HƯỚNG DẪN LAB
LAB 25 – LAB tổng hợp Switching

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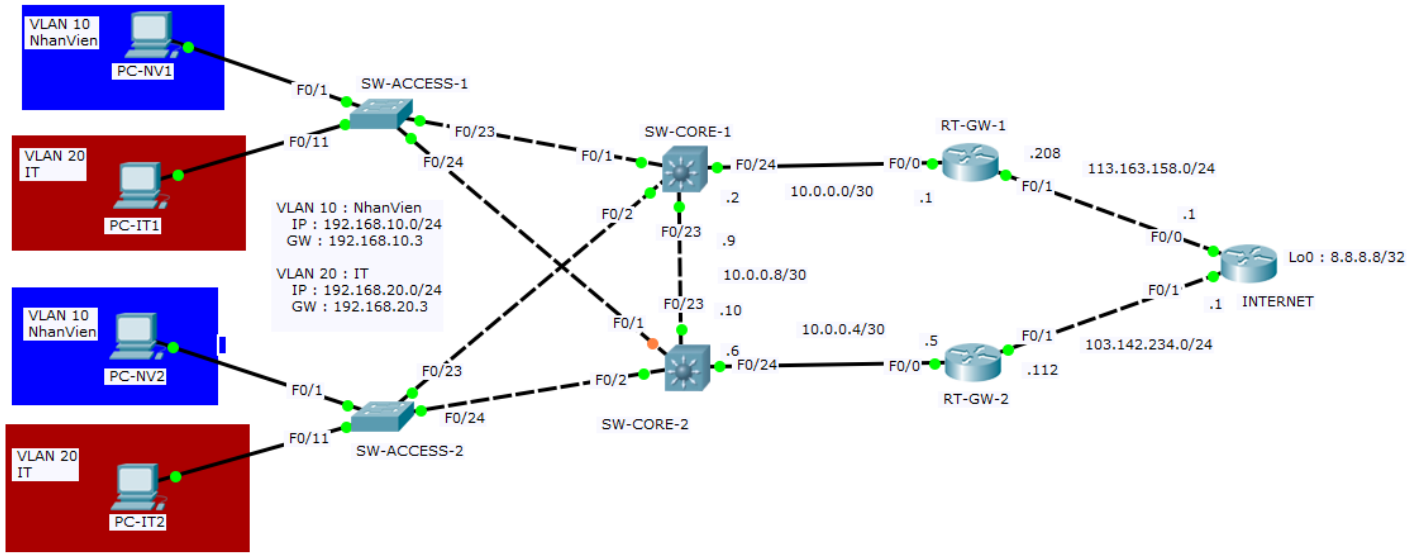
Sơ đồ LAB :



Yêu cầu

- Đấu nối và đặt tên thiết bị như sơ đồ
- Cấu hình VLAN như sau

Switch	VLAN	Tên VLAN	Port
SW-ACCESS-1	10	NhanVien	F0/1-10
	20	IT	F0/11-20
	999	Unused	
SW-ACCESS-2	10	NhanVien	F0/1-10
	20	IT	F0/11-20
	999	Unused	
SW-CORE-1	10	NhanVien	
	20	IT	
	999	Unused	
SW-CORE-2	10	NhanVien	
	20	IT	
	999	Unused	

- Cấu hình trunk cho link nối giữa các switch, chỉ cho phép các VLAN cần thiết đi qua, đổi native vlan lại thành 999.
- Cấu hình cho hệ thống switch chạy giao thức RSTP
  Cấu hình để
  - SW-CORE-1 là root primary switch cho tất cả VLAN 10
  - SW-CORE-2 là root primary switch cho tất cả VLAN 20
- Cấu hình các port access là portfast và bật tính năng BPDU Guard
- Đặt IP cho interface như sau

Thiết bị	Interface	IP
SW-CORE-1	F0/23	10.0.0.9/30
	F0/24	10.0.0.2/30
	Vlan 10	192.168.10.1/24
	Vlan 20	192.168.20.1/24
SW-CORE-2	F0/23	10.0.0.10/30
	F0/24	10.0.0.6/30
	Vlan 10	192.168.10.2/24
	Vlan 20	192.168.20.2/24
RT-GW-1	F0/0	10.0.0.1/30
	F0/1	113.163.158.208/24
RT-GW-2	F0/0	10.0.0.5/30
	F0/1	103.142.234.112/24
INTERNET	F0/0	113.163.158.1/24
	F0/1	103.142.234.1/24
	Loopback0	8.8.8.8/32

- Cấu hình để 2 SW-CORE làm DHCP Server với 2 pool như sau :

Pool	Thông số	Giá trị
NhanVien	Network	192.168.10.0
	Subnet mask	255.255.255.0
	Gateway	192.168.10.3
	DNS	8.8.8.8
IT	Network	192.168.20.0
	Subnet mask	255.255.255.0
	Gateway	192.168.20.3
	DNS	8.8.8.8

Exclude 10 IP đầu của mỗi subnet

- Cấu hình HSRP trên hai SW-CORE với các điều kiện sau :
  - IP Gateway ảo cho vlan 10 : 192.168.10.3
  - IP Gateway ảo cho vlan 20 : 192.168.20.3
  - SW-CORE-1 có priority 105 cho vlan 10, priority 100 cho vlan 20
  - SW-CORE-2 có priority 100 cho vlan 10, priority 105 cho vlan 20
  - Cấu hình preempt cho cả hai router
  - Cấu hình track Interface F0/24 trên hai SW-CORE
- Cấu hình EIGRP ASN 65000 cho 2 router RT-GW và 2 SW-CORE, quảng bá tất cả dãi IP Private.
  Cấu hình passive-interface trên các interface vlan

Lưu ý : 2 RT-GW không quảng bá IP Public.

- Cấu hình default route trên 2 router RT-GW
- Cấu hình NAT overload trên 2 router RT-GW để NAT tất cả IP private ra địa chỉ IP Public
- Tìm giải pháp để các PC có thể ra được Internet (có thể ping được 8.8.8.8), VLAN 10 chọn đường đi qua RT-GW-1, VLAN 20 chọn đường đi qua RT-GW-2
  Giải pháp phải đảm bảo tính dự phòng, khi một trong các sự cố sau xảy ra, PC vẫn phải ra được Internet :
  - Link giữa SW-CORE và RT-GW bị đứt
  - RT-GW gặp sự cố mất nguồn
  - Kết nối Internet của RT-GW bị đứt

Các bước thực hiện

Bước 1 : đấu nối và đặt tên thiết bị như sơ đồ

Bước 2 : cấu hình VLAN và gán port vào VLAN

SW-ACCESS-1

```
SW-ACCESS-1(config)#vlan 10
SW-ACCESS-1(config-vlan)#name NhanVien
SW-ACCESS-1(config-vlan)#exit
SW-ACCESS-1(config)#vlan 20
SW-ACCESS-1(config-vlan)#name IT
SW-ACCESS-1(config-vlan)#exit
SW-ACCESS-1(config)#vlan 999
SW-ACCESS-1(config-vlan)#name Unused
```

```
SW-ACCESS-1(config-vlan)#exit
SW-ACCESS-1(config)#
SW-ACCESS-1(config)#interface range F0/1-10
SW-ACCESS-1(config-if-range)#switchport access vlan 10
SW-ACCESS-1(config-if-range)#exit
SW-ACCESS-1(config)#interface range F0/11-20
SW-ACCESS-1(config-if-range)#switchport access vlan 20
```

Kiểm tra :

```
SW-ACCESS-1#show vlan brief

VLAN Name                             Status    Ports
---- -------------------------------- --------- -------------------------------
1    default                          active    Fa0/21, Fa0/22, Fa0/23, Fa0/24
                                                Gig0/1, Gig0/2
10   NhanVien                         active    Fa0/1, Fa0/2, Fa0/3, Fa0/4
                                                Fa0/5, Fa0/6, Fa0/7, Fa0/8
                                                Fa0/9, Fa0/10
20   IT                               active    Fa0/11, Fa0/12, Fa0/13, Fa0/14
                                                Fa0/15, Fa0/16, Fa0/17, Fa0/18
                                                Fa0/19, Fa0/20
999  Unused                           active
1002 fddi-default                     active
1003 token-ring-default               active
1004 fddinet-default                  active
1005 trnet-default                    active
```

SW-ACCESS-2

```
SW-ACCESS-2(config)#vlan 10
SW-ACCESS-2(config-vlan)#name NhanVien
SW-ACCESS-2(config-vlan)#exit
SW-ACCESS-2(config)#vlan 20
SW-ACCESS-2(config-vlan)#name IT
SW-ACCESS-2(config-vlan)#exit
SW-ACCESS-2(config)#vlan 999
SW-ACCESS-2(config-vlan)#name Unused
SW-ACCESS-2(config-vlan)#exit
SW-ACCESS-2(config)#
SW-ACCESS-2(config)#interface range F0/1-10
SW-ACCESS-2(config-if-range)#switchport access vlan 10
SW-ACCESS-2(config-if-range)#exit
SW-ACCESS-2(config)#interface range F0/11-20
SW-ACCESS-2(config-if-range)#switchport access vlan 20
```

Kiểm tra :

```
SW-ACCESS-2#show vlan brief

VLAN Name                             Status    Ports
---- -------------------------------- --------- -------------------------------
1    default                          active    Fa0/21, Fa0/22, Fa0/23, Fa0/24
                                                Gig0/1, Gig0/2
10   NhanVien                         active    Fa0/1, Fa0/2, Fa0/3, Fa0/4
                                                Fa0/5, Fa0/6, Fa0/7, Fa0/8
                                                Fa0/9, Fa0/10
20   IT                               active    Fa0/11, Fa0/12, Fa0/13, Fa0/14
                                                Fa0/15, Fa0/16, Fa0/17, Fa0/18
                                                Fa0/19, Fa0/20
999  Unused                           active
1002 fddi-default                     active
1003 token-ring-default               active
1004 fddinet-default                  active
```

```
1005 trnet-default                     active
```

SW-CORE-1

```
SW-CORE-1(config)#vlan 10
SW-CORE-1(config-vlan)#name NhanVien
SW-CORE-1(config-vlan)#exit
SW-CORE-1(config)#vlan 20
SW-CORE-1(config-vlan)#name IT
SW-CORE-1(config-vlan)#exit
SW-CORE-1(config)#vlan 999
SW-CORE-1(config-vlan)#name Unused
SW-CORE-1(config-vlan)#exit
SW-CORE-1(config)#
SW-CORE-1(config)#interface range F0/21-22
SW-CORE-1(config-if-range)#switchport access vlan 30
SW-CORE-1(config-if-range)#end
```

Kiểm tra:

```
SW-CORE-1#show vlan brief

VLAN Name                              Status    Ports
---- --------------------------------- --------- -------------------------------
1    default                           active    Fa0/1, Fa0/2, Fa0/3, Fa0/4
                                                 Fa0/5, Fa0/6, 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,
                                                 F0/21, F0/22, Fa0/23, Fa0/24,
                                                 Gig0/1, Gig0/2
10   NhanVien                          active
20   IT                                active
999  Unused                            active
1002 fddi-default                      active
1003 token-ring-default                active
1004 fddinet-default                   active
1005 trnet-default                     active
```

SW-CORE-2

```
SW-CORE-2(config)#vlan 10
SW-CORE-2(config-vlan)#name NhanVien
SW-CORE-2(config-vlan)#exit
SW-CORE-2(config)#vlan 20
SW-CORE-2(config-vlan)#name IT
SW-CORE-2(config-vlan)#exit
SW-CORE-2(config)#vlan 30
SW-CORE-2(config-vlan)#name Server
SW-CORE-2(config-vlan)#exit
SW-CORE-2(config)#vlan 999
SW-CORE-2(config-vlan)#name Unused
SW-CORE-2(config-vlan)#exit
SW-CORE-2(config)#
SW-CORE-2(config)#interface range F0/21-22
SW-CORE-2(config-if-range)#switchport access vlan 30
SW-CORE-2(config-if-range)#end
```

