-5-CONFIG_I: Configured from console by console

S4#show int trunk
Port        Mode         Encapsulation  Status        Native vlan
Gig0/2      on           802.1q         trunking      1

Port        Vlans allowed on trunk
Gig0/2      1-1005

Port        Vlans allowed and active in management domain
Gig0/2      1,11

Port        Vlans in spanning tree forwarding state and not pruned
Gig0/2      1,11
```

- Thêm VLAN 11 vào HCM-S1

```
S3(config)#int g0/2
S3(config-if)#switchport access vlan 11
% Access VLAN does not exist. Creating vlan 11
S3(config-if)#
%LINK-5-CHANGED: Interface Vlan11, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan11, changed state to up

S3(config-if)#show int trunk
                ^
% Invalid input detected at '^' marker.

S3(config-if)#exit
S3(config)#exit
S3#
%SYS-5-CONFIG_I: Configured from console by console

S3#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
S3(config)#exit
S3#
%SYS-5-CONFIG_I: Configured from console by console

S3#show int trunk
Port        Mode         Encapsulation  Status        Native vlan
Gig0/1      on           802.1q         trunking      1
Gig0/2      on           802.1q         trunking      1

Port        Vlans allowed on trunk
Gig0/1      1-1005
Gig0/2      1-1005

Port        Vlans allowed and active in management domain
Gig0/1      1,10,11
Gig0/2      1,10,11

Port        Vlans in spanning tree forwarding state and not pruned
Gig0/1      1,10,11
```

- Thêm VLAN 10 vào HCM-S2

```
S4>enable
S4#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
S4(config)#interface vlan 10
S4(config-if)#ip address 172.9.1.98 255.255.255.240
S4(config-if)#%IP-4-DUPADDR: Duplicate address 172.9.0.2 on Vlan11, sourced by 00E0.B069.8C02

S4(config-if)#int g0/2
S4(config-if)#switchport access vlan 10
% Access VLAN does not exist. Creating vlan 10
S4(config-if)#
%LINK-5-CHANGED: Interface Vlan10, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan10, changed state to up

S4(config-if)#exit
S4(config)#exit
S4#
%SYS-5-CONFIG_I: Configured from console by console

S4#show int trunk
Port        Mode         Encapsulation  Status        Native vlan
Gig0/2      on           802.1q         trunking      1

Port        Vlans allowed on trunk
Gig0/2      1-1005

Port        Vlans allowed and active in management domain
Gig0/2      1,10,11

Port        Vlans in spanning tree forwarding state and not pruned
Gig0/2      1,10,11
```

Yêu cầu 3: Sử dụng bảng địa chỉ IP của các thiết bị ở Yêu cầu 1, sinh viên thực hiện cấu hình địa chỉ IP cho các thiết bị.

- CT-R1

```
R1>enable
R1#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
R1(config)#interface g0/0.30
R1(config-subif)#no shutdown
R1(config-subif)#encapsulation dot1Q 30
R1(config-subif)#ip add 172.9.1.65 255.255.255.224
R1(config-subif)#interface g0/2
R1(config-if)#no shutdown
R1(config-if)#ip add 172.9.1.129 255.255.255.252
%LINK-5-CHANGED: Interface GigabitEthernet0/0.30, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0.30, changed state to up

R1(config-if)#exit
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
GigabitEthernet0/0     unassigned      YES unset  up                    up
GigabitEthernet0/0.30  172.9.1.65      YES manual up                    up
GigabitEthernet0/1     unassigned      YES unset  administratively down down
GigabitEthernet0/2     172.9.1.129     YES manual up                    up
Vlan1                  unassigned      YES unset  administratively down down
```

- HN-R1

