WELCOME

Cisco Certified Networking Associate(CCNA)

200-301

(10th Class)

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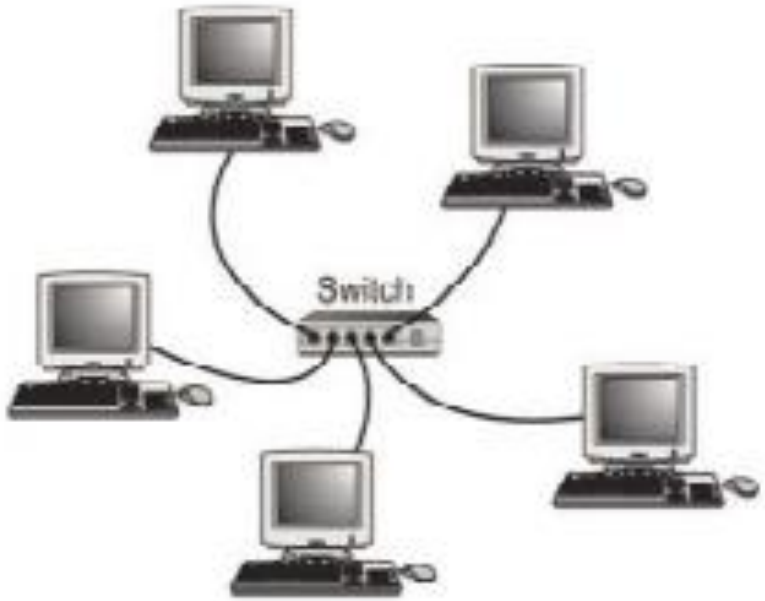
Basic Switching Concepts

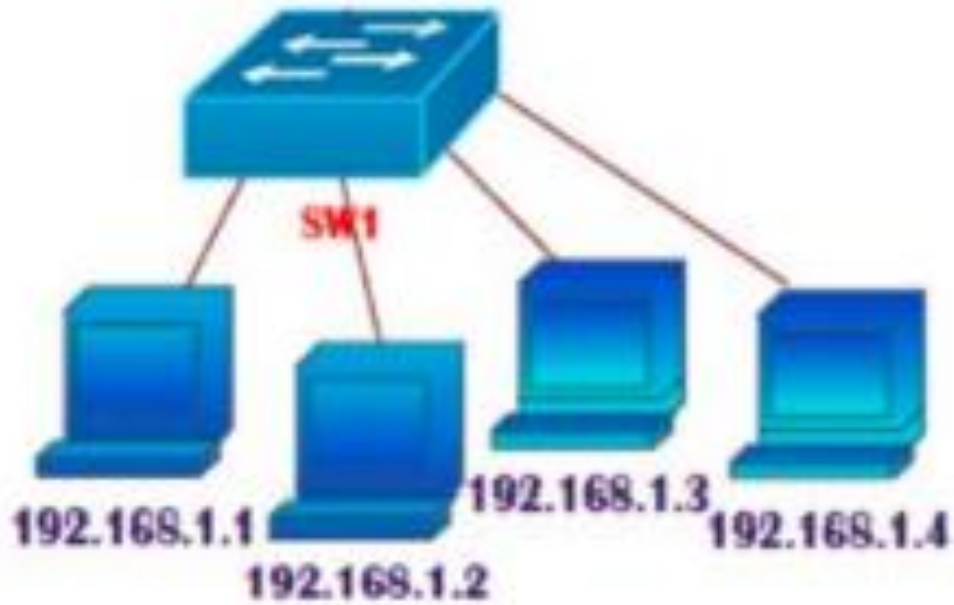
Provides centralized location to connect devices with in the LAN.



Switch

Rj45 Cable

Basic LAN setup



- Connect 4 computers in the LAN using Switch
- Configure IP addressing on all PC using 192.168.1.0/24 network.
- Check Connectivity between all the PC using Ping command

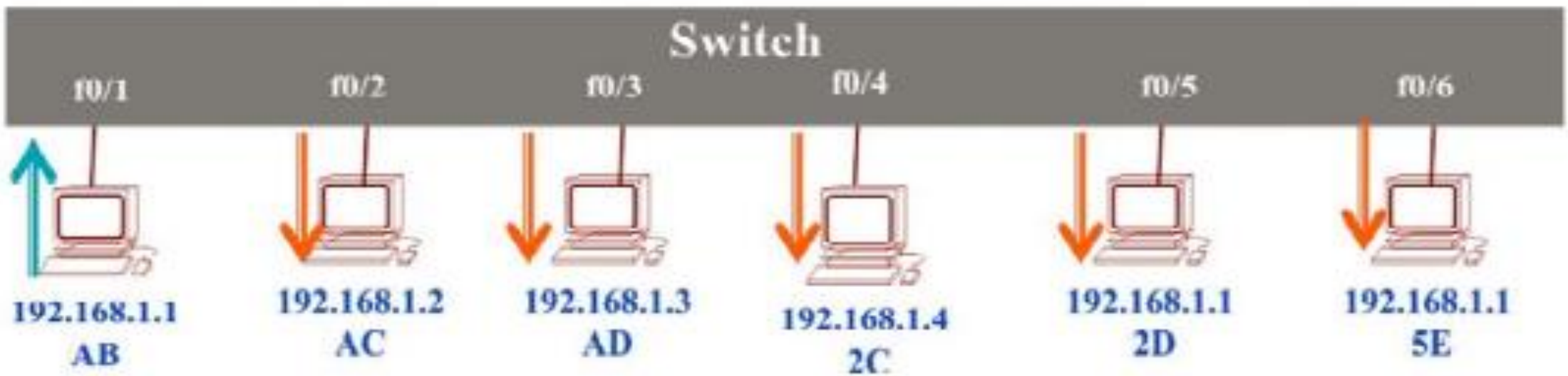
ARP process

Switch identify devices based on Mac-address

S – 192.168.1.1
D - 192.168.1.4

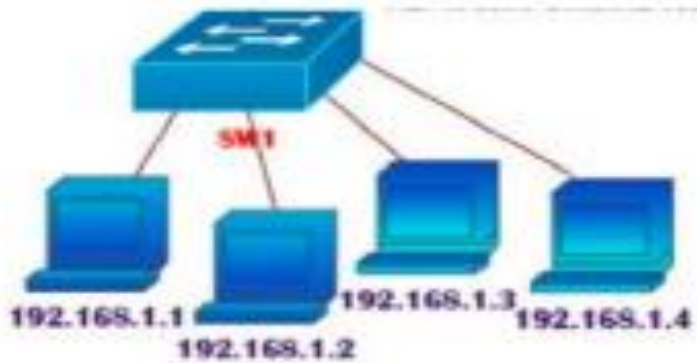
S – MAC=AB
D - MAC= ?