Kiểm tra:

```
SW-CORE-2#show vlan brief

VLAN Name                              Status    Ports
---- --------------------------------- --------- -------------------------------
```

```
1    default                          active    Fa0/1, Fa0/2, Fa0/3, Fa0/4
                                                Fa0/5, Fa0/6, 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,
                                                F0/21, F0/22, Fa0/23, Fa0/24,
                                                Gig0/1, Gig0/2
10   NhanVien                         active
20   IT                               active
999  Unused                           active
1002 fddi-default                     active
1003 token-ring-default               active
1004 fddinet-default                  active
1005 trnet-default                    active
```

Bước 3 : cấu hình trunk

SW-ACCESS-1

```
SW-ACCESS-1(config)#interface range F0/23-24
SW-ACCESS-1(config-if-range)#switchport mode trunk
SW-ACCESS-1(config-if-range)#switchport trunk allowed vlan 10,20
SW-ACCESS-1(config-if-range)#switchport trunk native vlan 999
```

Kiểm tra:

```
SW-ACCESS-1#show interfaces trunk
Port        Mode         Encapsulation  Status        Native vlan
Fa0/23      on           802.1q         trunking      999
Fa0/24      on           802.1q         trunking      999

Port        Vlans allowed on trunk
Fa0/23      10,20
Fa0/24      10,20

Port        Vlans allowed and active in management domain
Fa0/23      10,20
Fa0/24      10,20

Port        Vlans in spanning tree forwarding state and not pruned
Fa0/23      none
Fa0/24      none
```

SW-ACCESS-2

```
SW-ACCESS-2(config)#interface range F0/23-24
SW-ACCESS-2(config-if-range)#switchport mode trunk
SW-ACCESS-2(config-if-range)#switchport trunk allowed vlan 10,20
SW-ACCESS-2(config-if-range)#switchport trunk native vlan 999
```

Kiểm tra:

```
SW-ACCESS-2#show interfaces trunk
Port        Mode         Encapsulation  Status        Native vlan
Fa0/23      on           802.1q         trunking      999
Fa0/24      on           802.1q         trunking      999

Port        Vlans allowed on trunk
Fa0/23      10,20
Fa0/24      10,20

Port        Vlans allowed and active in management domain
```

```
Fa0/23      10,20
Fa0/24      10,20

Port        Vlans in spanning tree forwarding state and not pruned
Fa0/23      none
Fa0/24      none
```

SW-CORE-1

```
SW-CORE-1(config)#interface range F0/1-2
SW-CORE-1(config-if-range)#switchport trunk encapsulation dot1q
SW-CORE-1(config-if-range)#switchport mode trunk
SW-CORE-1(config-if-range)#switchport trunk allowed vlan 10,20
SW-CORE-1(config-if-range)#switchport trunk native vlan 999
```

Kiểm tra:

```
SW-CORE-1#show int trunk
Port        Mode         Encapsulation  Status        Native vlan
Fa0/1       on           802.1q         trunking      999
Fa0/2       on           802.1q         trunking      999

Port        Vlans allowed on trunk
Fa0/1       10,20
Fa0/2       10,20

Port        Vlans allowed and active in management domain
Fa0/1       10,20
Fa0/2       10,20

Port        Vlans in spanning tree forwarding state and not pruned
Fa0/1       none
Fa0/2       none
```

SW-CORE-2

```
SW-CORE-2(config)#interface range F0/1-2
SW-CORE-2(config-if-range)#switchport trunk encapsulation dot1q
SW-CORE-2(config-if-range)#switchport mode trunk
SW-CORE-2(config-if-range)#switchport trunk allowed vlan 10,20
SW-CORE-2(config-if-range)#switchport trunk native vlan 999
```

Kiểm tra:

```
SW-CORE-2#show int trunk
Port        Mode         Encapsulation  Status        Native vlan
Fa0/1       on           802.1q         trunking      999
Fa0/2       on           802.1q         trunking      999

Port        Vlans allowed on trunk
Fa0/1       10,20
Fa0/2       10,20

Port        Vlans allowed and active in management domain
Fa0/1       10,20
Fa0/2       10,20

Port        Vlans in spanning tree forwarding state and not pruned
Fa0/1       none
Fa0/2       none
```

Bước 4: Cấu hình RSTP cho tất cả các switch. cấu hình để SW-CORE-1 là Root Primary Switch cho tất cả vlan 10, SW-CORE-2 là Root Primary Switch cho vlan 20

SW-CORE-1

```
SW-CORE-1(config)#spanning-tree mode rapid-pvst
SW-CORE-1(config)#spanning-tree vlan 10 root primary
```

Kiểm tra:

```
SW-CORE-1#show spanning-tree vlan 10
VLAN0010
  Spanning tree enabled protocol rstp
  Root ID     Priority    24586
              Address     000C.CFDC.1478
              This bridge is the root
              Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec

  Bridge ID   Priority    24586  (priority 24576 sys-id-ext 10)
              Address     000C.CFDC.1478
              Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec
              Aging Time  20

Interface        Role Sts Cost      Prio.Nbr Type
---------------- ---- --- --------- -------- --------------------------------
Fa0/1            Desg FWD 19        128.1    P2p
Fa0/2            Desg FWD 19        128.2    P2p
```

SW-CORE-2

```
SW-CORE-2(config)#spanning-tree mode rapid-pvst
SW-CORE-2(config)#spanning-tree vlan 20 root secondary
```

Kiểm tra:

```
SW-CORE-2#show spanning-tree vlan 20
VLAN0020
  Spanning tree enabled protocol rstp
  Root ID     Priority    20500
              Address     0002.163C.CC5D
              This bridge is the root
              Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec

  Bridge ID   Priority    20500  (priority 20480 sys-id-ext 20)
              Address     0002.163C.CC5D
              Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec
              Aging Time  20

Interface        Role Sts Cost      Prio.Nbr Type
---------------- ---- --- --------- -------- --------------------------------
Fa0/1            Desg FWD 19        128.1    P2p
Fa0/2            Desg FWD 19        128.2    P2p
```

Bước 5 : Cấu hình portfast và BPDU Guard cho các port access

SW-ACCESS-1

```
SW-ACCESS-1(config)#interface range F0/1-20
SW-ACCESS-1(config-if-range)#spanning-tree portfast
SW-ACCESS-1(config-if-range)#spanning-tree bpduguard enable
```

SW-ACCESS-2

```
SW-ACCESS-2(config)#interface range F0/1-20
SW-ACCESS-2(config-if-range)#spanning-tree portfast
SW-ACCESS-2(config-if-range)#spanning-tree bpduguard enable
```

Bước 6 : Đặt IP cho các interface

SW-CORE-1

```
SW-CORE-1(config)#interface vlan 10
SW-CORE-1(config-if)#ip add 192.168.10.1 255.255.255.0
SW-CORE-1(config-if)#no shut
SW-CORE-1(config-if)#exit
SW-CORE-1(config)#interface vlan 20
SW-CORE-1(config-if)#ip add 192.168.20.1 255.255.255.0
SW-CORE-1(config-if)#no shut
SW-CORE-1(config-if)#exit
SW-CORE-1(config)#interface F0/23
SW-CORE-1(config-if)#no switchport
SW-CORE-1(config-if)#ip add 10.0.0.9 255.255.255.252
SW-CORE-1(config-if)#no shut
SW-CORE-1(config-if)#exit
SW-CORE-1(config)#interface F0/24
SW-CORE-1(config-if)#no switchport
SW-CORE-1(config-if)#ip add 10.0.0.2 255.255.255.252
SW-CORE-1(config-if)#no shut
```

Kiểm tra:

```
SW-CORE-1#show ip interface brief
Interface              IP-Address      OK? Method Status                Protocol
FastEthernet0/1        unassigned      YES unset  up                    up
FastEthernet0/2        unassigned      YES unset  up                    up
FastEthernet0/3        unassigned      YES unset  down                  down
FastEthernet0/4        unassigned      YES unset  down                  down
FastEthernet0/5        unassigned      YES unset  down                  down
FastEthernet0/6        unassigned      YES unset  down                  down
FastEthernet0/7        unassigned      YES unset  down                  down
FastEthernet0/8        unassigned      YES unset  down                  down
FastEthernet0/9        unassigned      YES unset  down                  down
FastEthernet0/10       unassigned      YES unset  down                  down
FastEthernet0/11       unassigned      YES unset  down                  down
FastEthernet0/12       unassigned      YES unset  down                  down
FastEthernet0/13       unassigned      YES unset  down                  down
FastEthernet0/14       unassigned      YES unset  down                  down
FastEthernet0/15       unassigned      YES unset  down                  down
FastEthernet0/16       unassigned      YES unset  down                  down
FastEthernet0/17       unassigned      YES unset  down                  down
FastEthernet0/18       unassigned      YES unset  down                  down
FastEthernet0/19       unassigned      YES unset  down                  down
FastEthernet0/20       unassigned      YES unset  down                  down
FastEthernet0/21       unassigned      YES unset  down                  down
FastEthernet0/22       unassigned      YES unset  down                  down
FastEthernet0/23       10.0.0.9        YES manual up                    up
FastEthernet0/24       10.0.0.2        YES manual down                  down
GigabitEthernet0/1     unassigned      YES unset  down                  down
GigabitEthernet0/2     unassigned      YES unset  down                  down
Vlan1                  unassigned      YES unset  administratively down down
Vlan10                 192.168.10.1    YES manual up                    up
Vlan20                 192.168.20.1    YES manual up                    up
```

SW-CORE-2

```
SW-CORE-2(config)#interface vlan 10
SW-CORE-2(config-if)#ip address 192.168.10.2 255.255.255.0
SW-CORE-2(config-if)#no shut
SW-CORE-2(config-if)#exit
SW-CORE-2(config)#interface vlan 20
SW-CORE-2(config-if)#ip address 192.168.20.2 255.255.255.0
SW-CORE-2(config-if)#no shut
SW-CORE-2(config-if)#exit
SW-CORE-2(config)#interface vlan 30
SW-CORE-2(config-if)#ip address 192.168.30.2 255.255.255.0
SW-CORE-2(config-if)#no shut
SW-CORE-2(config-if)#exit
SW-CORE-2(config)#interface F0/23
SW-CORE-2(config-if)#no switchport
SW-CORE-2(config-if)#ip address 10.0.0.10 255.255.255.252
SW-CORE-2(config-if)#no shut
SW-CORE-2(config-if)#exit
SW-CORE-2(config)#interface F0/24
SW-CORE-2(config-if)#no switchport
SW-CORE-2(config-if)#ip address 10.0.0.6 255.255.255.252
SW-CORE-2(config-if)#no shut
```

Kiểm tra:

```
SW-CORE-2#show ip interface brief
Interface              IP-Address      OK? Method Status                Protocol
FastEthernet0/1        unassigned      YES unset  up                    up
FastEthernet0/2        unassigned      YES unset  up                    up
FastEthernet0/3        unassigned      YES unset  down                  down
FastEthernet0/4        unassigned      YES unset  down                  down
FastEthernet0/5        unassigned      YES unset  down                  down
FastEthernet0/6        unassigned      YES unset  down                  down
FastEthernet0/7        unassigned      YES unset  down                  down
FastEthernet0/8        unassigned      YES unset  down                  down
FastEthernet0/9        unassigned      YES unset  down                  down
FastEthernet0/10       unassigned      YES unset  down                  down
FastEthernet0/11       unassigned      YES unset  down                  down
FastEthernet0/12       unassigned      YES unset  down                  down
FastEthernet0/13       unassigned      YES unset  down                  down
FastEthernet0/14       unassigned      YES unset  down                  down
FastEthernet0/15       unassigned      YES unset  down                  down
FastEthernet0/16       unassigned      YES unset  down                  down
FastEthernet0/17       unassigned      YES unset  down                  down
FastEthernet0/18       unassigned      YES unset  down                  down
FastEthernet0/19       unassigned      YES unset  down                  down
FastEthernet0/20       unassigned      YES unset  up                    up
FastEthernet0/21       unassigned      YES unset  down                  down
FastEthernet0/22       unassigned      YES unset  down                  down
FastEthernet0/23       10.0.0.10       YES manual up                    up
FastEthernet0/24       10.0.0.6        YES manual down                  down
GigabitEthernet0/1     unassigned      YES unset  down                  down
GigabitEthernet0/2     unassigned      YES unset  down                  down
Vlan1                  unassigned      YES unset  administratively down down
Vlan10                 192.168.10.2    YES manual up                    up
Vlan20                 192.168.20.2    YES manual up                    up

SW-CORE-1#ping 10.0.0.10

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.0.0.10, timeout is 2 seconds:
.!!!!
Success rate is 80 percent (4/5), round-trip min/avg/max = 0/0/2 ms
```

