Configurations

- **Step 1**: Turn on all the routers and switches interfaces and rename devices using the command **hostname**

```
Router(config)#hostname SecondCampus
SecondCampus(config)#int g0/0
SecondCampus(config-if)#no shut

SecondCampus(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0, changed state to up
```

- **Step2**: Configure clock rate on Main Campus Router

```
MainCampusRouter(config)#int s0/0/0
MainCampusRouter(config-if)#clo
MainCampusRouter(config-if)#clock ra
MainCampusRouter(config-if)#clock rate 64000
MainCampusRouter(config-if)#int s0/0/1
MainCampusRouter(config-if)#clock
MainCampusRouter(config-if)#clock ra
MainCampusRouter(config-if)#clock rate 64000
MainCampusRouter(config-if)#do wr
Building configuration...
[OK]
MainCampusRouter(config-if)#
```

- **Step 3**: Configure the VLANS on the layer 2 switches. We are using the switch name HR as an example

```
HR(config)#int ran
HR(config)#int range f0/1-24
HR(config-if-range)#swi
HR(config-if-range)#switchport mod
HR(config-if-range)#switchport mode acc
HR(config-if-range)#switchport mode access
HR(config-if-range)#swit
HR(config-if-range)#switchport acc
HR(config-if-range)#switchport access vlan
HR(config-if-range)#switchport access vlan 10
% Access VLAN does not exist. Creating vlan 10
HR(config-if-range)#
```

- **Step3**: L3 switch config

Configure all ports connected to L2 switches as access ports and assign the appropriate VLAN.

```
Switch(config-if)#swit
Switch(config-if)#switchport acc
Switch(config-if)#switchport access vlan 10
% Access VLAN does not exist. Creating vlan 10
```

The port connected to the router will have to be configured as a trunk port in our case the interfaces f0/1 of the main Campus L3 switch and f0/1 second campus L3 switch

```
SecondCampusL3SW(config-if)#switchport trunk encapsulation dot1q
SecondCampusL3SW(config-if)#sw
SecondCampusL3SW(config-if)#switchport mode
SecondCampusL3SW(config-if)#switchport mode tr
SecondCampusL3SW(config-if)#switchport mode trunk

SecondCampusL3SW(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to down

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up
```

```
MainCampusL3SW(config-if)#switchport trunk encapsulation dot1q
MainCampusL3SW(config-if)#swi
MainCampusL3SW(config-if)#switchport mod
MainCampusL3SW(config-if)#switchport mode tr
MainCampusL3SW(config-if)#switchport mode trunk

MainCampusL3SW(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to down

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up
```

- **Step 4**:Routers interfaces IP address assignment

1. Main Campus router

```
MainCampusRouter>
MainCampusRouter>
MainCampusRouter>en
MainCampusRouter#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
MainCampusRouter(config)#int s0/0/1
MainCampusRouter(config-if)#ip add 10.10.10.1 255.255.255.252
MainCampusRouter(config-if)#no shut
MainCampusRouter(config-if)#
```

```
MainCampusRouter(config-if)#int s0/0/0
MainCampusRouter(config-if)#ip add 10.10.10.5 255.255.255.252
MainCampusRouter(config-if)#no shut
MainCampusRouter(config-if)#
```