ARP Request
192.168.1.4 MAC= ?



ARP verification

```
PC>ping 192.168.1.2

    Pinging 192.168.1.2 with 32 bytes of data:

        Reply from 192.168.1.2: bytes=32 time=1ms TTL=128
        Reply from 192.168.1.2: bytes=32 time=0ms TTL=128
        Reply from 192.168.1.2: bytes=32 time=0ms TTL=128
        Reply from 192.168.1.2: bytes=32 time=0ms TTL=128
```




```
PC>ping 192.168.1.3

    Pinging 192.168.1.3 with 32 bytes of data:

        Reply from 192.168.1.3: bytes=32 time=2ms TTL=128
        Reply from 192.168.1.3: bytes=32 time=0ms TTL=128
        Reply from 192.168.1.3: bytes=32 time=0ms TTL=128
        Reply from 192.168.1.3: bytes=32 time=0ms TTL=128
```

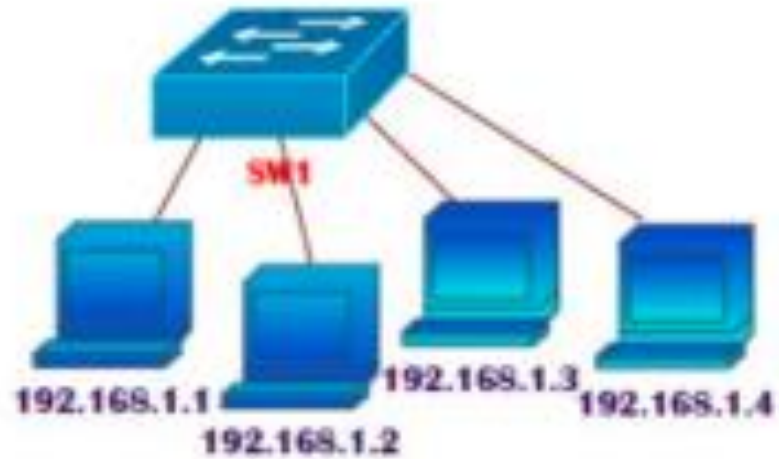
```
PC>arp -a

  Internet Address      Physical Address      Type
  192.168.1.2           000c.8547.85b2        dynamic
  192.168.1.3           0060.5c31.6aeb        dynamic
```

To check the mac-address entries in the MAC table

Switch# show mac-address-table

Mac Address Table

Vlan	Mac Address	Type	Ports
1	000a.419b.8ca9	DYNAMIC	Fa0/5
1	000c.8547.85b2	DYNAMIC	Fa0/2
1	0060.5c31.6aeb	DYNAMIC	Fa0/4
1	00d0.ff8b.4dad	DYNAMIC	Fa0/1



Switch basic functions

- If destination address present in mac-table - Switch do unicast
- If destination address not present in mac-table - Switch do broadcast (flooding)

- Switches update the MAC-table based on source address .
- Max-age time for mac-entries is 300 seconds of inactivity.

Types of Switches

Unmanageable switches

- plug and play (Connect & use)
- No configurations and verifications can be done
- There is no console port.

Manageable switches

- also plug and play (Connect & use)
- It has console port and CLI access.
- We can verify and modify configurations and can implement and test some advance switching technologies (VLAN, trunking , STP)

Cisco's Hierarchical Design Model

Access Layer

1900 & 2900 (L2 switches)

Catalyst 2900

Catalyst 1900

Distribution Layer

3550, 3560, 3750

(L3 switches or multi-layer switches)

Cisco 3550

Cisco 3560

Core Layer

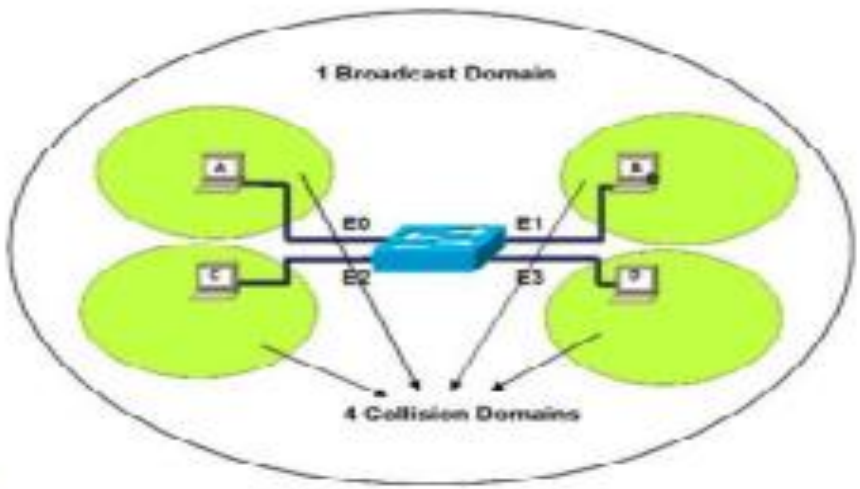
4500, 6500 (L3 switches or multi-layer switches)