RT-GW-1

```
RT-GW-1(config)#interface F0/0
RT-GW-1(config-if)#ip address 10.0.0.1 255.255.255.252
RT-GW-1(config-if)#no shut
RT-GW-1(config-if)#exit
RT-GW-1(config)#interface F0/1
RT-GW-1(config-if)#ip address 113.163.158.208 255.255.255.0
RT-GW-1(config-if)#no shut
```

Kiểm tra:

```
RT-GW-1#show ip int brief
Interface              IP-Address      OK? Method Status                Protocol
FastEthernet0/0        10.0.0.1        YES manual up                    up
FastEthernet0/1        113.163.158.208 YES manual up                    down
Vlan1                  unassigned      YES unset  administratively down down

RT-GW-1#ping 10.0.0.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.0.0.2, timeout is 2 seconds:
.!!!!
Success rate is 80 percent (4/5), round-trip min/avg/max = 0/0/0 ms
```

RT-GW-2

```
RT-GW-2(config)#interface F0/0
RT-GW-2(config-if)#ip add 10.0.0.5 255.255.255.252
RT-GW-2(config-if)#no shut
RT-GW-2(config-if)#exit
RT-GW-2(config)#interface F0/1
RT-GW-2(config-if)#ip address 103.142.234.112 255.255.255.0
RT-GW-2(config-if)#no shut
```

Kiểm tra:

```
RT-GW-2#show ip interface brief
Interface              IP-Address      OK? Method Status                Protocol
FastEthernet0/0        10.0.0.5        YES manual up                    up
FastEthernet0/1        103.142.234.112 YES manual up                    down
Vlan1                  unassigned      YES unset  administratively down down

RT-GW-2#ping 10.0.0.6

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.0.0.6, timeout is 2 seconds:
.!!!!
Success rate is 80 percent (4/5), round-trip min/avg/max = 0/0/1 ms
```

Internet

```
INTERNET(config)#interface F0/0
INTERNET(config-if)#ip add 113.163.158.1 255.255.255.0
INTERNET(config-if)#no shut
INTERNET(config-if)#exit
INTERNET(config)#interface F0/1
INTERNET(config-if)#ip address 103.142.234.1 255.255.255.0
INTERNET(config-if)#no shut
INTERNET(config-if)#exit
INTERNET(config)#interface loopback0
INTERNET(config-if)#ip add 8.8.8.8 255.255.255.255
```

Kiểm tra:

```
INTERNET#show ip int brief
Interface              IP-Address      OK? Method Status                Protocol
FastEthernet0/0        113.163.158.1   YES manual up                    up
FastEthernet0/1        103.142.234.1   YES manual up                    up
Loopback0              8.8.8.8         YES manual up                    up
Vlan1                  unassigned      YES unset  administratively down down

INTERNET#ping 113.163.158.208

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 113.163.158.208, timeout is 2 seconds:
.!!!!
Success rate is 80 percent (4/5), round-trip min/avg/max = 0/0/0 ms

INTERNET#ping 103.142.234.112

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 103.142.234.112, timeout is 2 seconds:
.!!!!
Success rate is 80 percent (4/5), round-trip min/avg/max = 0/0/0 ms
```

Bước 7 : Cấu hình DHCP Server cho 2 SW-CORE

SW-CORE-1

```
SW-CORE-1(config)#ip dhcp pool NhanVien
SW-CORE-1(dhcp-config)#network 192.168.10.0 255.255.255.0
SW-CORE-1(dhcp-config)#default-router 192.168.10.3
SW-CORE-1(dhcp-config)#dns 8.8.8.8
SW-CORE-1(dhcp-config)#exit
SW-CORE-1(config)#ip dhcp pool IT
SW-CORE-1(dhcp-config)#network 192.168.20.0 255.255.255.0
SW-CORE-1(dhcp-config)#default-router 192.168.20.3
SW-CORE-1(dhcp-config)#dns 8.8.8.8
SW-CORE-1(dhcp-config)#exit
SW-CORE-1(config)#ip dhcp excluded-address 192.168.10.1 192.168.10.10
SW-CORE-1(config)#ip dhcp excluded-address 192.168.10.2 192.168.20.10
```

Kiểm tra:

```
SW-CORE-1#show ip dhcp pool

Pool NhanVien :
 Utilization mark (high/low)    : 100 / 0
 Subnet size (first/next)       : 0 / 0
 Total addresses                : 254
 Leased addresses               : 0
 Excluded addresses             : 0
 Pending event                  : none

 1 subnet is currently in the pool
 Current index        IP address range                    Leased/Excluded/Total
 192.168.10.1         192.168.10.1     - 192.168.10.254    0    / 0     / 254

Pool IT :
 Utilization mark (high/low)    : 100 / 0
 Subnet size (first/next)       : 0 / 0
 Total addresses                : 254
 Leased addresses               : 0
 Excluded addresses             : 0
 Pending event                  : none
```

```
 1 subnet is currently in the pool
 Current index        IP address range                    Leased/Excluded/Total
 192.168.20.1         192.168.20.1     - 192.168.20.254    0    / 0     / 254
```

SW-CORE-2

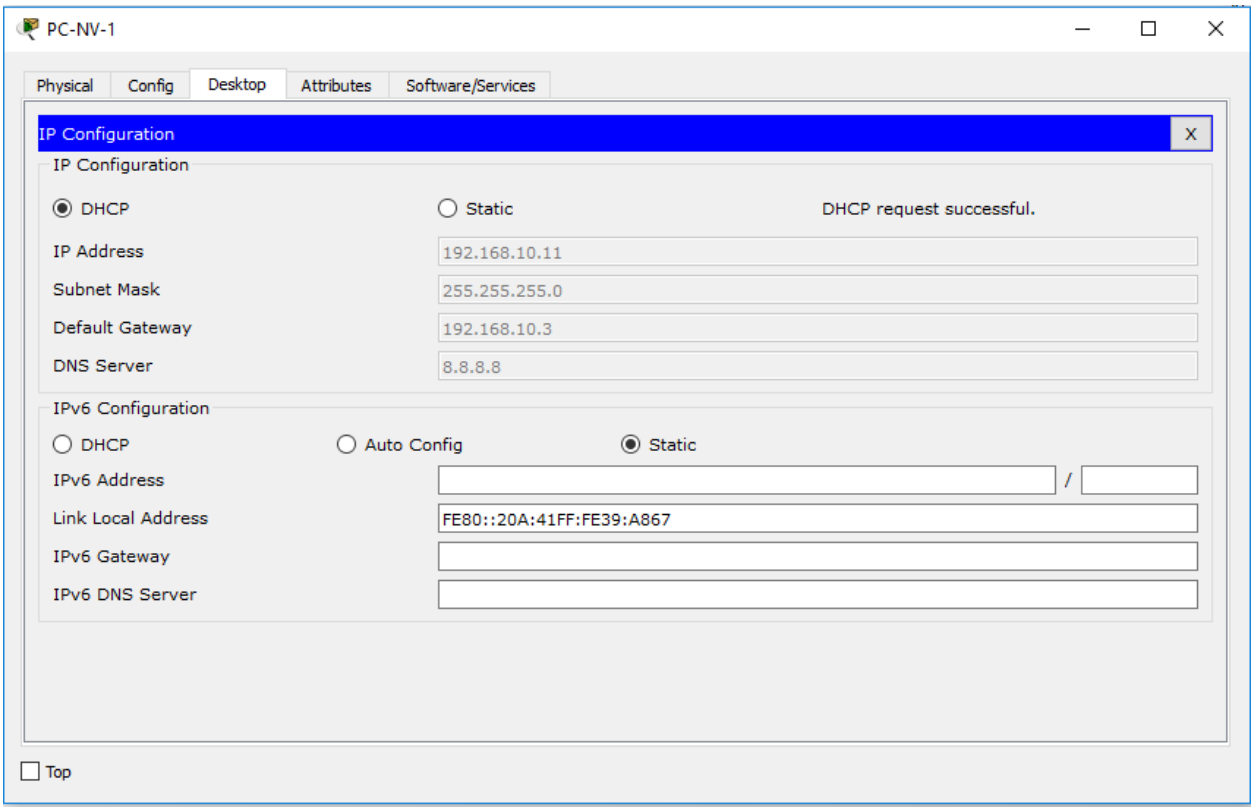
```
SW-CORE-2(config)#ip dhcp pool NhanVien
SW-CORE-2(dhcp-config)# network 192.168.10.0 255.255.255.0
SW-CORE-2(dhcp-config)# default-router 192.168.10.3
SW-CORE-2(dhcp-config)# dns-server 8.8.8.8
SW-CORE-2(dhcp-config)#exit
SW-CORE-2(config)#ip dhcp pool IT
SW-CORE-2(dhcp-config)# network 192.168.20.0 255.255.255.0
SW-CORE-2(dhcp-config)# default-router 192.168.20.3
SW-CORE-2(dhcp-config)# dns-server 8.8.8.8
SW-CORE-2(dhcp-config)#exit
SW-CORE-2(config)#ip dhcp excluded-address 192.168.10.1 192.168.10.10
SW-CORE-2(config)#ip dhcp excluded-address 192.168.10.2 192.168.20.10
```

Kiểm tra:

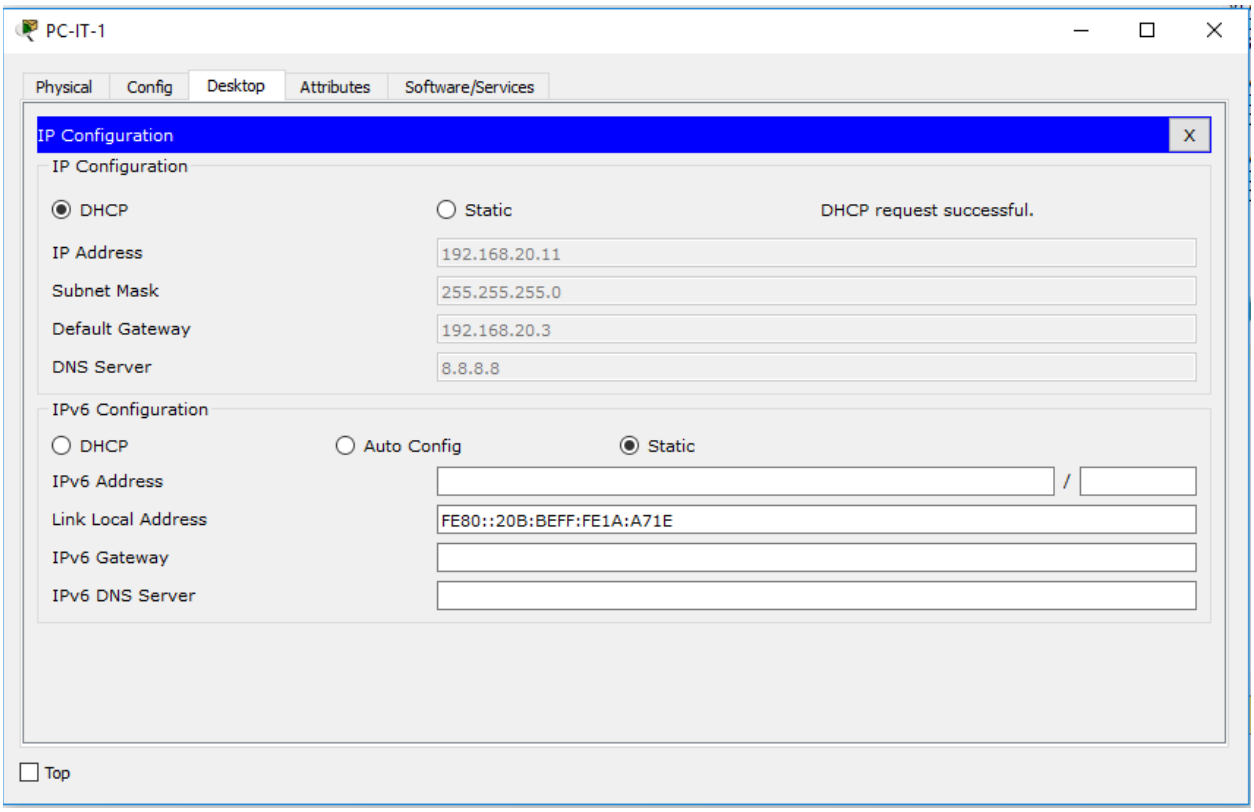
```
SW-CORE-2#show ip dhcp pool

Pool NhanVien :
 Utilization mark (high/low)    : 100 / 0
 Subnet size (first/next)       : 0 / 0
 Total addresses                : 254
 Leased addresses               : 0
 Excluded addresses             : 0
 Pending event                  : none

 1 subnet is currently in the pool
 Current index        IP address range                    Leased/Excluded/Total
 192.168.10.1         192.168.10.1     - 192.168.10.254    0    / 0     / 254

Pool IT :
 Utilization mark (high/low)    : 100 / 0
 Subnet size (first/next)       : 0 / 0
 Total addresses                : 254
 Leased addresses               : 0
 Excluded addresses             : 0
 Pending event                  : none

 1 subnet is currently in the pool
 Current index        IP address range                    Leased/Excluded/Total
 192.168.20.1         192.168.20.1     - 192.168.20.254    0    / 0     / 254
```