```
R2#show ip int brief
Interface              IP-Address      OK? Method Status                Protocol
GigabitEthernet0/0     unassigned      YES unset  up                    up
GigabitEthernet0/0.20  172.9.1.1       YES manual up                    up
GigabitEthernet0/0.21  172.9.1.113     YES manual up                    up
GigabitEthernet0/1     unassigned      YES unset  up                    up
GigabitEthernet0/2     unassigned      YES unset  administratively down down
Vlan1                  unassigned      YES unset  administratively down down
R2#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
R2(config)#interface g0/0.20
R2(config-subif)#no shutdown
R2(config-subif)#encapsulation dot1Q 20
R2(config-subif)#ip add 172.9.1.1 255.255.255.192
R2(config-subif)#interface g0/0.21
R2(config-subif)#no shutdown
R2(config-subif)#encapsulation dot1Q 21
R2(config-subif)#ip add 172.9.1.113 255.255.255.240
R2(config-subif)#interface g0/1
R2(config-if)#no shutdown
R2(config-if)#ip add 172.9.1.133 255.255.255.252
R2(config-if)#exit
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
GigabitEthernet0/0     unassigned      YES unset  up                    up
GigabitEthernet0/0.20  172.9.1.1       YES manual up                    up
GigabitEthernet0/0.21  172.9.1.113     YES manual up                    up
GigabitEthernet0/1     172.9.1.133     YES manual up                    up
GigabitEthernet0/2     unassigned      YES unset  administratively down down
Vlan1                  unassigned      YES unset  administratively down down
```

- HCM-R1

```
R3>enable
R3#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
R3(config)#interface g0/1
R3(config-if)#no shutdown
R3(config-if)#ip add 172.9.1.134 255.255.255.252
R3(config-if)#interface g0/2
R3(config-if)#no shutdown
R3(config-if)#ip add 172.9.1.130 255.255.255.252
R3(config-if)#interface g0/0
R3(config-if)#no shutdown
R3(config-if)#ip add 172.9.1.137 255.255.255.252
R3(config-if)#exit
R3(config)#exit
R3#
%SYS-5-CONFIG_I: Configured from console by console

R3#show ip int brief
Interface              IP-Address      OK? Method Status                Protocol
GigabitEthernet0/0     172.9.1.137     YES manual up                    up
GigabitEthernet0/1     172.9.1.134     YES manual up                    up
GigabitEthernet0/2     172.9.1.130     YES manual up                    up
Vlan1                  unassigned      YES unset  administratively down down
```

- HCM-R2

```
R4>enable
R4#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
R4(config)#interface g0/1.10
R4(config-subif)#no shutdown
R4(config-subif)#encapsulation dot1Q 10
R4(config-subif)#ip add 172.9.1.97 255.255.255.252
R4(config-subif)#interface g0/1.11
R4(config-subif)#no shutdown
R4(config-subif)#encapsulation dot1Q 11
R4(config-subif)#ip add 172.9.0.1 255.255.255.240
R4(config-subif)#interface g0/0
R4(config-if)#no shutdown
R4(config-if)#ip add 172.9.1.138 255.255.255.252
%LINK-5-CHANGED: Interface GigabitEthernet0/1.10, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/1.10, changed state to up

%LINK-5-CHANGED: Interface GigabitEthernet0/1.11, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/1.11, changed state to up

R4(config-if)#exit
R4(config)#exit
R4#
%SYS-5-CONFIG_I: Configured from console by console

R4#show ip int brief
Interface              IP-Address      OK? Method Status                Protocol
GigabitEthernet0/0     172.9.1.138     YES manual up                    up
GigabitEthernet0/1     unassigned      YES unset  up                    up
GigabitEthernet0/1.10  172.9.1.97      YES manual up                    up
GigabitEthernet0/1.11  172.9.0.1       YES manual up                    up
GigabitEthernet0/2     unassigned      YES unset  administratively down down
Vlan1                  unassigned      YES unset  administratively down down
```

- CT-S1

```
Vlan1                  unassigned      YES manual administratively down down
Vlan30                 172.9.1.66      YES manual up                    up
Enter configuration commands, one per line.  End with CNTL/Z.
S1(config)#interface vlan 30
S1(config-if)#ip address 172.9.1.66 255.255.255.224
S1(config-if)#exit
S1(config)#exit
S1#
%SYS-5-CONFIG_I: Configured from console by console
```

- HN-S1