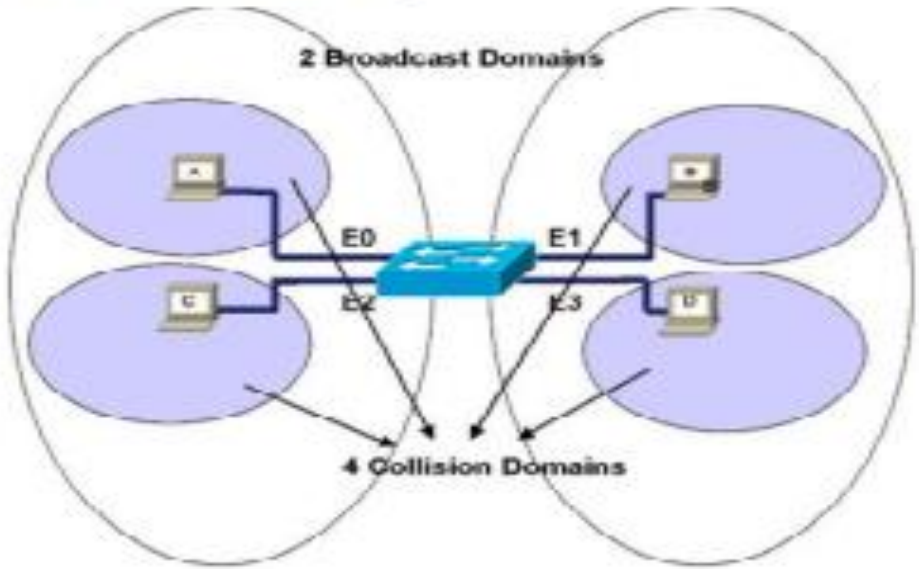
4500 , 6500

VLAN & Trunks

Virtual LAN

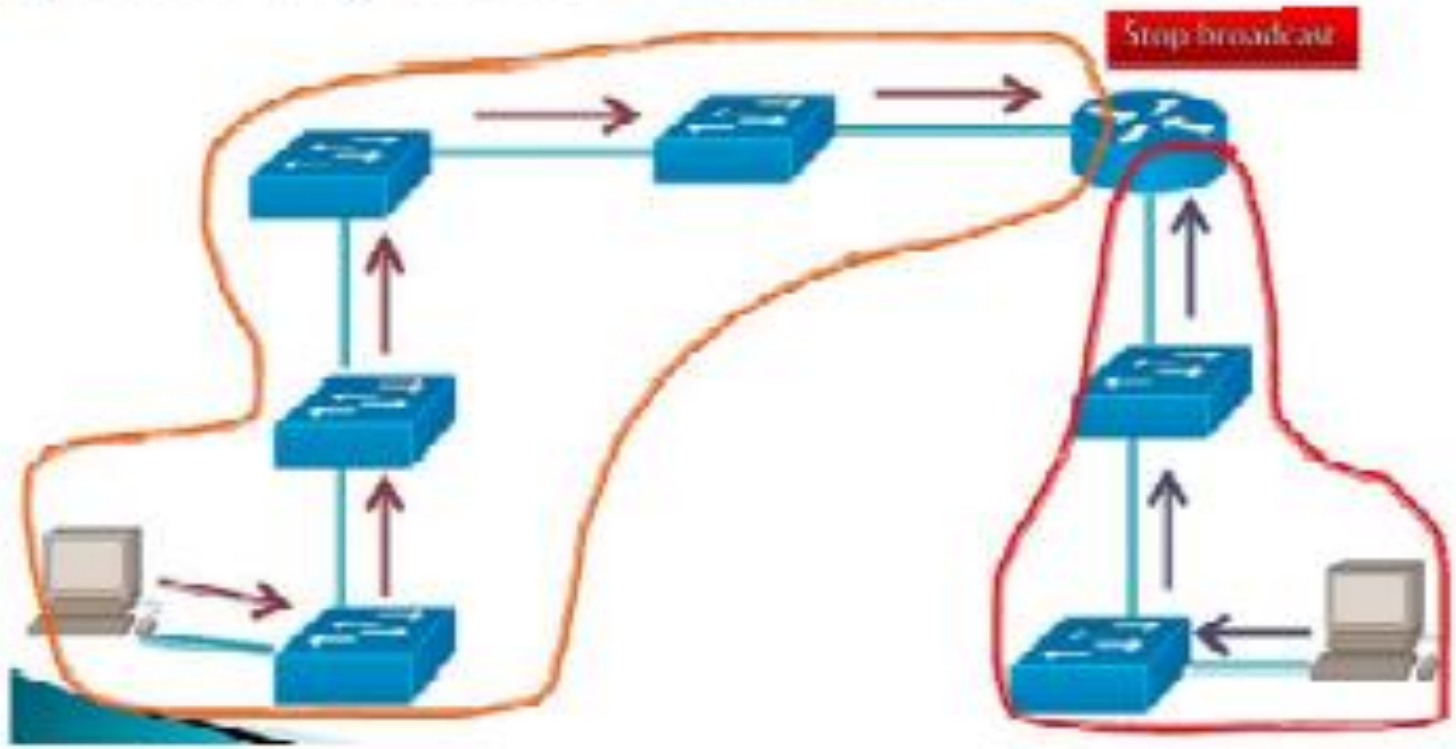
- Divides one single Broadcast domain into Multiple Broadcast domains.
- Layer 2 Security
- Vlan 1 is the default VLAN.
- We can create vlans from 2 – 1001
- Can be Configured on a Manageable switches only