Bước 7 : cho PC nhận IP bằng DHCP

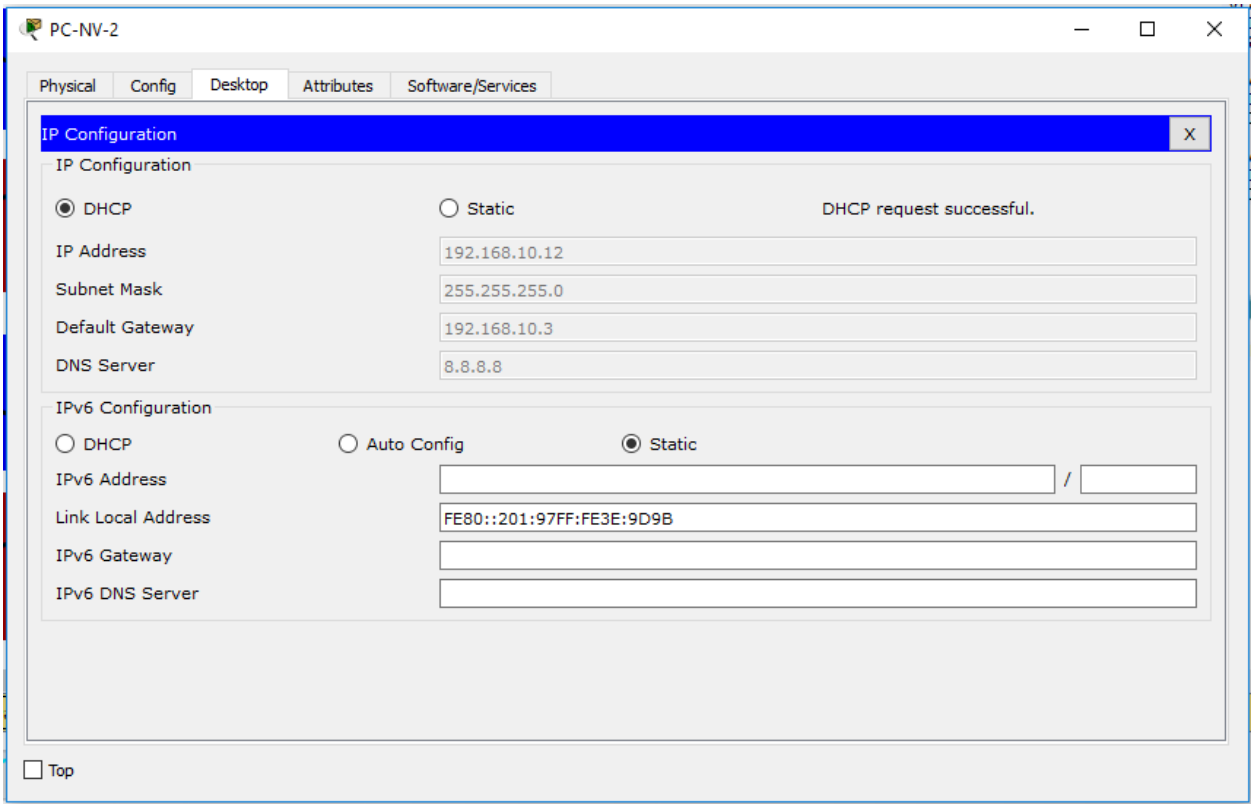
PC-NV-1


PC-NV-1
Physical
Config
Desktop
Attributes
Software/Services
IP Configuration
X
IP Configuration
DHCP
Static
DHCP request successful.
IP Address
192.168.10.11
Subnet Mask
255.255.255.0
Default Gateway
192.168.10.3
DNS Server
8.8.8.8
IPv6 Configuration
DHCP
Auto Config
Static
IPv6 Address
/
Link Local Address
FE80::20A:41FF:FE39:A867
IPv6 Gateway
IPv6 DNS Server
Top

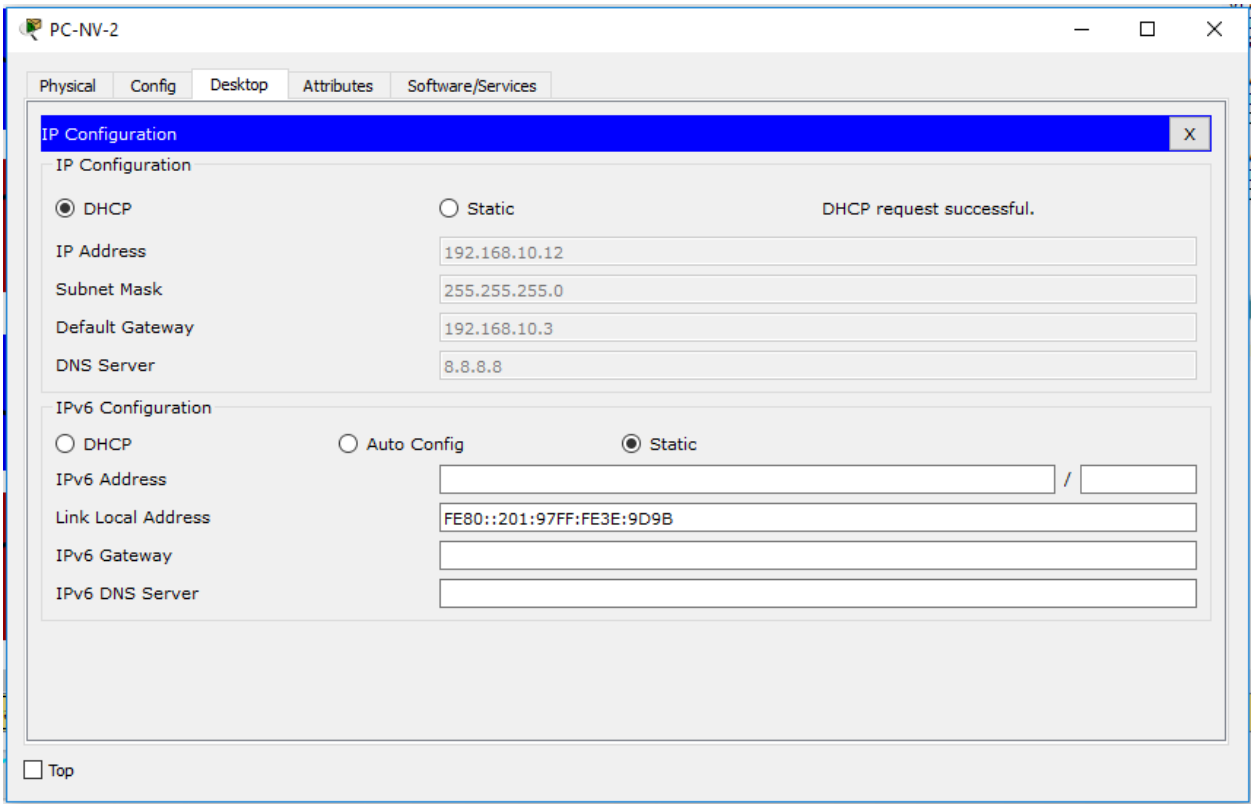
PC-IT-1


PC-IT-1
Physical
Config
Desktop
Attributes
Software/Services
IP Configuration
X
IP Configuration
DHCP
Static
DHCP request successful.
IP Address
192.168.20.11
Subnet Mask
255.255.255.0
Default Gateway
192.168.20.3
DNS Server
8.8.8.8
IPv6 Configuration
DHCP
Auto Config
Static
IPv6 Address
/
Link Local Address
FE80::20B:BEFF:FE1A:A71E
IPv6 Gateway
IPv6 DNS Server
Top

PC-NV-2


PC-NV-2
Physical
Config
Desktop
Attributes
Software/Services
IP Configuration
X
IP Configuration
DHCP
Static
DHCP request successful.
IP Address
192.168.10.12
Subnet Mask
255.255.255.0
Default Gateway
192.168.10.3
DNS Server
8.8.8.8
IPv6 Configuration
DHCP
Auto Config
Static
IPv6 Address
/
Link Local Address
FE80::201:97FF:FE3E:9D9B
IPv6 Gateway
IPv6 DNS Server
Top

PC-IT-2


PC-NV-2
Physical
Config
Desktop
Attributes
Software/Services
IP Configuration
X
IP Configuration
DHCP
Static
DHCP request successful.
IP Address
192.168.10.12
Subnet Mask
255.255.255.0
Default Gateway
192.168.10.3
DNS Server
8.8.8.8
IPv6 Configuration
DHCP
Auto Config
Static
IPv6 Address
/
Link Local Address
FE80::201:97FF:FE3E:9D9B
IPv6 Gateway
IPv6 DNS Server
Top

Bước 8: cấu hình HSRP

SW-CORE-1

```
SW-CORE-1(config)#interface vlan 10
SW-CORE-1(config-if)#standby 1 ip 192.168.10.3
SW-CORE-1(config-if)#standby 1 priority 105
SW-CORE-1(config-if)#standby 1 preempt
SW-CORE-1(config-if)#exit
SW-CORE-1(config)#interface vlan 20
SW-CORE-1(config-if)#standby 2 ip 192.168.20.3
SW-CORE-1(config-if)#standby 2 preempt
```

SW-CORE-2

```
SW-CORE-2(config)#interface vlan 10
SW-CORE-2(config-if)#standby 1 ip 192.168.10.3
SW-CORE-2(config-if)#standby 1 preempt
SW-CORE-2(config-if)#exit
SW-CORE-2(config)#interface vlan 20
SW-CORE-2(config-if)#standby 2 ip 192.168.20.3
SW-CORE-2(config-if)#standby 2 priority 105
SW-CORE-2(config-if)#standby 2 preempt
```

Không cần cấu hình priority cho SW-CORE-2, vì priority mặc định đã là 100.