```
Vlan1                  unassigned      YES manual administratively down down
Vlan20                 172.9.1.2       YES manual up                    up
Vlan21                 172.9.1.114     YES manual up                    up
```

- HCM-S1

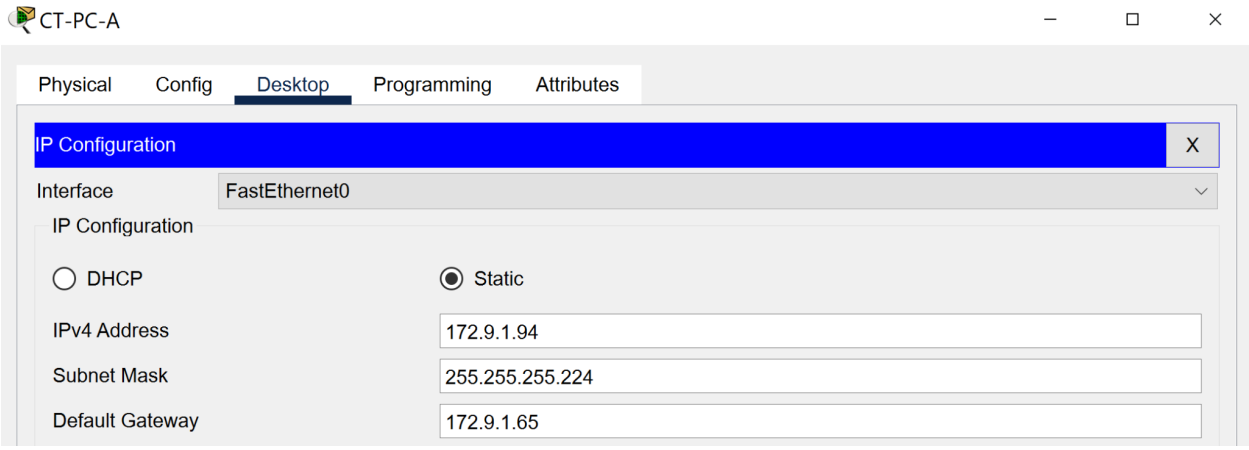
```
Vlan1                  unassigned      YES manual administratively down down
Vlan10                 172.9.1.98      YES manual up                    up
```

- HCM-S2

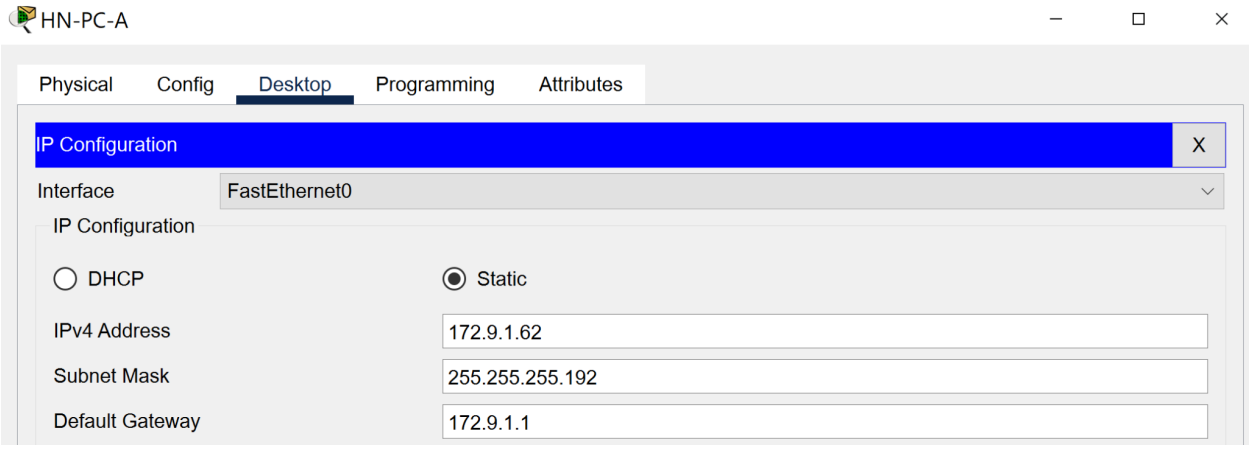
```
S4(config)#interface vlan 11
S4(config-if)#ip address 172.9.0.2 255.255.255.0
```