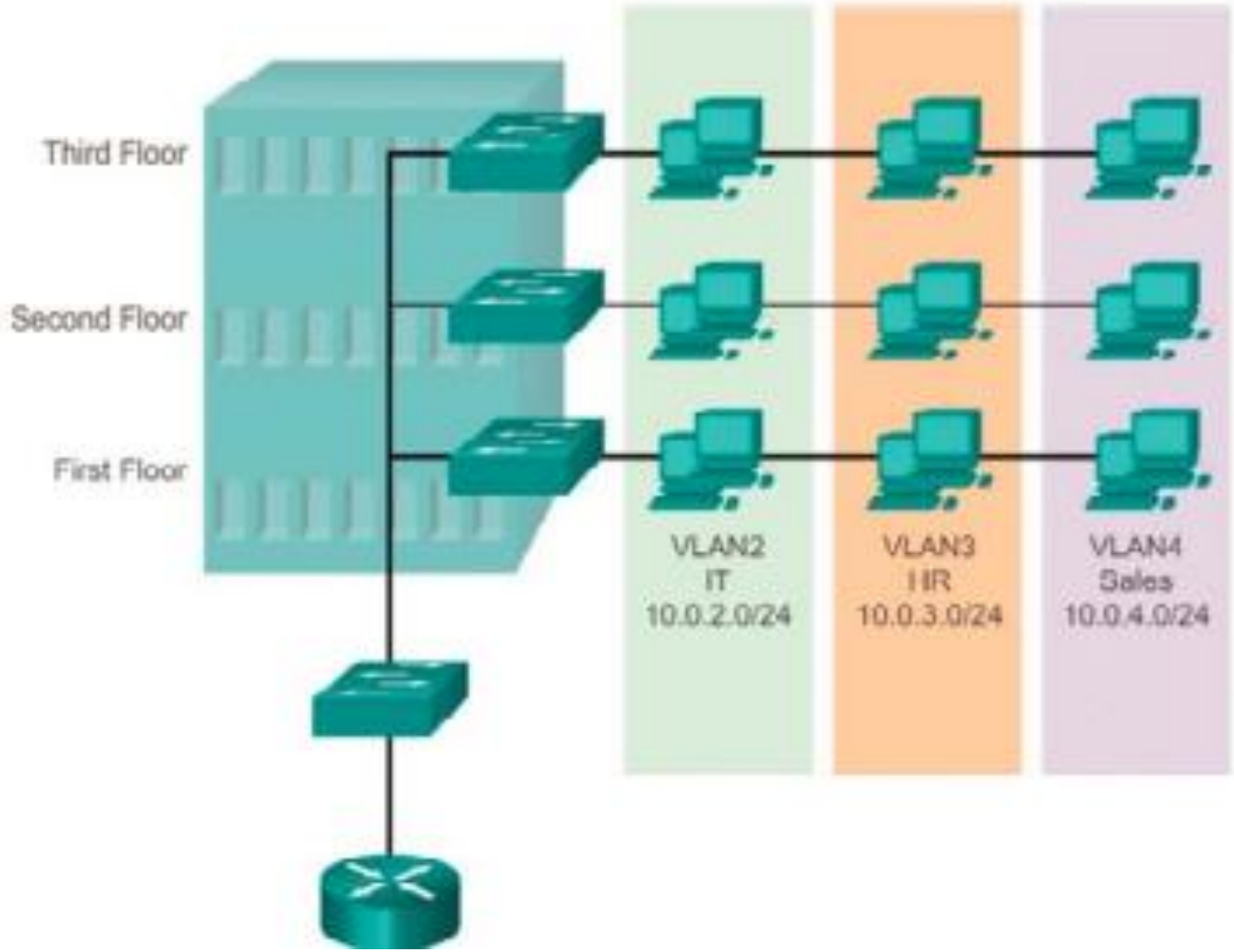
Broadcast Domain

Set of all devices that receive broadcast frames originating from any device within the set.



Benefits of VLANs

- Limit the number of broadcast
- Better performance
- Security



VLAN

- Work based on port numbers
- Default all ports will be in vlan 1
- Need to manually assign a port on a switch to a VLAN
- One port can be a member of only one VLAN

vlan 10 (Green) = 1, 2, 3, 4, 9 , 12

vlan 20 (Red) = 5, 6, 10, 11

vlan 30 (Blue) = 7 , 8

Switch#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 Fa0/21, Fa0/22, Fa0/23, Fa0/24
1002	fddi-default	active	
1003	token-ring-default	active	
1004	fddinet-default	active	
1005	trnet-default	active	

Creating VLAN

```
Switch(config)# vlan <no>
Switch(config-Vlan)# name <name>
Switch(config-Vlan)# Exit
```

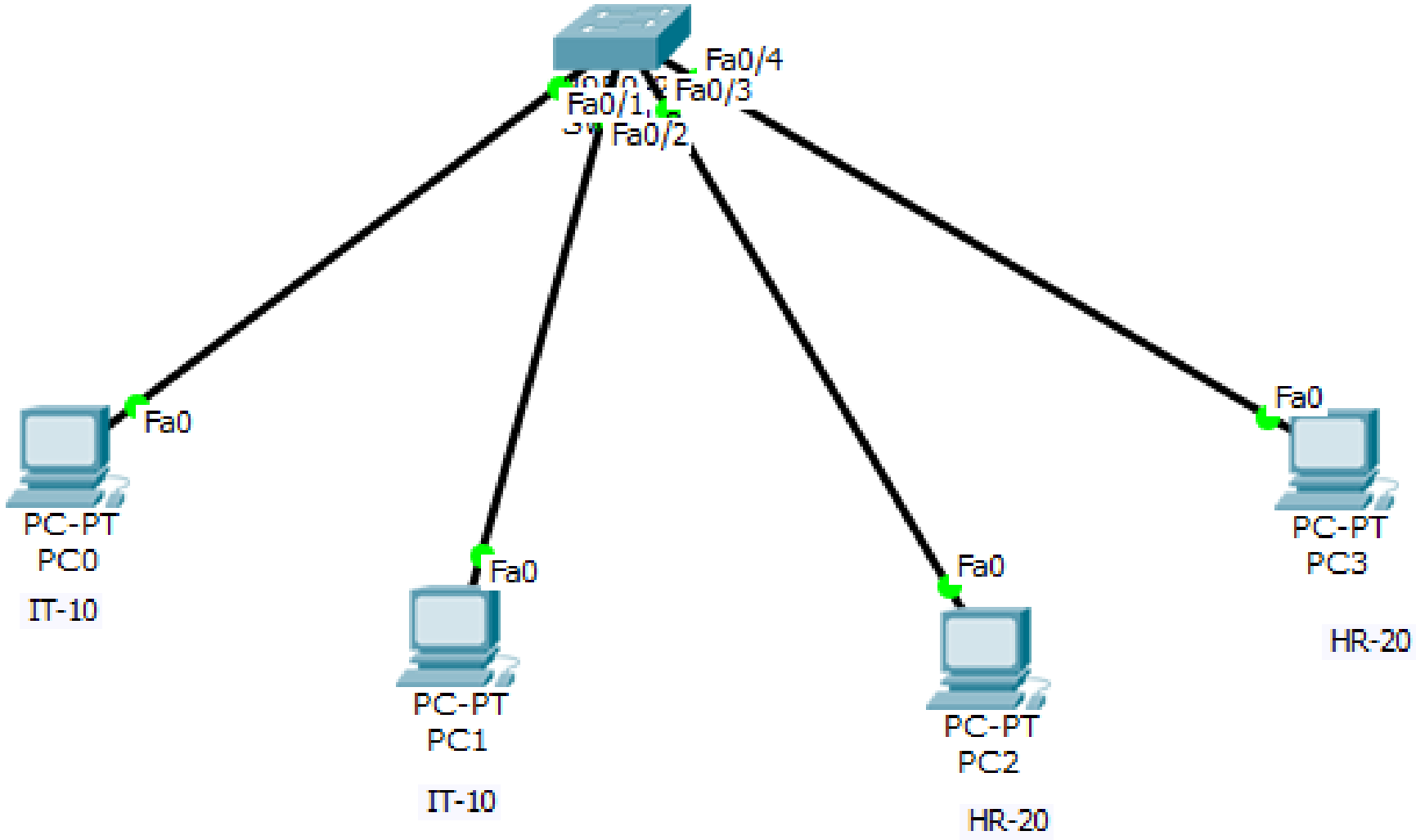
Assigning ports - VLAN

```
Switch(config)# interface <interface type> <interface no.>
Switch(config-if)# switchport mode access
Switch(config-if)# switchport access Vlan <no>
```

VLAN-Configuration

192.168.10.1-192.168.10.10 (IT-10) (Fa0/1, Fa0/2)