2. Second Campus

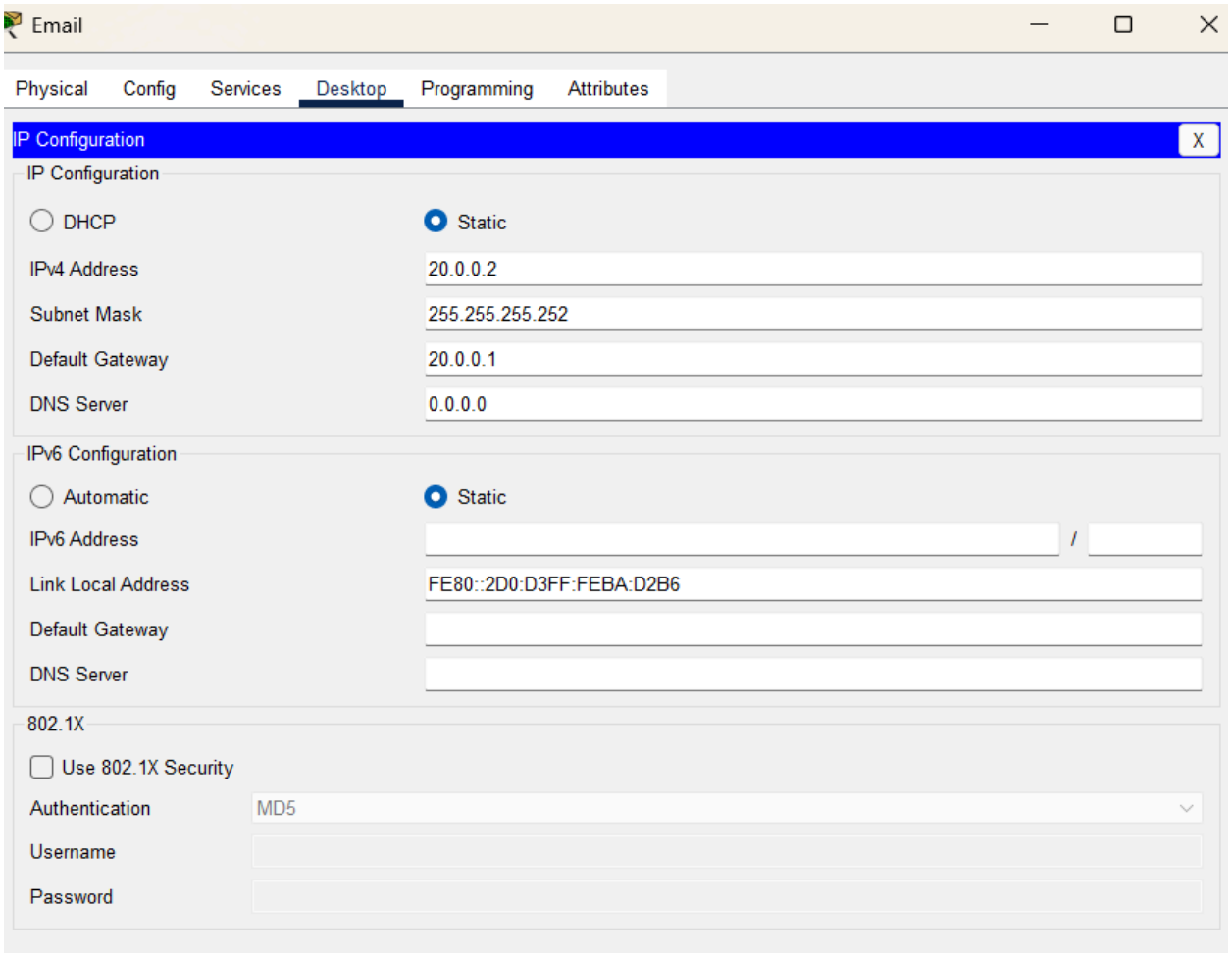
```
SecondCampus(config)#int s0/3/0
SecondCampus(config-if)#ip add 10.10.10.2 255.255.255.252
SecondCampus(config-if)#no shut
SecondCampus(config-if)#
```

3. Cloud router

```
Cloud(config)#int s0/1/0
Cloud(config-if)#ip add 10.10.10.6 255.255.255.252
Cloud(config-if)#no shut
Cloud(config-if)#
```

```
Cloud(config-if)#int g0/0
Cloud(config-if)#ip add 20.0.0.1 255.255.255.252
Cloud(config-if)#no shut
```