```
Vlan1                  unassigned      YES manual administratively down down
Vlan11                 172.9.0.2       YES manual up                    up
```

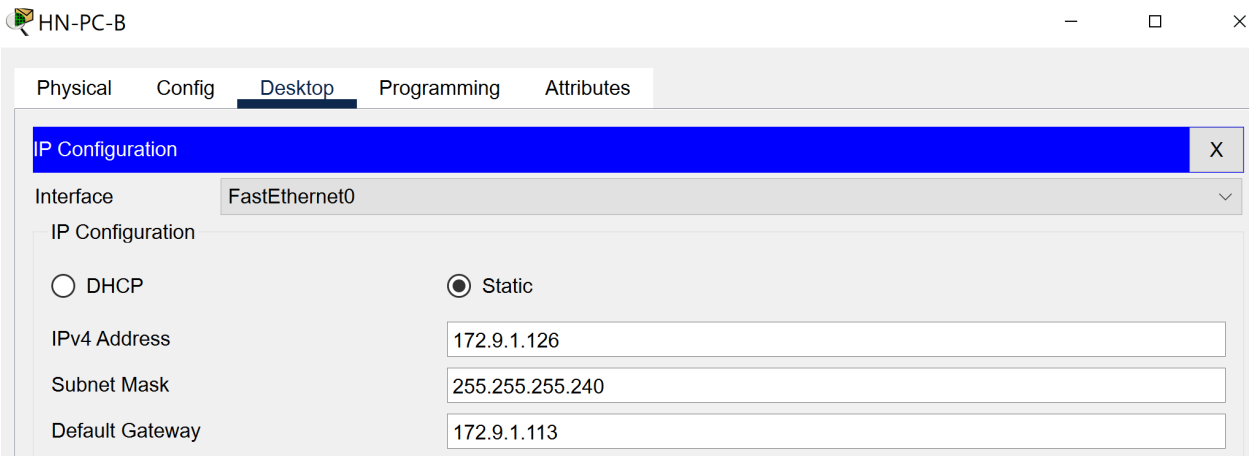
- CT-PC-A



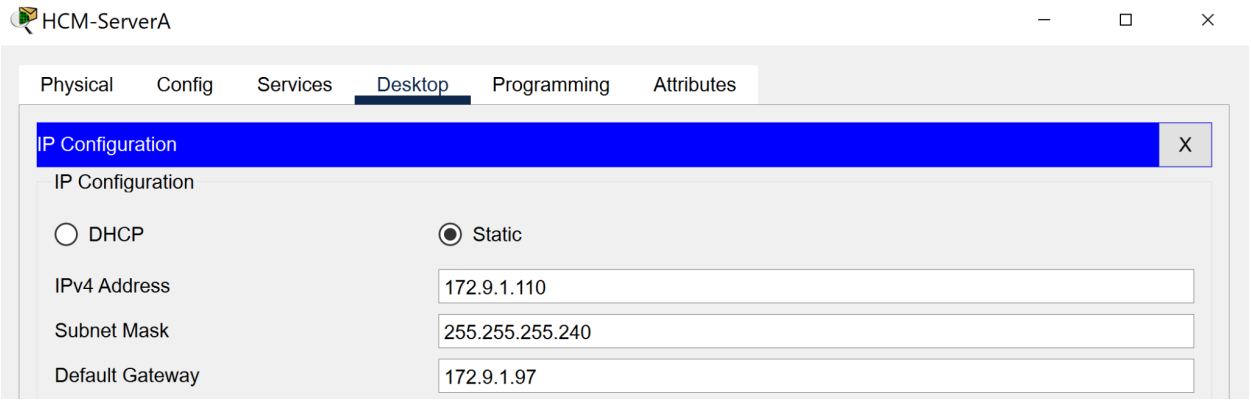
- HN-PC-A



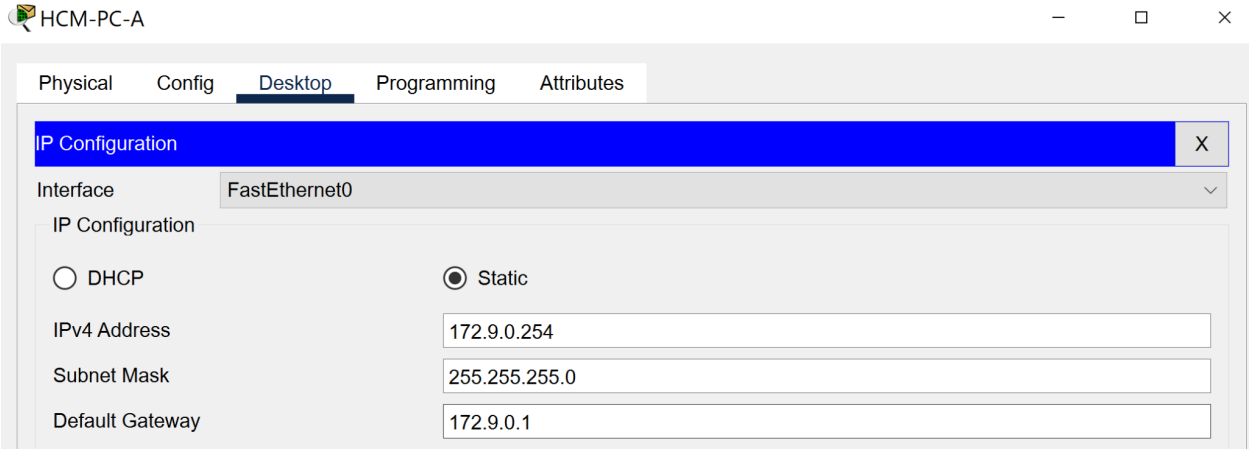
- HN-PC-B



- HCM-ServerA



- HCM-PC-A



<u>Yêu cầu 4:</u> Sinh viên cấu hình định tuyến OSPF trên các router để thỏa các yêu cầu bên dưới

- Cấu hình định tuyến OSPF cho các router và thực hiện kiểm tra

- CT-R1