192.168.10.20-192.168.10.40 (HR-20) (Fa0/3, Fa0/4)



VLAN Configuration :

```
Switch>enable
Switch#configure terminal
Switch(config)#vlan 10
Switch(config-vlan)#name IT
Switch(config-vlan)# exit
Switch(config)#vlan 20
Switch(config-vlan)#name HR
Switch(config-vlan)# exit
Switch(config)# exit
```

```
Switch#configure terminal
Switch(config)#interface fastEthernet 0/1
Switch(config-if)#switchport access vlan 10
Switch(config-if)#exit
Switch(config)#interface fastEthernet 0/2
Switch(config-if)#switchport access vlan 10
Switch(config-if)#exit
Switch(config)#interface fastEthernet 0/3
Switch(config-if)#switchport access vlan 20
Switch(config-if)#exit
Switch(config)#interface fastEthernet 0/4
Switch(config-if)#switchport access vlan 20
Switch# write
```

Switch#show vlan brief

VLAN Name Status Ports

---- -------------------------------- --------- -------------------------------

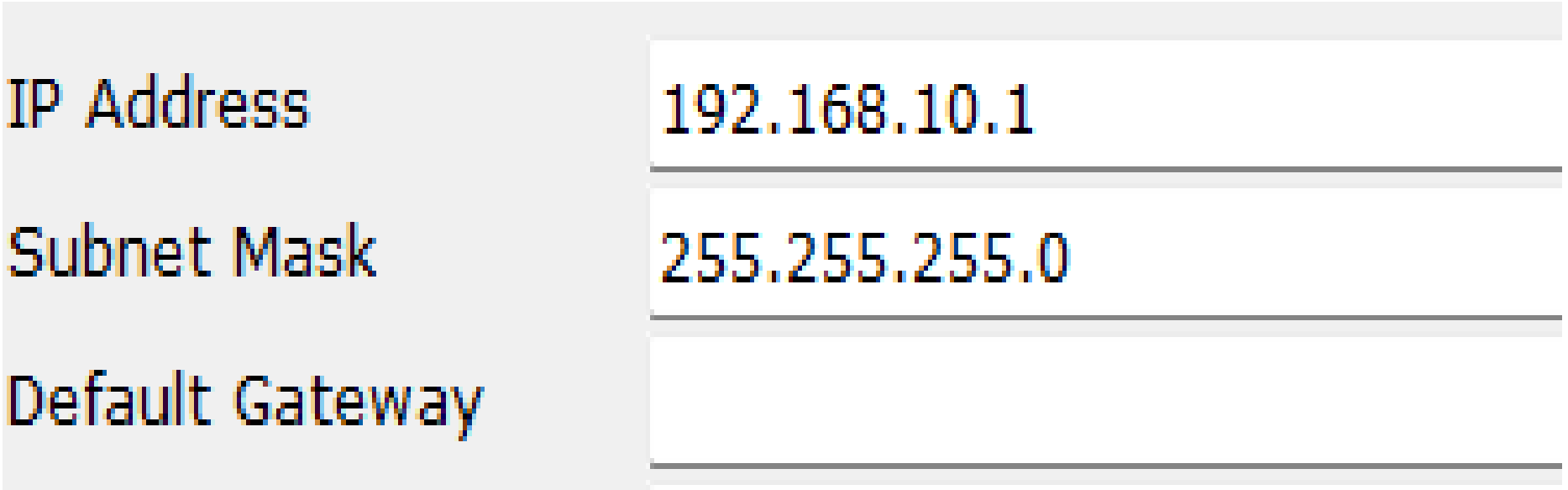
1 default active Fa0/5, Fa0/6, Fa0/7, Fa0/8
Fa0/9, Fa0/10, Fa0/11, Fa0/12, Fa0/13, Fa0/14, Fa0/15, Fa0/16
Fa0/17, Fa0/18, Fa0/19, Fa0/20, Fa0/21, Fa0/22, Fa0/23, Fa0/24

10 IT active Fa0/1, Fa0/2
20 HR active Fa0/3, Fa0/4

1003 token-ring-default active
1004 fddinet-default active
1005 trnet-default active

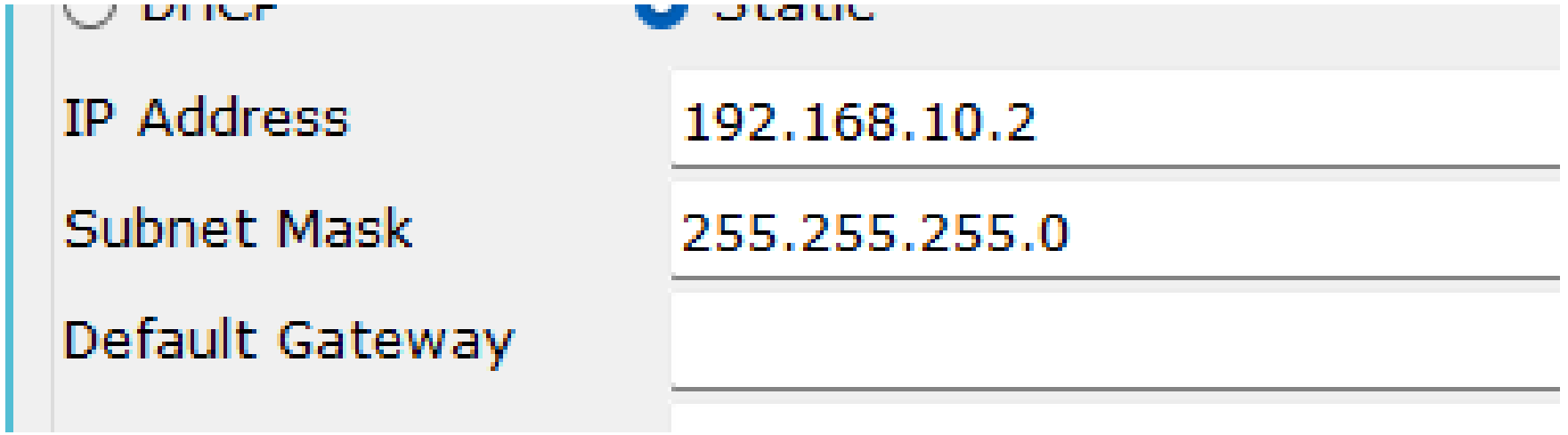
পরবর্তীতে প্রতিটি কম্পিউটারে প্রবেশ করে IP দিতে হবে।