4. Mail server



- **Step5**: Inter Vlan routing and DHCP Configuration

On the second campus router, we are going to create subinterfaces and assign them IP addresses. That subinterface will then become the default gateway of the dhcp pool for the associated VLAN.

```
SecondCampus(config-if)#int g0/0.90
SecondCampus(config-subif)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0.90, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0.90, changed state to up

SecondCampus(config-subif)#
SecondCampus(config-subif)#enc
SecondCampus(config-subif)#encapsulation do
SecondCampus(config-subif)#encapsulation dot1Q 90
SecondCampus(config-subif)#ip add
SecondCampus(config-subif)#ip address 192.168.9.1 255.255.255.0
SecondCampus(config-subif)#exit
SecondCampus(config)#int g0/0.100
SecondCampus(config-subif)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0.100, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0.100, changed state to up

SecondCampus(config-subif)#
SecondCampus(config-subif)#en
SecondCampus(config-subif)#encapsulation do
SecondCampus(config-subif)#encapsulation dot1Q 100
SecondCampus(config-subif)#ip add
SecondCampus(config-subif)#ip address 192.168.10.1 255.255.255.0
SecondCampus(config-subif)#
```

Configure the router as a DHCP server

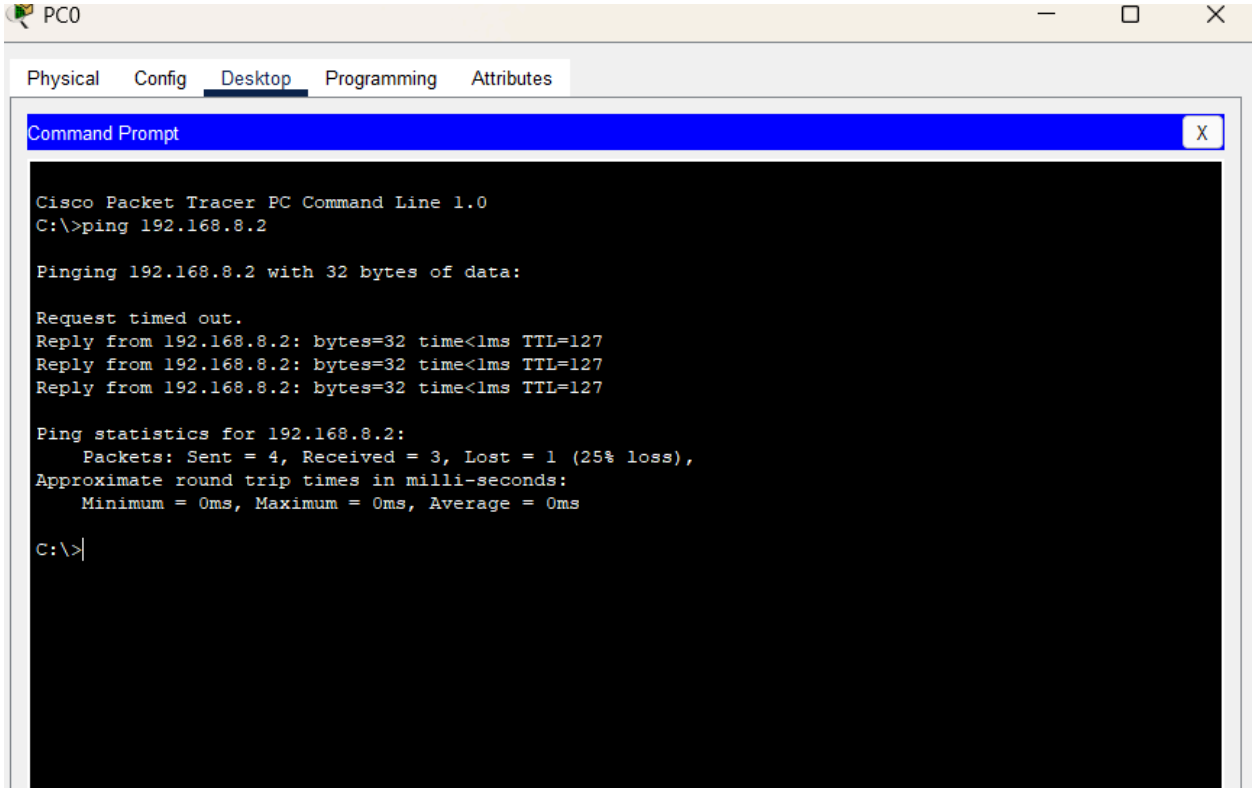
```
SecondCampus(config-subif)#service dhcp
SecondCampus(config)#ip dhcp pool staff
SecondCampus(dhcp-config)#netwo
SecondCampus(dhcp-config)#network 192.168.9.0 255.255.255.0
SecondCampus(dhcp-config)#default r
SecondCampus(dhcp-config)#default rou
SecondCampus(dhcp-config)#defaul
SecondCampus(dhcp-config)#default-router 192.168.9.1
SecondCampus(dhcp-config)#dns
SecondCampus(dhcp-config)#dns-server 192.168.9.1
SecondCampus(dhcp-config)#ex
SecondCampus(dhcp-config)#exit
SecondCampus(config)#ip dh
SecondCampus(config)#ip dhcp poo
SecondCampus(config)#ip dhcp pool studentLab
SecondCampus(dhcp-config)#net
SecondCampus(dhcp-config)#network 192.168.10.0 255.255.255.0
SecondCampus(dhcp-config)#defau
SecondCampus(dhcp-config)#default-router 192.168.10.1
SecondCampus(dhcp-config)#dns
SecondCampus(dhcp-config)#dns-server 192.168.10.1
SecondCampus(dhcp-config)#do wr
SecondCampus(dhcp-config)#
```