```
R1>enable
R1#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
R1(config)#router ospf 1
R1(config-router)#network 172.9.1.129 0.0.0.0 area 0
R1(config-router)#network 172.9.1.65 0.0.0.0 area 0

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 172.9.1.129
  Number of areas in this router is 1. 1 normal 0 stub 0 nssa
  Maximum path: 4
  Routing for Networks:
    172.9.1.129 0.0.0.0 area 0
    172.9.1.65 0.0.0.0 area 0
  Routing Information Sources:
    Gateway         Distance      Last Update
    172.9.1.129           110      00:24:35
    172.9.1.133           110      00:24:43
    172.9.1.137           110      00:21:50
    172.9.1.138           110      00:21:35
  Distance: (default is 110)
```

```
R1#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

     172.9.0.0/16 is variably subnetted, 10 subnets, 6 masks
O       172.9.0.0/24 [110/3] via 172.9.1.130, 00:09:25, GigabitEthernet0/2
O       172.9.1.0/26 [110/3] via 172.9.1.130, 00:12:31, GigabitEthernet0/2
C       172.9.1.64/27 is directly connected, GigabitEthernet0/0.30
L       172.9.1.65/32 is directly connected, GigabitEthernet0/0.30
O       172.9.1.96/28 [110/3] via 172.9.1.130, 00:09:35, GigabitEthernet0/2
O       172.9.1.112/28 [110/3] via 172.9.1.130, 00:12:31, GigabitEthernet0/2
C       172.9.1.128/30 is directly connected, GigabitEthernet0/2
L       172.9.1.129/32 is directly connected, GigabitEthernet0/2
O       172.9.1.132/30 [110/2] via 172.9.1.130, 00:12:31, GigabitEthernet0/2
O       172.9.1.136/30 [110/2] via 172.9.1.130, 00:12:31, GigabitEthernet0/2
```

- HN-R1

```
R2>enable
R2#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
R2(config)#router ospf 1
R2(config-router)#network 172.9.1.133 0.0.0.0 area 0
R2(config-router)#network 172.9.1.113 0.0.0.0 area 0
R2(config-router)#network 172.9.1.1 0.0.0.0 area 0
R2(config-router)#
00:17:25: %OSPF-5-ADJCHG: Process 1, Nbr 172.9.1.137 on GigabitEthernet0/1 from LOADING to
FULL, Loading Done
```

```
R2#show ip protocol

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 172.9.1.133
  Number of areas in this router is 1. 1 normal 0 stub 0 nssa
  Maximum path: 4
  Routing for Networks:
    172.9.1.133 0.0.0.0 area 0
    172.9.1.113 0.0.0.0 area 0
    172.9.1.1 0.0.0.0 area 0
  Routing Information Sources:
    Gateway         Distance      Last Update
    172.9.1.129          110      00:25:09
    172.9.1.133          110      00:25:18
    172.9.1.137          110      00:22:24
    172.9.1.138          110      00:22:09
  Distance: (default is 110)
```