Bước 9 : Kiểm tra cấu hình HSRP

SW-CORE-1

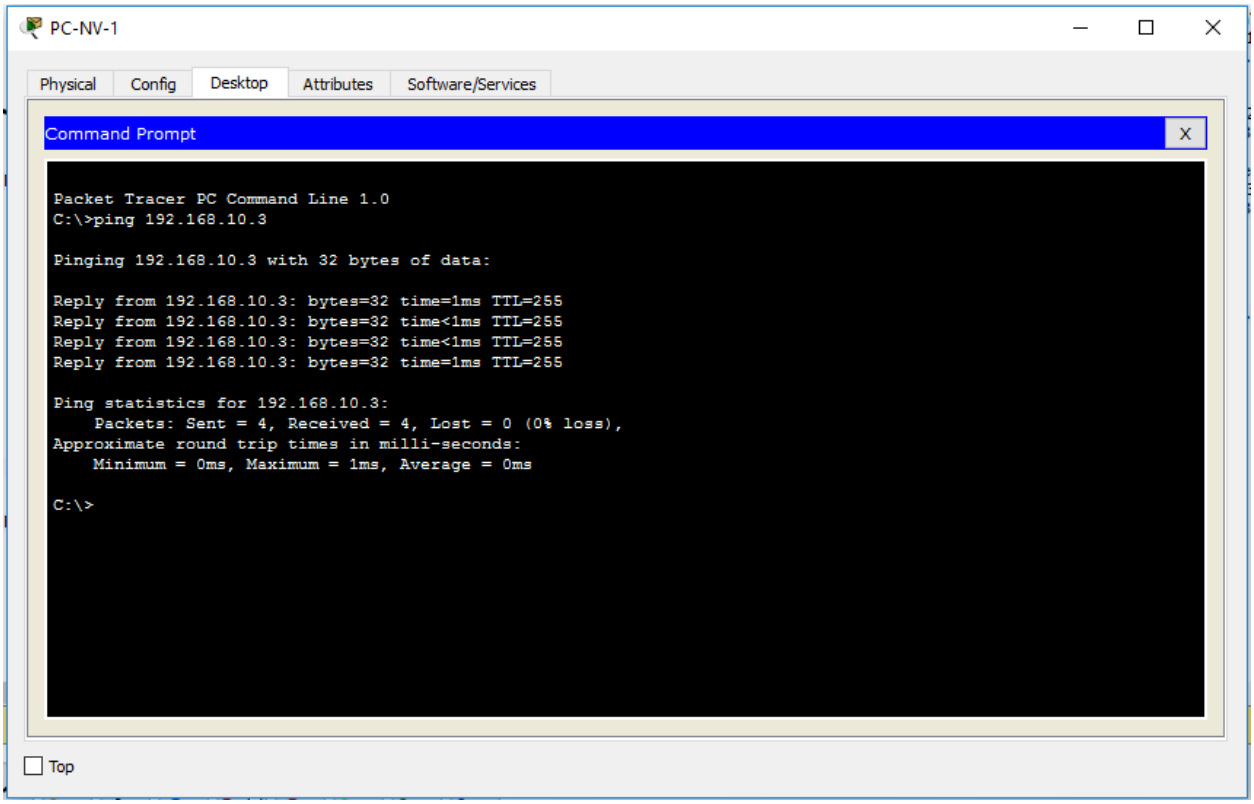
```
SW-CORE-1#show standby
Vlan10 - Group 1
  State is Active
    6 state changes, last state change 01:09:10
  Virtual IP address is 192.168.10.3
  Active virtual MAC address is 0000.0C07.AC01
    Local virtual MAC address is 0000.0C07.AC01 (v1 default)
  Hello time 3 sec, hold time 10 sec
    Next hello sent in 0.215 secs
  Preemption enabled
  Active router is local
  Standby router is 192.168.10.2
  Priority 105 (default 105)
  Group name is hsrp-Vl1-1 (default)
Vlan20 - Group 2
  State is Standby
    6 state changes, last state change 01:11:47
  Virtual IP address is 192.168.20.3
  Active virtual MAC address is 0000.0C07.AC02
    Local virtual MAC address is 0000.0C07.AC02 (v1 default)
  Hello time 3 sec, hold time 10 sec
    Next hello sent in 2.376 secs
  Preemption enabled
  Active router is 192.168.20.2
  Standby router is local
  Priority 100 (default 100)
  Group name is hsrp-Vl2-2 (default)
```

SW-CORE-2

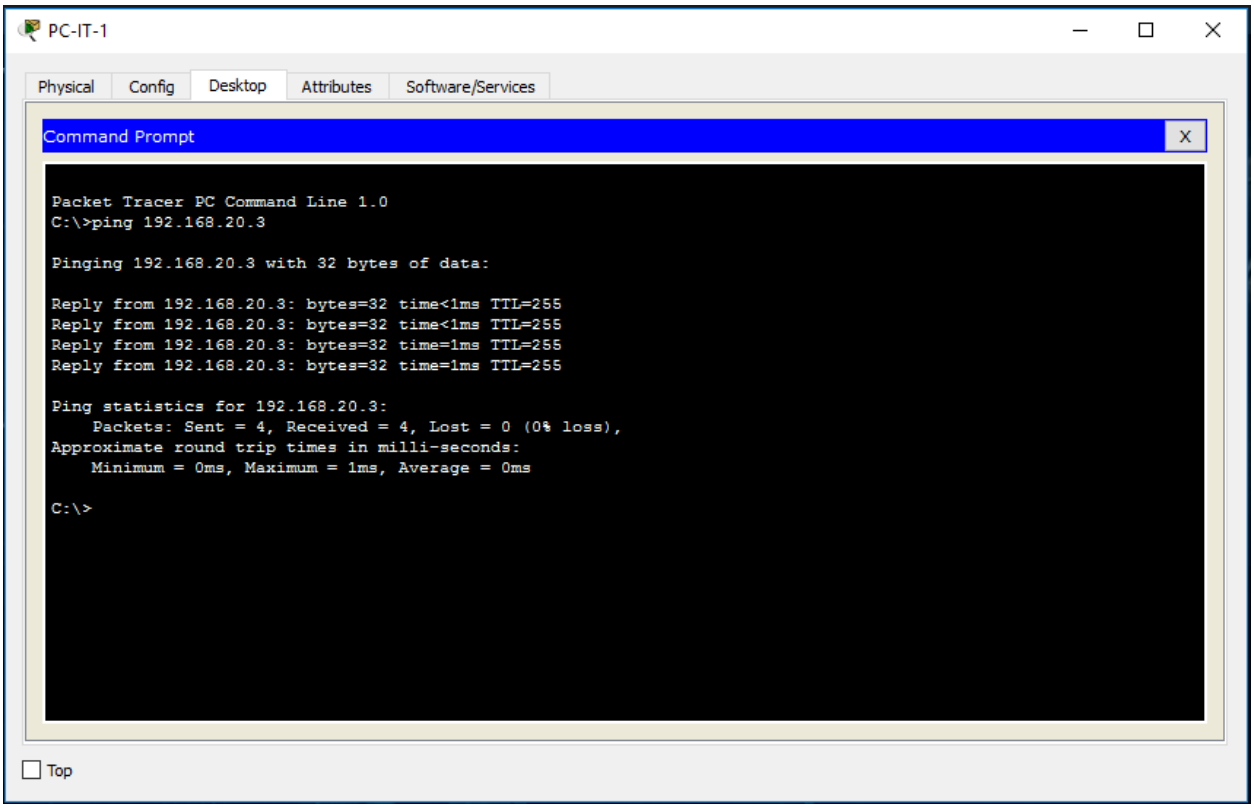
```
SW-CORE-2#show standby
Vlan10 - Group 1
  State is Standby
    3 state changes, last state change 01:12:53
  Virtual IP address is 192.168.10.3
  Active virtual MAC address is 0000.0C07.AC01
    Local virtual MAC address is 0000.0C07.AC01 (v1 default)
  Hello time 3 sec, hold time 10 sec
    Next hello sent in 2.456 secs
  Preemption enabled
  Active router is 192.168.10.1
  Standby router is local
  Priority 100 (default 100)
  Group name is hsrp-Vl1-1 (default)
Vlan20 - Group 2
  State is Active
    3 state changes, last state change 01:17:22
  Virtual IP address is 192.168.20.3
  Active virtual MAC address is 0000.0C07.AC02
    Local virtual MAC address is 0000.0C07.AC02 (v1 default)
  Hello time 3 sec, hold time 10 sec
    Next hello sent in 2.566 secs
  Preemption enabled
  Active router is local
  Standby router is 192.168.20.1
  Priority 105 (default 105)
  Group name is hsrp-Vl2-2 (default)
```

Trên PC, ping thử địa chỉ GW ảo

PC-NV-1



PC-IT-1



Bước 10: cấu hình track interface

SW-CORE-1

```
SW-CORE-1(config)#interface vlan 10
SW-CORE-1(config-if)#standby 1 track F0/24
SW-CORE-1(config-if)#exit
SW-CORE-1(config)#interface vlan 20
SW-CORE-1(config-if)#standby 2 track F0/24
```

Kiểm tra:

```
SW-CORE-1#show standby
Vlan10 - Group 1
  State is Active
    6 state changes, last state change 00:00:18
  Virtual IP address is 192.168.10.3
  Active virtual MAC address is 0000.0C07.AC01
    Local virtual MAC address is 0000.0C07.AC01 (v1 default)
  Hello time 3 sec, hold time 10 sec
    Next hello sent in 1.341 secs
  Preemption enabled
  Active router is local
  Standby router is 192.168.10.2
  Priority 105 (configured 105)
    Track interface FastEthernet0/24 state Up decrement 10
  Group name is hsrp-Vl1-1 (default)
Vlan20 - Group 2
  State is Standby
```

```
    10 state changes, last state change 00:17:58
  Virtual IP address is 192.168.20.3
  Active virtual MAC address is 0000.0C07.AC02
    Local virtual MAC address is 0000.0C07.AC02 (v1 default)
  Hello time 3 sec, hold time 10 sec
    Next hello sent in 0.201 secs
  Preemption enabled
  Active router is 192.168.20.2, priority 105 (expires in 6 sec)
    MAC address is 0000.0C07.AC02
  Standby router is local
  Priority 100 (default 100)
  Group name is hsrp-Vl2-2 (default)
```

SW-CORE-1

```
SW-CORE-1(config)#interface vlan 10
SW-CORE-1(config-if)#standby 1 track F0/24
SW-CORE-1(config-if)#exit
SW-CORE-1(config)#interface vlan 20
SW-CORE-1(config-if)#standby 2 track F0/24
```

Kiểm tra:

```
SW-CORE-2#show standby
Vlan10 - Group 1
  State is Standby
    5 state changes, last state change 00:00:28
  Virtual IP address is 192.168.10.3
  Active virtual MAC address is 0000.0C07.AC01
    Local virtual MAC address is 0000.0C07.AC01 (v1 default)
  Hello time 3 sec, hold time 10 sec
    Next hello sent in 2.405 secs
  Preemption enabled
  Active router is 192.168.10.1
  Standby router is local
  Priority 100 (default 100)
  Group name is hsrp-Vl1-1 (default)
Vlan20 - Group 2
  State is Active
    8 state changes, last state change 00:17:39
  Virtual IP address is 192.168.20.3
  Active virtual MAC address is 0000.0C07.AC02
    Local virtual MAC address is 0000.0C07.AC02 (v1 default)
  Hello time 3 sec, hold time 10 sec
    Next hello sent in 0.338 secs
  Preemption enabled
  Active router is local
  Standby router is 192.168.20.1, priority 100 (expires in 8 sec)
  Priority 105 (configured 105)
    Track interface FastEthernet0/24 state Up decrement 10
  Group name is hsrp-Vl2-2 (default)
```

Dựa vào output, có thể thấy, nếu đường uplink F0/24 gặp sự cố, priority của SW-CORE-1 sẽ bị trừ đi 10, và sẽ nhỏ hơn của SW-CORE-2. Lúc đó SW-CORE-2 sẽ trở thành Active.