On the main Campus router we will create sub interfaces and also assign IP addresses

```
MainCampusRouter(config)#interface g0/0.10
MainCampusRouter(config-subif)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0.10, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0.10, changed state to up

MainCampusRouter(config-subif)#
MainCampusRouter(config-subif)#enca
MainCampusRouter(config-subif)#encapsulation do
MainCampusRouter(config-subif)#encapsulation dot1Q 10
MainCampusRouter(config-subif)#ip add
MainCampusRouter(config-subif)#ip address 192.168.1.1 255.255.255.0
MainCampusRouter(config-subif)#no shut
```

Configure MainCampusRouter as the DHCP server

```
MainCampusRouter(config)#service dhcp
MainCampusRouter(config)#ip dhc
MainCampusRouter(config)#ip dhcp poo
MainCampusRouter(config)#ip dhcp pool admin
MainCampusRouter(dhcp-config)#net
MainCampusRouter(dhcp-config)#network 192.168.1.0 255.255.255.0
MainCampusRouter(dhcp-config)#default rou
MainCampusRouter(dhcp-config)#default router 192.168.1
                                          ^
% Invalid input detected at '^' marker.

MainCampusRouter(dhcp-config)#default router 192.168.1.1
                                          ^
% Invalid input detected at '^' marker.

MainCampusRouter(dhcp-config)#default- 192.168.1.1
MainCampusRouter(dhcp-config)#default-r
MainCampusRouter(dhcp-config)#default-router 192.168.1.1
MainCampusRouter(dhcp-config)#dns
MainCampusRouter(dhcp-config)#dns-server 192.168.1.1
MainCampusRouter(dhcp-config)#
```



Step6: Routing using ospf

First lets test the connectivity between the PC from the Admin department in the main campus and the PC from the IT department in the second campus.

```
C:\>ping 192.168.10.2

Pinging 192.168.10.2 with 32 bytes of data:

Reply from 192.168.1.1: Destination host unreachable.
Reply from 192.168.1.1: Destination host unreachable.
Reply from 192.168.1.1: Destination host unreachable.
Reply from 192.168.1.1: Destination host unreachable.

Ping statistics for 192.168.10.2:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>
```