```
R2#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

     172.9.0.0/16 is variably subnetted, 11 subnets, 6 masks
O       172.9.0.0/24 [110/3] via 172.9.1.134, 00:11:03, GigabitEthernet0/1
C       172.9.1.0/26 is directly connected, GigabitEthernet0/0.20
L       172.9.1.1/32 is directly connected, GigabitEthernet0/0.20
O       172.9.1.64/27 [110/3] via 172.9.1.134, 00:14:03, GigabitEthernet0/1
O       172.9.1.96/28 [110/3] via 172.9.1.134, 00:11:14, GigabitEthernet0/1
C       172.9.1.112/28 is directly connected, GigabitEthernet0/0.21
L       172.9.1.113/32 is directly connected, GigabitEthernet0/0.21
O       172.9.1.128/30 [110/2] via 172.9.1.134, 00:14:03, GigabitEthernet0/1
C       172.9.1.132/30 is directly connected, GigabitEthernet0/1
L       172.9.1.133/32 is directly connected, GigabitEthernet0/1
O       172.9.1.136/30 [110/2] via 172.9.1.134, 00:14:13, GigabitEthernet0/1
```

- HCM-R1

```
R3>enable
R3#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
R3(config)#router ospf 1
R3(config-router)#network 172.9.1.134 0.0.0.0 area 0
R3(config-router)#network 172.9.1.130 0.0.0.0 area 0
R3(config-router)#network 172.9.1.137 0.0.0.0 area 0
R3(config-router)#
00:17:25: %OSPF-5-ADJCHG: Process 1, Nbr 172.9.1.133 on GigabitEthernet0/1 from LOADING to
FULL, Loading Done
```

```
R3#show ip protocol

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 172.9.1.137
  Number of areas in this router is 1. 1 normal 0 stub 0 nssa
  Maximum path: 4
  Routing for Networks:
    172.9.1.134 0.0.0.0 area 0
    172.9.1.130 0.0.0.0 area 0
    172.9.1.137 0.0.0.0 area 0
  Routing Information Sources:
    Gateway         Distance      Last Update
    172.9.1.129           110      00:26:13
    172.9.1.133           110      00:26:21
    172.9.1.137           110      00:23:28
    172.9.1.138           110      00:23:13
  Distance: (default is 110)
```

```
R3>enable
R3#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

     172.9.0.0/16 is variably subnetted, 11 subnets, 6 masks
O       172.9.0.0/24 [110/2] via 172.9.1.138, 00:11:43, GigabitEthernet0/0
O       172.9.1.0/26 [110/2] via 172.9.1.133, 00:14:53, GigabitEthernet0/1
O       172.9.1.64/27 [110/2] via 172.9.1.129, 00:14:43, GigabitEthernet0/2
O       172.9.1.96/28 [110/2] via 172.9.1.138, 00:11:59, GigabitEthernet0/0
O       172.9.1.112/28 [110/2] via 172.9.1.133, 00:14:53, GigabitEthernet0/1
C       172.9.1.128/30 is directly connected, GigabitEthernet0/2
L       172.9.1.130/32 is directly connected, GigabitEthernet0/2
C       172.9.1.132/30 is directly connected, GigabitEthernet0/1
L       172.9.1.134/32 is directly connected, GigabitEthernet0/1
C       172.9.1.136/30 is directly connected, GigabitEthernet0/0
L       172.9.1.137/32 is directly connected, GigabitEthernet0/0
```

- HCM-R2

```
R4>enable
R4#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
R4(config)#network 172.9.1.138 0.0.0.0 area 0
             ^
% Invalid input detected at '^' marker.

R4(config)#router ospf 1
R4(config-router)#network 172.9.1.138 0.0.0.0 area 0
R4(config-router)#network 172.9.1.97 0.0.0.0 area 0
R4(config-router)#network 172.9.1.97 0.0.0.0 area 0
00:20:19: %OSPF-5-ADJCHG: Process 1, Nbr 172.9.1.137 on GigabitEthernet0/0 frnetwork
172.9.1.138 0.0.0.0 area 0
R4(config-router)#network 172.9.0.1 0.0.0.0 area 0
```

```
R4#show ip protocol

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 172.9.1.138
  Number of areas in this router is 1. 1 normal 0 stub 0 nssa
  Maximum path: 4
  Routing for Networks:
    172.9.1.138 0.0.0.0 area 0
    172.9.1.97 0.0.0.0 area 0
    172.9.0.1 0.0.0.0 area 0
  Routing Information Sources:
    Gateway         Distance      Last Update
    172.9.1.129           110      00:26:43
    172.9.1.133           110      00:26:51
    172.9.1.137           110      00:23:58
    172.9.1.138           110      00:23:43
  Distance: (default is 110)
```