Bước 11 : kiểm tra tính dự phòng

Shutdown port F0/24 trên SW-CORE-1

SW-CORE-1

```
SW-CORE-1(config)#interface F0/24
SW-CORE-1(config-if)#shutdown
```

Kiểm tra trên SW-CORE-2

SW-CORE-2

```
SW-CORE-2#show standby
Vlan10 - Group 1
  State is Active
    5 state changes, last state change 01:31:48
  Virtual IP address is 192.168.10.3
  Active virtual MAC address is 0000.0C07.AC01
    Local virtual MAC address is 0000.0C07.AC01 (v1 default)
  Hello time 3 sec, hold time 10 sec
    Next hello sent in 0.117 secs
  Preemption enabled
  Active router is local
  Standby router is 192.168.10.1, priority 95 (expires in 7 sec)
  Priority 100 (default 100)
  Group name is hsrp-Vl1-1 (default)
Vlan20 - Group 2
  State is Active
    5 state changes, last state change 01:31:48
  Virtual IP address is 192.168.20.3
  Active virtual MAC address is 0000.0C07.AC02
    Local virtual MAC address is 0000.0C07.AC02 (v1 default)
  Hello time 3 sec, hold time 10 sec
    Next hello sent in 2.128 secs
  Preemption enabled
  Active router is local
  Standby router is 192.168.20.1, priority 95 (expires in 8 sec)
  Priority 100 (default 100)
  Group name is hsrp-Vl2-2 (default)
```

SW-CORE-2 đã trở thành Active

Khôi phục lại port F0/24 trên SW-CORE-1

SW-CORE-1

```
SW-CORE-1(config)#interface F0/24
SW-CORE-1(config-if)#no shutdown
```

Kiểm tra:

```
SW-CORE-1#show standby
Vlan10 - Group 1
  State is Active
    13 state changes, last state change 01:34:01
  Virtual IP address is 192.168.10.3
  Active virtual MAC address is 0000.0C07.AC01
    Local virtual MAC address is 0000.0C07.AC01 (v1 default)
  Hello time 3 sec, hold time 10 sec
    Next hello sent in 0.562 secs
  Preemption enabled
  Active router is local
  Standby router is 192.168.10.1, priority 100 (expires in 0 sec)
  Priority 105 (configured 105)
    Track interface FastEthernet0/24 state Up decrement 10
  Group name is hsrp-Vl1-1 (default)
Vlan20 - Group 2
  State is Active
```

```
    13 state changes, last state change 01:34:00
  Virtual IP address is 192.168.20.3
  Active virtual MAC address is 0000.0C07.AC02
    Local virtual MAC address is 0000.0C07.AC02 (v1 default)
  Hello time 3 sec, hold time 10 sec
    Next hello sent in 2.137 secs
  Preemption enabled
  Active router is local
  Standby router is 192.168.20.1, priority 100 (expires in 0 sec)
  Priority 105 (configured 105)
    Track interface FastEthernet0/24 state Up decrement 10
  Group name is hsrp-Vl2-2 (default)
```

SW-CORE-1 đã trở lại vai trò Active

Bước 12 : Cấu hình EIGRP

Đối với hai SW-CORE, do các subnet 192.168.10.0/24 và 192.168.20.0/24 có thể được summary lại thành 192.168.0.0/16 và 10.0.0.0/30, 10.0.0.4/30 và 10.0.0.8/30 có thể được summary lại thành 10.0.0.0/28, nên khi cấu hình OSPF cho hai SW-CORE, chỉ cần dùng 2 lệnh network :

```
network 192.168.0.0 0.0.255.255
network 10.0.0.0 0.0.0.15
```

SW-CORE-1

```
SW-CORE-1(config)#router eigrp 65000
SW-CORE-1(config-router)#network 192.168.0.0 0.0.255.255
SW-CORE-1(config-router)#network 10.0.0.0 0.0.0.15
SW-CORE-1(config-router)#passive-interface vlan 10
SW-CORE-1(config-router)#passive-interface vlan 20
```

Kiểm tra:

```
SW-CORE-1#show ip protocols

Routing Protocol is "eigrp  65000 "
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Default networks flagged in outgoing updates
  Default networks accepted from incoming updates
  EIGRP metric weight K1=1, K2=0, K3=1, K4=0, K5=0
  EIGRP maximum hopcount 100
  EIGRP maximum metric variance 1
Redistributing: eigrp 65000
  Automatic network summarization is in effect
  Automatic address summarization:
    10.0.0.0/8 for Vlan10, Vlan20
      Summarizing with metric 28160
  Maximum path: 4
  Routing for Networks:
     192.168.0.0/16
     10.0.0.0/28
  Passive Interface(s):
    Vlan10
    Vlan20
  Routing Information Sources:
    Gateway         Distance      Last Update
  Distance: internal 90 external 170
```

SW-CORE-2

```
SW-CORE-2(config)#router eigrp 65000
```

```
SW-CORE-2(config-router)#network 192.168.0.0 0.0.255.255
SW-CORE-2(config-router)#network 10.0.0.0 0.0.0.15
SW-CORE-2(config-router)#passive-interface vlan 10
SW-CORE-2(config-router)#passive-interface vlan 20
```

Kiểm tra:

```
SW-CORE-2#show ip protocols

Routing Protocol is "eigrp  65000 "
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Default networks flagged in outgoing updates
  Default networks accepted from incoming updates
  EIGRP metric weight K1=1, K2=0, K3=1, K4=0, K5=0
  EIGRP maximum hopcount 100
  EIGRP maximum metric variance 1
Redistributing: eigrp 65000
  Automatic network summarization is in effect
  Automatic address summarization:
    10.0.0.0/8 for Vlan10, Vlan20
      Summarizing with metric 28160
  Maximum path: 4
  Routing for Networks:
     192.168.0.0/16
     10.0.0.0/28
  Passive Interface(s):
    Vlan10
    Vlan20
  Routing Information Sources:
    Gateway         Distance      Last Update
    10.0.0.9        90            9234221
  Distance: internal 90 external 170
```

RT-GW-1

```
RT-GW-1(config)#router eigrp 65000
RT-GW-1(config-router)#network 10.0.0.0 0.0.0.3
```

Kiểm tra:

```
RT-GW-1#show ip protocols

Routing Protocol is "eigrp  65000 "
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Default networks flagged in outgoing updates
  Default networks accepted from incoming updates
  EIGRP metric weight K1=1, K2=0, K3=1, K4=0, K5=0
  EIGRP maximum hopcount 100
  EIGRP maximum metric variance 1
Redistributing: eigrp 65000
  Automatic network summarization is in effect
  Automatic address summarization:
  Maximum path: 4
  Routing for Networks:
     10.0.0.0/30
  Routing Information Sources:
    Gateway         Distance      Last Update
    10.0.0.2        90            9349474
  Distance: internal 90 external 170
```

RT-GW-2

```
RT-GW-2(config)#router eigrp 65000
RT-GW-2(config-router)#network 10.0.0.4 0.0.0.3
```

Kiểm tra:

```
RT-GW-2#show ip protocols

Routing Protocol is "eigrp  65000 "
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Default networks flagged in outgoing updates
  Default networks accepted from incoming updates
  EIGRP metric weight K1=1, K2=0, K3=1, K4=0, K5=0
  EIGRP maximum hopcount 100
  EIGRP maximum metric variance 1
Redistributing: eigrp 65000
  Automatic network summarization is in effect
  Automatic address summarization:
  Maximum path: 4
  Routing for Networks:
    10.0.0.4/30
  Routing Information Sources:
    Gateway         Distance      Last Update
    10.0.0.6        90            9429532
  Distance: internal 90 external 170
```

Lưu ý : không bao giờ chạy bất kì giao thức định tuyến nào với nhà cung cấp dịch vụ, trừ khi cấu hình MPLS Layer-3 VPN.

Bước 13: Kiểm tra bảng định tuyến

SW-CORE-1

```
SW-CORE-1#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, 4 subnets, 2 masks
D       10.0.0.0/8 is a summary, 00:26:45, Null0
C       10.0.0.0/30 is directly connected, FastEthernet0/24
D       10.0.0.4/30 [90/30720] via 10.0.0.10, 00:26:44, FastEthernet0/23
C       10.0.0.8/30 is directly connected, FastEthernet0/23
C    192.168.10.0/24 is directly connected, Vlan10
C    192.168.20.0/24 is directly connected, Vlan20
```

SW-CORE-2

```
SW-CORE-2#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, 4 subnets, 2 masks
D       10.0.0.0/8 is a summary, 00:05:26, Null0
D       10.0.0.0/30 [90/30720] via 10.0.0.9, 00:05:26, FastEthernet0/23
C       10.0.0.4/30 is directly connected, FastEthernet0/24
C       10.0.0.8/30 is directly connected, FastEthernet0/23
C    192.168.10.0/24 is directly connected, Vlan10
C    192.168.20.0/24 is directly connected, Vlan20
```

RT-GW-1

```
RT-GW-1#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

     10.0.0.0/30 is subnetted, 3 subnets
C       10.0.0.0 is directly connected, FastEthernet0/0
D       10.0.0.4 [90/33280] via 10.0.0.2, 00:05:11, FastEthernet0/0
D       10.0.0.8 [90/30720] via 10.0.0.2, 00:05:11, FastEthernet0/0
     113.0.0.0/24 is subnetted, 1 subnets
C       113.163.158.0 is directly connected, FastEthernet0/1
D    192.168.10.0/24 [90/25628160] via 10.0.0.2, 00:05:11, FastEthernet0/0
D    192.168.20.0/24 [90/25628160] via 10.0.0.2, 00:05:11, FastEthernet0/0
```

RT-GW-2

```
RT-GW-2#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

     10.0.0.0/30 is subnetted, 3 subnets
D       10.0.0.0 [90/33280] via 10.0.0.6, 00:04:21, FastEthernet0/0
C       10.0.0.4 is directly connected, FastEthernet0/0
D       10.0.0.8 [90/30720] via 10.0.0.6, 00:04:21, FastEthernet0/0
     103.0.0.0/24 is subnetted, 1 subnets
C       103.142.234.0 is directly connected, FastEthernet0/1
D    192.168.10.0/24 [90/25628160] via 10.0.0.6, 00:04:21, FastEthernet0/0
D    192.168.20.0/24 [90/25628160] via 10.0.0.6, 00:04:21, FastEthernet0/0
```

Các router và switch đã học được đầy đủ các subnet trong mạng nội bộ nhưng các thiết bị vẫn chưa có defaut route ra ngoài Internet

Bước 14 : cấu hình default route

RT-GW-1

```
RT-GW-1(config)#ip route 0.0.0.0 0.0.0.0 F0/1
```

Kiểm tra:

```
RT-GW-1#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 0.0.0.0 to network 0.0.0.0

     10.0.0.0/30 is subnetted, 3 subnets
C       10.0.0.0 is directly connected, FastEthernet0/0
D       10.0.0.4 [90/33280] via 10.0.0.2, 00:05:11, FastEthernet0/0
D       10.0.0.8 [90/30720] via 10.0.0.2, 00:05:11, FastEthernet0/0
     113.0.0.0/24 is subnetted, 1 subnets
C       113.163.158.0 is directly connected, FastEthernet0/1
D    192.168.10.0/24 [90/25628160] via 10.0.0.2, 00:05:11, FastEthernet0/0
D    192.168.20.0/24 [90/25628160] via 10.0.0.2, 00:05:11, FastEthernet0/0
S*   0.0.0.0/0 is directly connected, FastEthernet0/1

RT-GW-1#ping 8.8.8.8

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 8.8.8.8, timeout is 2 seconds:
.!!!!
Success rate is 80 percent (4/5), round-trip min/avg/max = 0/0/1 ms
```

RT-GW-1 đã ra được internet.

RT-GW-2

```
RT-GW-2(config)#ip route 0.0.0.0 0.0.0.0 F0/1
```

Kiểm tra:

```
RT-GW-2#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 0.0.0.0 to network 0.0.0.0

         10.0.0.0/30 is subnetted, 3 subnets
D       10.0.0.0 [90/33280] via 10.0.0.6, 00:04:21, FastEthernet0/0
C       10.0.0.4 is directly connected, FastEthernet0/0
D       10.0.0.8 [90/30720] via 10.0.0.6, 00:04:21, FastEthernet0/0
     103.0.0.0/24 is subnetted, 1 subnets
C       103.142.234.0 is directly connected, FastEthernet0/1
D    192.168.10.0/24 [90/25628160] via 10.0.0.6, 00:04:21, FastEthernet0/0
D    192.168.20.0/24 [90/25628160] via 10.0.0.6, 00:04:21, FastEthernet0/0
```

```
S*   0.0.0.0/0 is directly connected, FastEthernet0/1

RT-GW-2#ping 8.8.8.8

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 8.8.8.8, timeout is 2 seconds:
.!!!!
Success rate is 80 percent (4/5), round-trip min/avg/max = 0/0/0 ms
```

RT-GW-2 cũng đã ra được internet.