Main campus routes configuration

```
MainCampusRouter(config)#router osp
MainCampusRouter(config)#router ospf 100
MainCampusRouter(config-router)#net
MainCampusRouter(config-router)#network 192.168.1.0 0.0.0.255 are
MainCampusRouter(config-router)#network 192.168.1.0 0.0.0.255 area 1
MainCampusRouter(config-router)#network 192.168.2.0 0.0.0.255 area 1
MainCampusRouter(config-router)#network 192.168.3.0 0.0.0.255 area 1
MainCampusRouter(config-router)#network 192.168.4.0 0.0.0.255 area 1
MainCampusRouter(config-router)#network 192.168.5.0 0.0.0.255 area 1
MainCampusRouter(config-router)#network 192.168.6.0 0.0.0.255 area 1
MainCampusRouter(config-router)#network 192.168.7.0 0.0.0.255 area 1
MainCampusRouter(config-router)#network 192.168.8.0 0.0.0.255 area 1
MainCampusRouter(config-router)#net
MainCampusRouter(config-router)#network 10.10.10.0 0.0.03 are
MainCampusRouter(config-router)#network 10.10.10.0 0.0.03 are
MainCampusRouter(config-router)#network 10.10.10.0 0.0.0.3 a
MainCampusRouter(config-router)#network 10.10.10.0 0.0.0.3 area 1
MainCampusRouter(config-router)#
04:35:52: %OSPF-5-ADJCHG: Process 100, Nbr 192.168.10.1 on Serial0/0/1 from LOADING to FULL,
Loading Done
net
MainCampusRouter(config-router)#network 10.10.10.4 0.0.0.3 are
MainCampusRouter(config-router)#network 10.10.10.4 0.0.0.3 area 1
MainCampusRouter(config-router)#
```

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Second campus routes configuration

```
SecondCampus(config-router)#network 10.10.10.0 0.0.0.3 area 1
SecondCampus(config-router)#network 10.10.10.0 0.0.0.3 area 1
SecondCampus(config-router)#no network 192.168.10.0 0.0.0.255 area 0
SecondCampus(config-router)#network 192.168.10.0 0.0.0.255 area 1
SecondCampus(config-router)#do write
Building configuration...
[OK]
SecondCampus(config-router)#
04:35:52: %OSPF-5-ADJCHG: Process 100, Nbr 192.168.8.1 on Serial0/3/0 from LOADING to FULL, Loading
Done
```

Lets test the connectivity one more time

```
C:\>ping 192.168.10.2

Pinging 192.168.10.2 with 32 bytes of data:

Request timed out.
Reply from 192.168.10.2: bytes=32 time=18ms TTL=126
Reply from 192.168.10.2: bytes=32 time=1ms TTL=126
Reply from 192.168.10.2: bytes=32 time=17ms TTL=126

Ping statistics for 192.168.10.2:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 1ms, Maximum = 18ms, Average = 12ms

C:\>
```

Show IP route

```
     192.168.7.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.7.0/24 is directly connected, GigabitEthernet0/0.70
L       192.168.7.1/32 is directly connected, GigabitEthernet0/0.70
     192.168.8.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.8.0/24 is directly connected, GigabitEthernet0/0.80
L       192.168.8.1/32 is directly connected, GigabitEthernet0/0.80
O    192.168.9.0/24 [110/65] via 10.10.10.2, 00:02:28, Serial0/0/1
O    192.168.10.0/24 [110/65] via 10.10.10.2, 00:02:28, Serial0/0/1
```

```
Pinging 20.0.0.2 with 32 bytes of data:

Request timed out.
Reply from 20.0.0.2: bytes=32 time=1ms TTL=126
Reply from 20.0.0.2: bytes=32 time=1ms TTL=126
Reply from 20.0.0.2: bytes=32 time=1ms TTL=126

Ping statistics for 20.0.0.2:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 1ms, Maximum = 1ms, Average = 1ms
```