1. Go to PCO => Click Desktop => Click IP Configuration

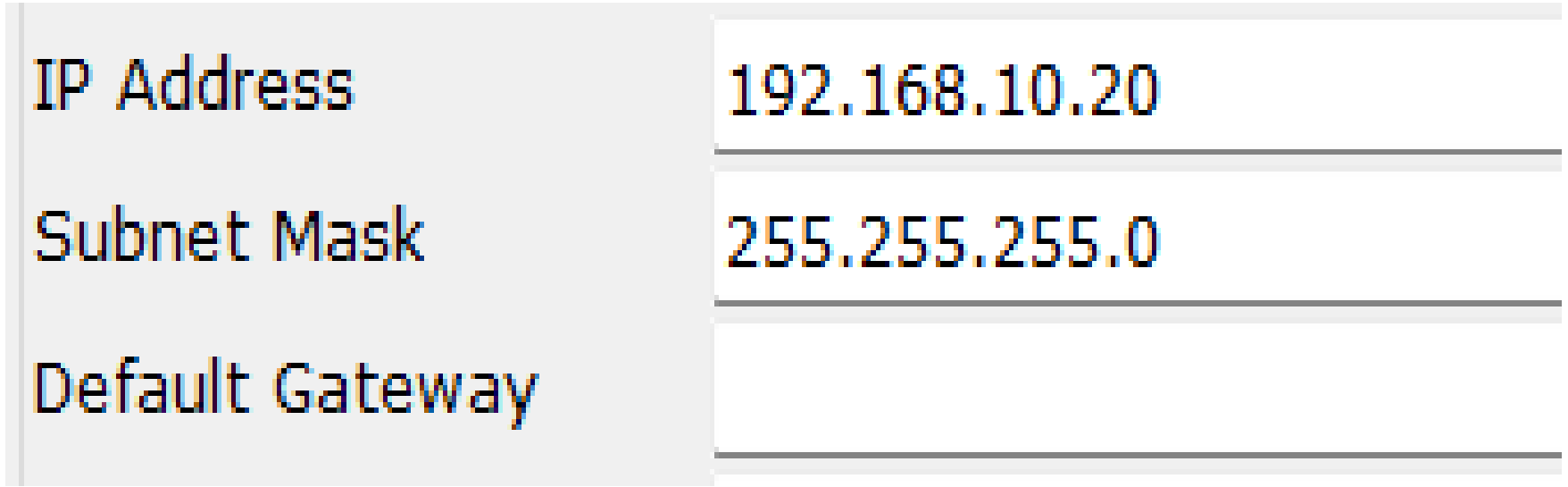


পরবর্তীতে IP Address, Subnet Mask দিয়ে উপরে Cross এ Click দিতে হবে।

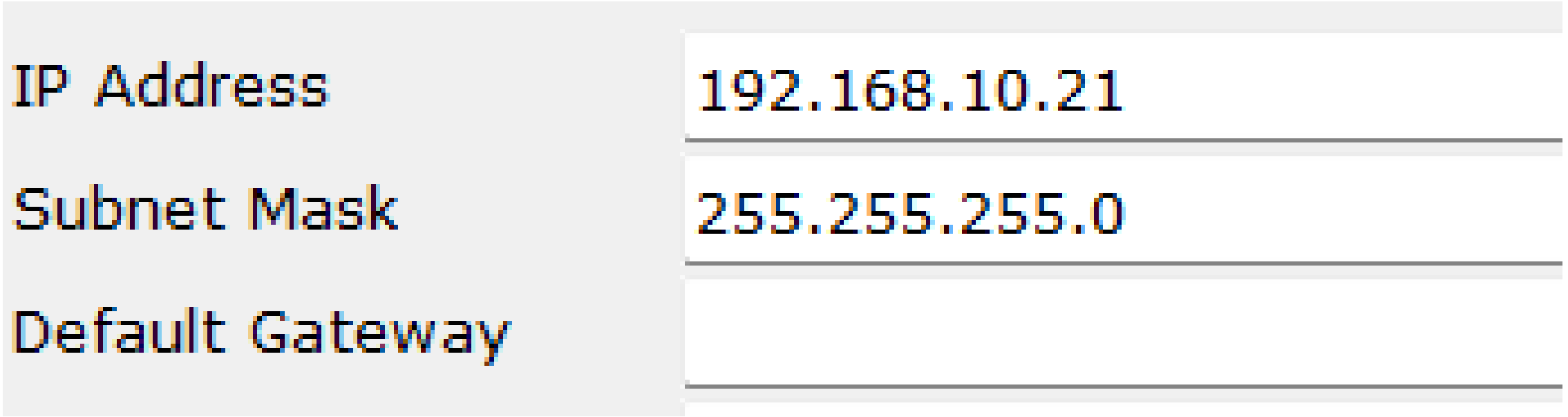
2. Go to PC1 => Click Desktop => Click IP Configuration



3. Go to PC2 => Click Desktop => Click IP Configuration



4. Go to PC3 => Click Desktop => Click IP Configuration



পরবর্তীতে আমরা প্রথমে একটি IT-10 Department এর প্রথম কম্পিউটারের প্রবেশ করে IT-10 এর অন্য কম্পিউটারকে Ping করে দেখবো যে, Connectivity আছে কীনা।

1. Go to PCO => Click Desktop => Click Command Prompt

PC>ping 192.168.10.2

Pinging 192.168.10.2 with 32 bytes of data:
Reply from 192.168.10.2: bytes=32 time=0ms TTL=128
Reply from 192.168.10.2: bytes=32 time=0ms TTL=128
Reply from 192.168.10.2: bytes=32 time=0ms TTL=128
Reply from 192.168.10.2: bytes=32 time=0ms TTL=128

Ping statistics for 192.168.10.2:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 0ms, Maximum = 0ms, Average = 0ms

যদি এইরকম আসে তাহলে আমি অন্য কম্পিউটারের সাথে সংযুক্ত আছি। আর সংযুক্ত না থাকলে Request Time Out আসবে।

পরবর্তীতে আমরা প্রথমে একটি IT-10 Department এর প্রথম কম্পিউটারের থেকে HR-20 এর অন্য কম্পিউটারকে Ping করে দেখবো যে, Connectivity আছে কীনা।

1. Go to PCO => Click Desktop => Click Command Prompt

PC>ping 192.168.10.20

Pinging 192.168.10.20 with 32 bytes of data:

Request timed out.
Request timed out.
Request timed out.
Request timed out.