Nhưng hai SW-CORE thì vẫn chưa có default route

SW-CORE-1

```
SW-CORE-1#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, 4 subnets, 2 masks
D       10.0.0.0/8 is a summary, 00:26:45, Null0
C       10.0.0.0/30 is directly connected, FastEthernet0/24
D       10.0.0.4/30 [90/30720] via 10.0.0.10, 00:26:44, FastEthernet0/23
C       10.0.0.8/30 is directly connected, FastEthernet0/23
C    192.168.10.0/24 is directly connected, Vlan10
C    192.168.20.0/24 is directly connected, Vlan20
```

SW-CORE-2

```
SW-CORE-2#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, 4 subnets, 2 masks
D       10.0.0.0/8 is a summary, 00:05:26, Null0
D       10.0.0.0/30 [90/30720] via 10.0.0.9, 00:05:26, FastEthernet0/23
C       10.0.0.4/30 is directly connected, FastEthernet0/24
C       10.0.0.8/30 is directly connected, FastEthernet0/23
C    192.168.10.0/24 is directly connected, Vlan10
C    192.168.20.0/24 is directly connected, Vlan20
```

Để hai SW-CORE có default route, và đảm bảo tính dự phòng như đề yêu cầu, có thể cấu hình 2 đường default route với AD khác nhau kết hợp với track. Nhưng cách làm này gặp phải vấn đề sau :

- SW-CORE-1 và SW-CORE-2 phải track interface F0/1 trên RT-GW-1, điều này là không thể. SW-CORE-1 và SW-CORE-2 bắt buộc phải **track ip sla**, nhưng kiểu track này không phải IOS nào cũng hỗ trợ

Nếu không thể track interface F0/1, SW-CORE chỉ đảm bảo được tính dự phòng trong 2 trường hợp :

- Link giữa SW-CORE-1 và RT-GW-1 gặp sự cố
- RT-GW-1 gặp sự cố

Bài lab này giới thiệu đến các bạn giải pháp tối ưu hơn, đó là **redistribute static route vào ospf**

Cụ thể như sau :

Bước 15 : redistribute static route

RT-GW-1

```
RT-GW-1(config)#router eigrp 65000
RT-GW-1(config-router)# redistribute static metric 100000 1 255 1 1500
```

RT-GW-2

```
RT-GW-2(config)#router eigrp 65000
RT-GW-2(config-router)# redistribute static metric 100000 1 255 1 1500
```

Bước 16 : Kiểm tra lại bảng định tuyến trên hai SW-CORE

SW-CORE-1

```
SW-CORE-1#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 10.0.0.1 to network 0.0.0.0

     10.0.0.0/8 is variably subnetted, 4 subnets, 2 masks
D       10.0.0.0/8 is a summary, 00:13:42, Null0
C       10.0.0.0/30 is directly connected, FastEthernet0/24
D       10.0.0.4/30 [90/30720] via 10.0.0.10, 00:11:48, FastEthernet0/23
C       10.0.0.8/30 is directly connected, FastEthernet0/23
C    192.168.10.0/24 is directly connected, Vlan10
C    192.168.20.0/24 is directly connected, Vlan20
D*EX 0.0.0.0/0 [170/28416] via 10.0.0.1, 00:00:47, FastEthernet0/24
```

SW-CORE-2

```
SW-CORE-2#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 10.0.0.9 to network 0.0.0.0

     10.0.0.0/8 is variably subnetted, 4 subnets, 2 masks
D       10.0.0.0/8 is a summary, 00:15:10, Null0
```

```
D       10.0.0.0/30 [90/30720] via 10.0.0.9, 00:15:10, FastEthernet0/23
C       10.0.0.4/30 is directly connected, FastEthernet0/24
C       10.0.0.8/30 is directly connected, FastEthernet0/23
C    192.168.10.0/24 is directly connected, Vlan10
C    192.168.20.0/24 is directly connected, Vlan20
D*EX 0.0.0.0/0 [170/28416] via 10.0.0.5, 00:04:10, FastEthernet0/24
```

Có thể thấy, default route của SW-CORE-1 là qua RT-GW-1, trong khi default route của SW-CORE-2 là qua SW-CORE-1

Bước 17 : Kiểm tra tính dự phòng của default route

Shutdown đường internet (port F0/1) trên RT-GW-1 và kiểm tra lại bảng định tuyến

RT-GW-1

```
RT-GW-1(config)#interface F0/1
RT-GW-1(config-if)#shutdown
```

SW-CORE-1

```
SW-CORE-1#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 10.0.0.10 to network 0.0.0.0

     10.0.0.0/8 is variably subnetted, 4 subnets, 2 masks
D       10.0.0.0/8 is a summary, 00:19:18, Null0
C       10.0.0.0/30 is directly connected, FastEthernet0/24
D       10.0.0.4/30 [90/30720] via 10.0.0.10, 00:17:24, FastEthernet0/23
C       10.0.0.8/30 is directly connected, FastEthernet0/23
C    192.168.10.0/24 is directly connected, Vlan10
C    192.168.20.0/24 is directly connected, Vlan20
D*EX 0.0.0.0/0 [170/56320] via 10.0.0.10, 00:00:19, FastEthernet0/23
```

SW-CORE-2

```
SW-CORE-2#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 10.0.0.5 to network 0.0.0.0

     10.0.0.0/8 is variably subnetted, 4 subnets, 2 masks
D       10.0.0.0/8 is a summary, 00:18:19, Null0
D       10.0.0.0/30 [90/30720] via 10.0.0.9, 00:18:19, FastEthernet0/23
C       10.0.0.4/30 is directly connected, FastEthernet0/24
C       10.0.0.8/30 is directly connected, FastEthernet0/23
C    192.168.10.0/24 is directly connected, Vlan10
C    192.168.20.0/24 is directly connected, Vlan20
D*EX 0.0.0.0/0 [170/53760] via 10.0.0.5, 00:01:14, FastEthernet0/24
```

Có thể thấy, default route của SW-CORE-1 là qua SW-CORE-2, trong khi default route của SW-CORE-2 là qua RT-GW-2

Khôi phục lại kết nối internet của RT-GW-1

RT-GW-1
RT-GW-1(config)#**interface F0/1** RT-GW-1(config-if)#**shutdown**

Kiểm tra tương tự với **RT-GW-2** và **SW-CORE-2**

Bước 18 : Cấu hình NAT

RT-GW-1
RT-GW-1(config)#**access-list 1 permit 10.0.0.0 0.0.0.15** RT-GW-1(config)#**access-list 1 permit 192.168.0.0 0.0.255.255** RT-GW-1(config)#**ip nat inside source list 1 interface F0/1** RT-GW-1(config)#**interface F0/1** RT-GW-1(config-if)#**ip nat outside** RT-GW-1(config-if)#**exit** RT-GW-1(config)#**interface F0/0** RT-GW-1(config-if)#**ip nat inside**

RT-GW-2
RT-GW-1(config)#**access-list 1 permit 10.0.0.0 0.0.0.15** RT-GW-1(config)#**access-list 1 permit 192.168.0.0 0.0.255.255** RT-GW-1(config)#**ip nat inside source list 1 interface F0/1** RT-GW-1(config)#**interface F0/1** RT-GW-1(config-if)#**ip nat outside** RT-GW-1(config-if)#**exit** RT-GW-1(config)#**interface F0/0** RT-GW-1(config-if)#**ip nat inside**

Bước 19 : Kiểm tra kết nối Intenet

Trên PC bất kì, ping 8.8.8.8

```
C:\>ping 8.8.8.8

Pinging 8.8.8.8 with 32 bytes of data:

Request timed out.
Reply from 8.8.8.8: bytes=32 time=1ms TTL=253
Reply from 8.8.8.8: bytes=32 time=16ms TTL=253
Reply from 8.8.8.8: bytes=32 time<1ms TTL=253

Ping statistics for 8.8.8.8:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 16ms, Average = 5ms
```

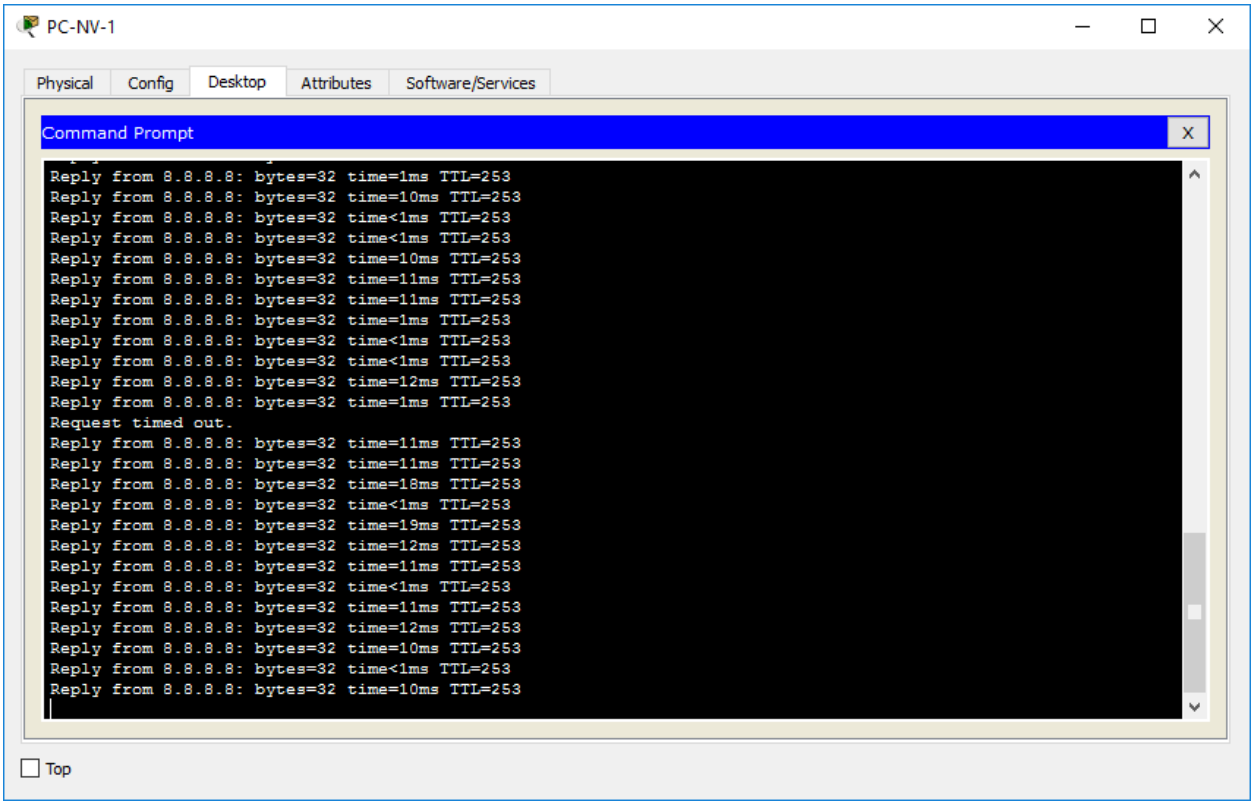
Bước 20 : Kiểm tra tính dự phòng khi link giữa SW-CORE-1 và RT-GW-1 gặp sự cố

Trên PC-NV, ping liên tục đến 8.8.8.8 bằng lệnh **ping –t 8.8.8.8**

```
C:\>ping -t 8.8.8.8

Pinging 8.8.8.8 with 32 bytes of data:

Reply from 8.8.8.8: bytes=32 time=1ms TTL=253
Reply from 8.8.8.8: bytes=32 time<1ms TTL=253
Reply from 8.8.8.8: bytes=32 time<1ms TTL=253
Reply from 8.8.8.8: bytes=32 time<1ms TTL=253
```

Trong lúc ping, delete link giữa SW-CORE-1 và RT-GW-1 .