```
R4>enable
R4#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

     172.9.0.0/16 is variably subnetted, 11 subnets, 6 masks
C       172.9.0.0/24 is directly connected, GigabitEthernet0/1.11
L       172.9.0.1/32 is directly connected, GigabitEthernet0/1.11
O       172.9.1.0/26 [110/3] via 172.9.1.137, 00:12:45, GigabitEthernet0/0
O       172.9.1.64/27 [110/3] via 172.9.1.137, 00:12:45, GigabitEthernet0/0
C       172.9.1.96/28 is directly connected, GigabitEthernet0/1.10
L       172.9.1.97/32 is directly connected, GigabitEthernet0/1.10
O       172.9.1.112/28 [110/3] via 172.9.1.137, 00:12:45, GigabitEthernet0/0
O       172.9.1.128/30 [110/2] via 172.9.1.137, 00:12:45, GigabitEthernet0/0
O       172.9.1.132/30 [110/2] via 172.9.1.137, 00:12:45, GigabitEthernet0/0
C       172.9.1.136/30 is directly connected, GigabitEthernet0/0
L       172.9.1.138/32 is directly connected, GigabitEthernet0/0
```

- Ping kiểm tra giữa các PC và server

- HN-PC-A ping HCM-ServerA

```
C:\>ping 172.9.1.110

Pinging 172.9.1.110 with 32 bytes of data:

Reply from 172.9.1.110: bytes=32 time<1ms TTL=125
Reply from 172.9.1.110: bytes=32 time<1ms TTL=125
Reply from 172.9.1.110: bytes=32 time=1ms TTL=125
Reply from 172.9.1.110: bytes=32 time<1ms TTL=125

Ping statistics for 172.9.1.110:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 1ms, Average = 0ms
```

- HCM-PC-A ping HN-PC-B

```
C:\>ping 172.9.1.126

Pinging 172.9.1.126 with 32 bytes of data:

Reply from 172.9.1.126: bytes=32 time<1ms TTL=125
Reply from 172.9.1.126: bytes=32 time=11ms TTL=125
Reply from 172.9.1.126: bytes=32 time=11ms TTL=125
Reply from 172.9.1.126: bytes=32 time=1ms TTL=125

Ping statistics for 172.9.1.126:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 11ms, Average = 5ms
```

- HCM-ServerA ping CT-PC-A

```
C:\>ping 172.9.1.94

Pinging 172.9.1.94 with 32 bytes of data:

Reply from 172.9.1.94: bytes=32 time<1ms TTL=125
Reply from 172.9.1.94: bytes=32 time<1ms TTL=125
Reply from 172.9.1.94: bytes=32 time<1ms TTL=125
Reply from 172.9.1.94: bytes=32 time<1ms TTL=125

Ping statistics for 172.9.1.94:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

- HN-PC-B ping CT-PC-A

```
C:\>ping 172.9.1.94

Pinging 172.9.1.94 with 32 bytes of data:

Reply from 172.9.1.94: bytes=32 time<1ms TTL=125
Reply from 172.9.1.94: bytes=32 time<1ms TTL=125
Reply from 172.9.1.94: bytes=32 time=2ms TTL=125
Reply from 172.9.1.94: bytes=32 time<1ms TTL=125

Ping statistics for 172.9.1.94:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 2ms, Average = 0ms
```

- Quảng bá default static route cho các router khác bằng OSPF
- Tạo cổng loopback 0 trên router HCM-R1

```
Enter configuration commands, one per line.  End with CNTL/Z.
R3(config)#interface 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
no shutdown
R3(config-if)#ip address 8.8.8.8 255.255.255.255
```

```
R3# show ip interface brief
Interface              IP-Address      OK? Method Status                Protocol
GigabitEthernet0/0     172.9.1.137     YES manual up                    up
GigabitEthernet0/1     172.9.1.134     YES manual up                    up
GigabitEthernet0/2     172.9.1.130     YES manual up                    up
Loopback0              8.8.8.8         YES manual up                    up
Vlan1                  unassigned      YES unset  administratively down down
```