Ping statistics for 192.168.10.20:
Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

যদি Request Time Out আসে তাহলে আমি অন্য কম্পিউটারের সাথে সংযুক্ত নেই। এটাই মূলত Vlan Configuration

এইবার আমরা একটি HR-20 Department এর প্রথম কম্পিউটারের প্রবেশ করে HR-20 এর অন্য কম্পিউটারকে Ping করে দেখবো যে, Connectivity আছে কীনা।

1. Go to PC2 => Click Desktop => Click Command Prompt

PC>ping 192.168.10.21

Pinging 192.168.10.21 with 32 bytes of data:
Reply from 192.168.10.21: bytes=32 time=0ms TTL=128
Reply from 192.168.10.21: bytes=32 time=0ms TTL=128
Reply from 192.168.10.21: bytes=32 time=0ms TTL=128
Reply from 192.168.10.21: bytes=32 time=0ms TTL=128

Ping statistics for 192.168.10.21:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 0ms, Maximum = 0ms, Average = 0ms

যদি এইরকম আসে তাহলে আমি অন্য কম্পিউটারের সাথে সংযুক্ত আছি। আর সংযুক্ত না থাকলে Request Time Out আসবে।

পরবর্তীতে আমরা প্রথমে একটি HR-20 Department এর প্রথম কম্পিউটারের থেকে IT-10 এর অন্য কম্পিউটারকে Ping করে দেখবো যে, Connectivity আছে কীনা।

1. Go to PC2 => Click Desktop => Click Command Prompt

PC>ping 192.168.10.1

Pinging 192.168.10.1 with 32 bytes of data:

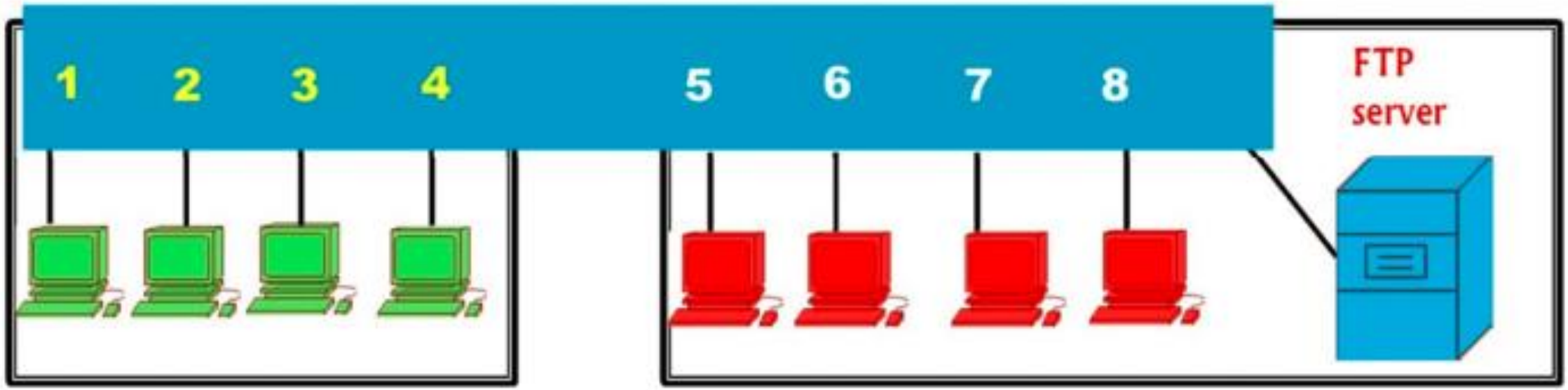
Request timed out.
Request timed out.
Request timed out.
Request timed out.

Ping statistics for 192.168.10.1:
Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

যদি Request Time Out আসে তাহলে আমি অন্য কম্পিউটারের সাথে সংযুক্ত নেই। এটাই মূলত Vlan Configuration