Kết quả : ping gián đoạn 1 thời gian, sau đó bình thường trở lại => Dự phòng thành công



Khôi phục lại kết nối

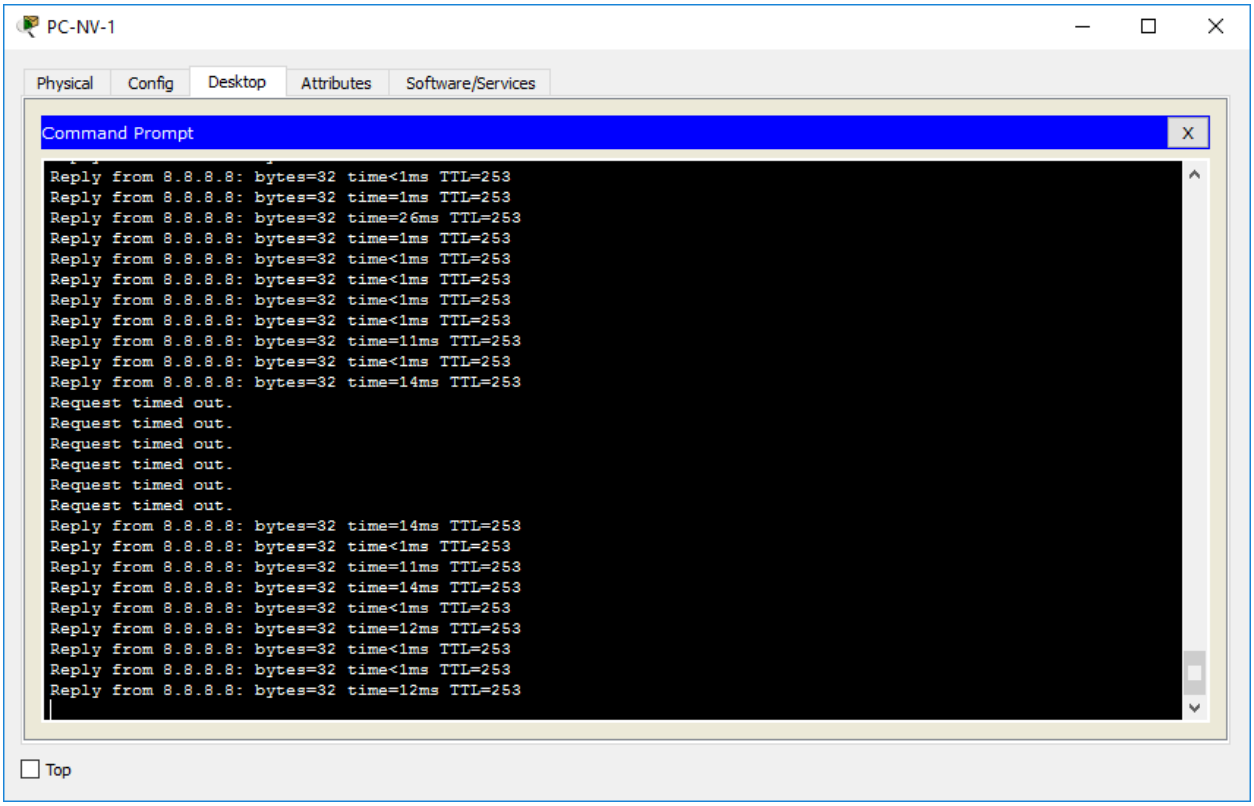
Bước 21 : Kiểm tra tính dự phòng khi SW-CORE-1 gặp sự cố

Trên PC-NV, ping liên tục đến 8.8.8.8 bằng lệnh **ping –t 8.8.8.8**

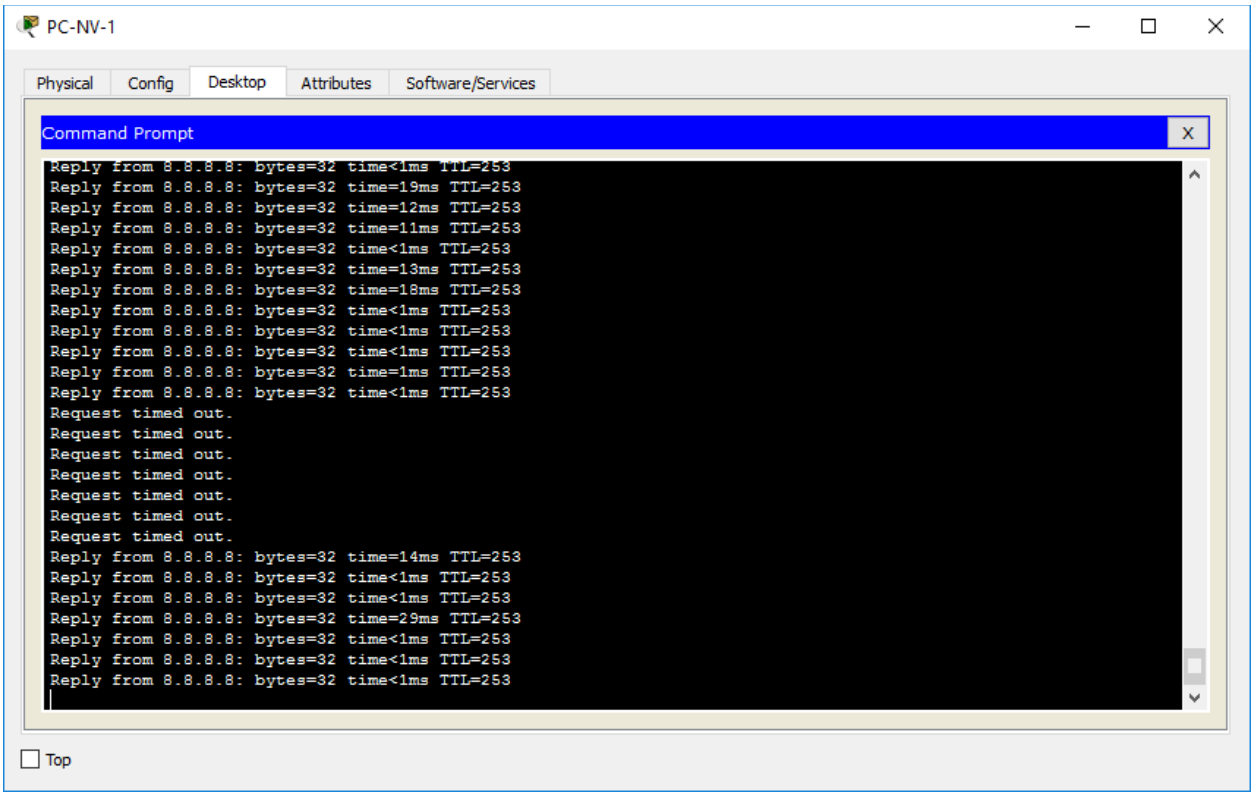
```
C:\>ping -t 8.8.8.8

Pinging 8.8.8.8 with 32 bytes of data:

Reply from 8.8.8.8: bytes=32 time=1ms TTL=253
Reply from 8.8.8.8: bytes=32 time<1ms TTL=253
Reply from 8.8.8.8: bytes=32 time<1ms TTL=253
Reply from 8.8.8.8: bytes=32 time<1ms TTL=253
```

Trong lúc ping, lưu cấu hình và delete SW-CORE-1

Kết quả : ping gián đoạn 1 thời gian, sau đó bình thường trở lại => Dự phòng thành công



Bấm tổ hợp phím Ctrl + Z để khôi phục lại SW-CORE-1. ping sẽ gián đoạn 1 thời gian, sau đó bình thường trở lại



Bước 22 : Kiểm tra tính dự phòng khi RT-GW-1 mất kết nối Internet

Trên PC-NV, ping liên tục đến 8.8.8.8 bằng lệnh **ping –t 8.8.8.8**

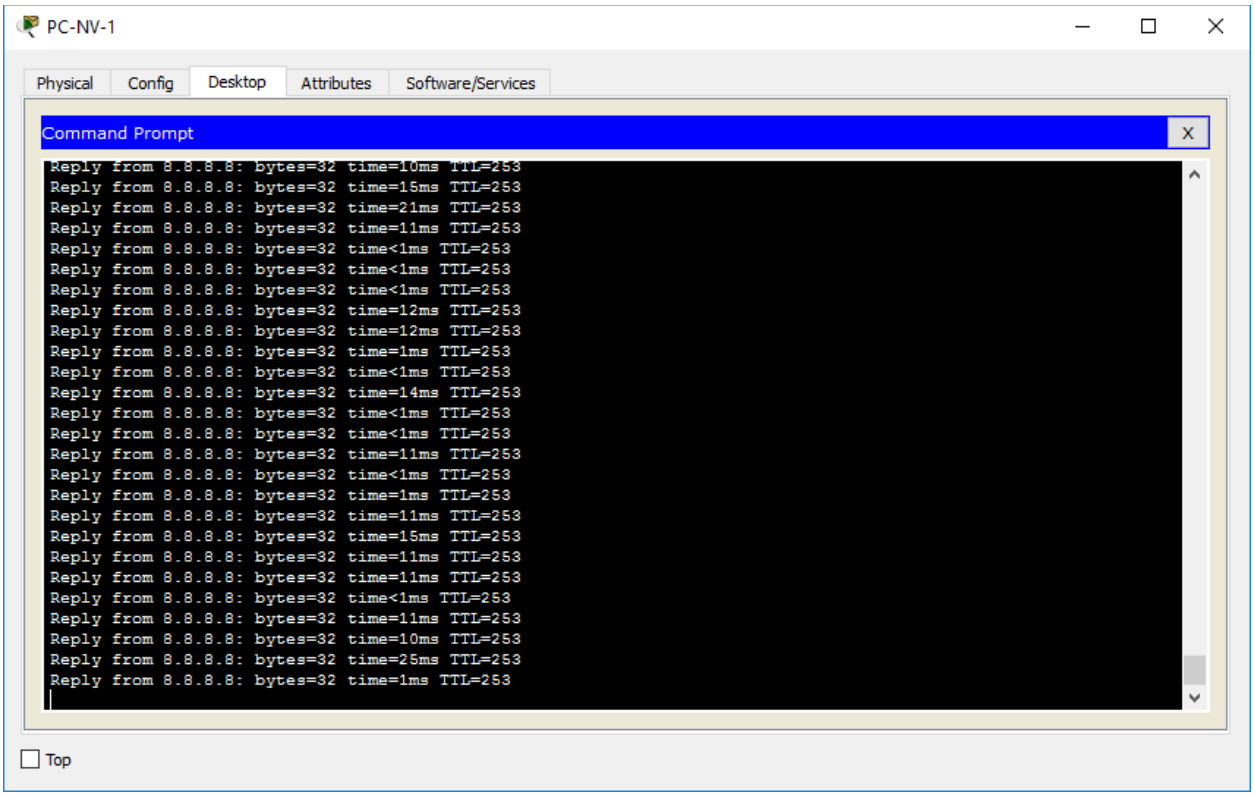
```
C:\>ping -t 8.8.8.8

Pinging 8.8.8.8 with 32 bytes of data:

Reply from 8.8.8.8: bytes=32 time=1ms TTL=253
Reply from 8.8.8.8: bytes=32 time<1ms TTL=253
Reply from 8.8.8.8: bytes=32 time<1ms TTL=253
Reply from 8.8.8.8: bytes=32 time<1ms TTL=253
```

Trong lúc ping, delete link giữa RT-GW-1 và Internet

Kết quả : ping gần như không bị gián đoạn => Dự phòng thành công

Lưu ý : có thể ping sẽ bị gián đoạn 1 thời gian ngắn, tùy điều kiện lúc làm lab.

Thực hiện tương tự các bước 20, 21, 22 với các PC-IT và hướng SW-CORE-2 và RT-GW-2



Khôi phục lại kết nối