- Tạo default static route đi ra cổng này

```
R3(config)#ip route 0.0.0.0 0.0.0.0 Loopback0
```

- Quảng bá default static route

```
R3#
%SYS-5-CONFIG_I: Configured from console by console
conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R3(config)#router ospf 1
R3(config-router)#default-information originate
```

- Default static route này đã có trong các router còn lại, kiểm tra bằng lệnh show ip route

```
R1>enable
R1#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 172.9.1.130 to network 0.0.0.0

     172.9.0.0/16 is variably subnetted, 10 subnets, 6 masks
O       172.9.0.0/24 [110/3] via 172.9.1.130, 00:04:07, GigabitEthernet0/2
O       172.9.1.0/26 [110/3] via 172.9.1.130, 00:04:07, GigabitEthernet0/2
C       172.9.1.64/27 is directly connected, GigabitEthernet0/0.30
L       172.9.1.65/32 is directly connected, GigabitEthernet0/0.30
O       172.9.1.96/28 [110/3] via 172.9.1.130, 00:04:07, GigabitEthernet0/2
O       172.9.1.112/28 [110/3] via 172.9.1.130, 00:04:07, GigabitEthernet0/2
C       172.9.1.128/30 is directly connected, GigabitEthernet0/2
L       172.9.1.129/32 is directly connected, GigabitEthernet0/2
O       172.9.1.132/30 [110/2] via 172.9.1.130, 00:04:07, GigabitEthernet0/2
O       172.9.1.136/30 [110/2] via 172.9.1.130, 00:04:07, GigabitEthernet0/2
O*E2 0.0.0.0/0 [110/1] via 172.9.1.130, 00:04:07, GigabitEthernet0/2
```

```
R2>enable
R2#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 172.9.1.134 to network 0.0.0.0

     172.9.0.0/16 is variably subnetted, 11 subnets, 6 masks
O       172.9.0.0/24 [110/3] via 172.9.1.134, 00:04:38, GigabitEthernet0/1
C       172.9.1.0/26 is directly connected, GigabitEthernet0/0.20
L       172.9.1.1/32 is directly connected, GigabitEthernet0/0.20
O       172.9.1.64/27 [110/3] via 172.9.1.134, 00:04:28, GigabitEthernet0/1
O       172.9.1.96/28 [110/3] via 172.9.1.134, 00:04:38, GigabitEthernet0/1
C       172.9.1.112/28 is directly connected, GigabitEthernet0/0.21
L       172.9.1.113/32 is directly connected, GigabitEthernet0/0.21
O       172.9.1.128/30 [110/2] via 172.9.1.134, 00:04:28, GigabitEthernet0/1
C       172.9.1.132/30 is directly connected, GigabitEthernet0/1
L       172.9.1.133/32 is directly connected, GigabitEthernet0/1
O       172.9.1.136/30 [110/2] via 172.9.1.134, 00:04:38, GigabitEthernet0/1
O*E2 0.0.0.0/0 [110/1] via 172.9.1.134, 00:04:38, GigabitEthernet0/1
```

```
R4>enable
R4#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 172.9.1.137 to network 0.0.0.0

     172.9.0.0/16 is variably subnetted, 11 subnets, 6 masks
C       172.9.0.0/24 is directly connected, GigabitEthernet0/1.11
L       172.9.0.1/32 is directly connected, GigabitEthernet0/1.11
O       172.9.1.0/26 [110/3] via 172.9.1.137, 00:04:57, GigabitEthernet0/0
O       172.9.1.64/27 [110/3] via 172.9.1.137, 00:04:57, GigabitEthernet0/0
C       172.9.1.96/28 is directly connected, GigabitEthernet0/1.10
L       172.9.1.97/32 is directly connected, GigabitEthernet0/1.10
O       172.9.1.112/28 [110/3] via 172.9.1.137, 00:04:57, GigabitEthernet0/0
O       172.9.1.128/30 [110/2] via 172.9.1.137, 00:04:57, GigabitEthernet0/0
O       172.9.1.132/30 [110/2] via 172.9.1.137, 00:05:07, GigabitEthernet0/0
C       172.9.1.136/30 is directly connected, GigabitEthernet0/0
L       172.9.1.138/32 is directly connected, GigabitEthernet0/0
O*E2 0.0.0.0/0 [110/1] via 172.9.1.137, 00:05:07, GigabitEthernet0/0
```