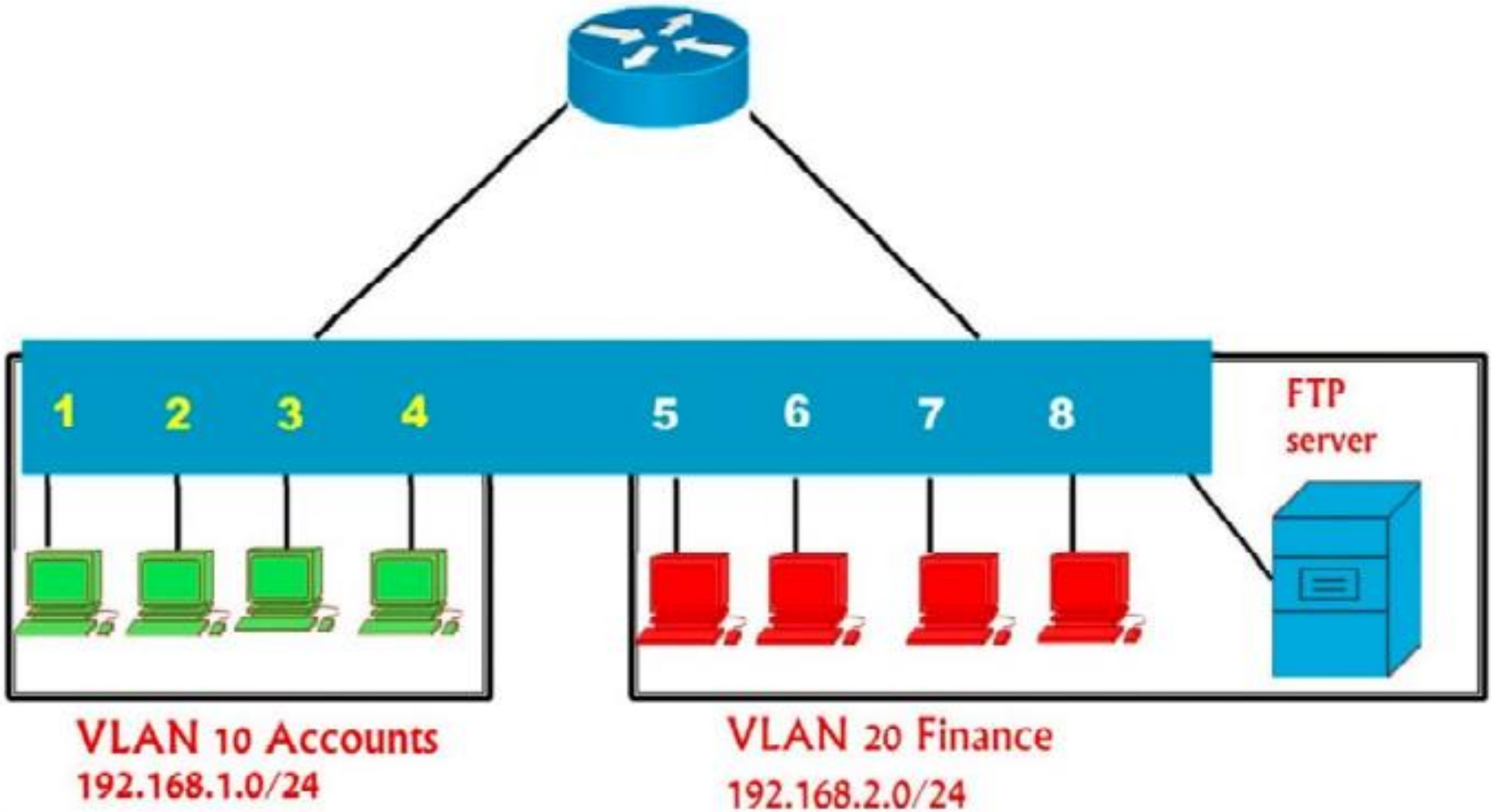
Inter -VLAN Routing

allowing the users of one VLAN to access resources of other VLAN



Inter -VLAN Routing

- Need a at-least one router
- Every VLAN must have a default gateway

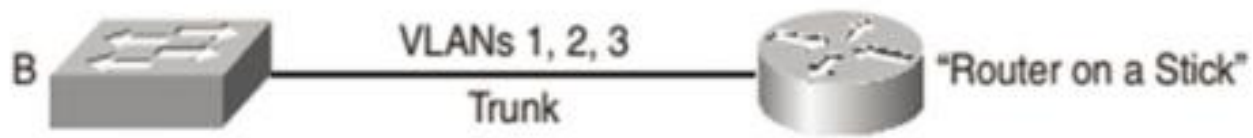


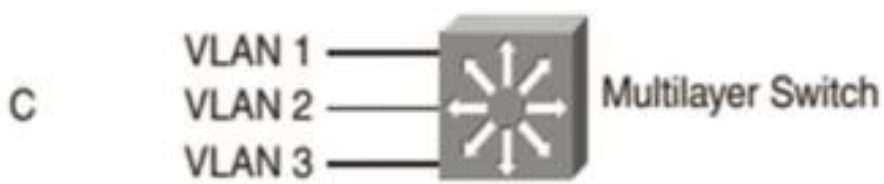
Inter-Vlan Routing Methods

A. Separate Physical Gateway on Router

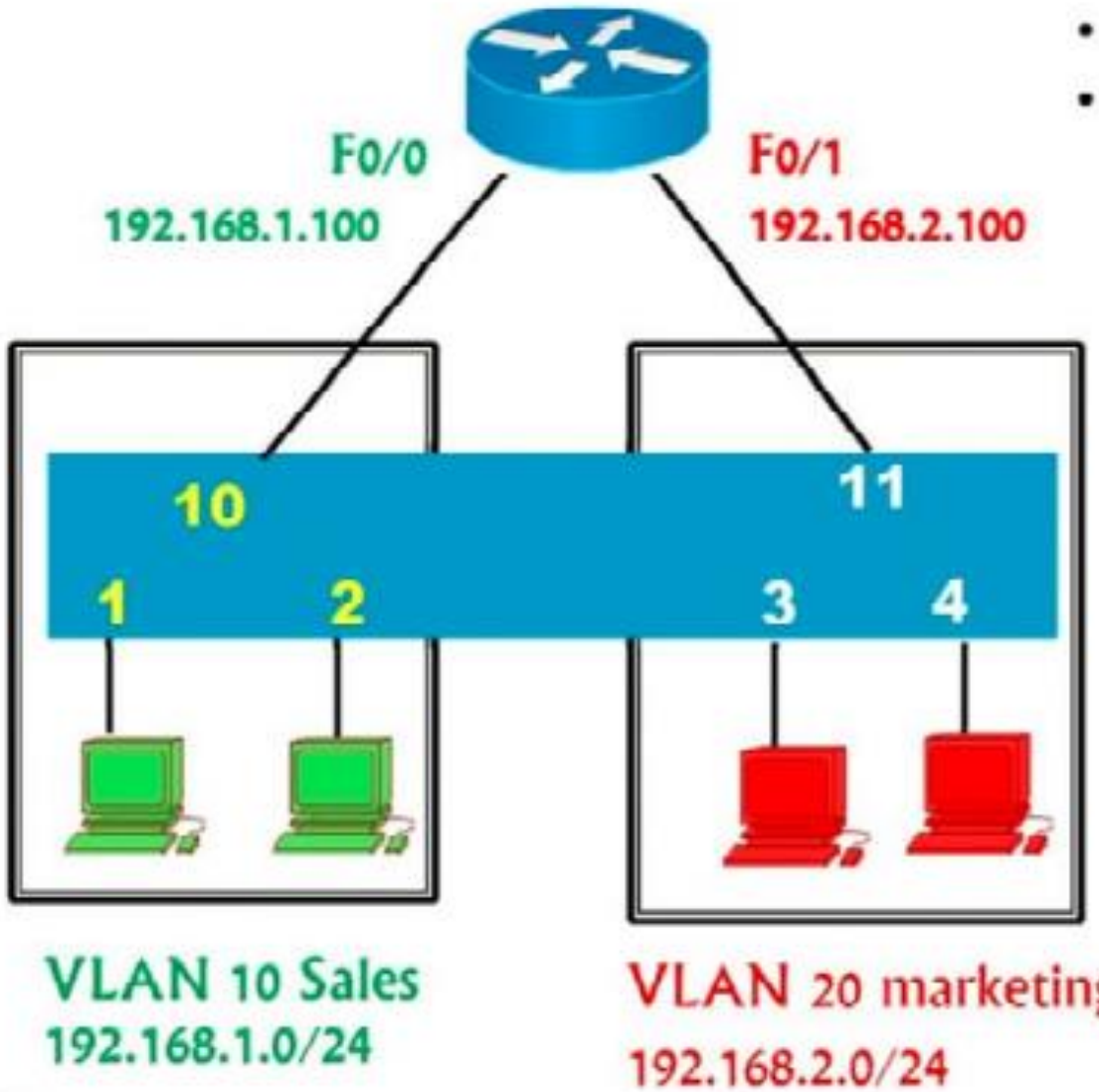
B. Using Sub-interfaces

C. Using Layer 3 Switch





Inter- VLAN routing using separate interfaces

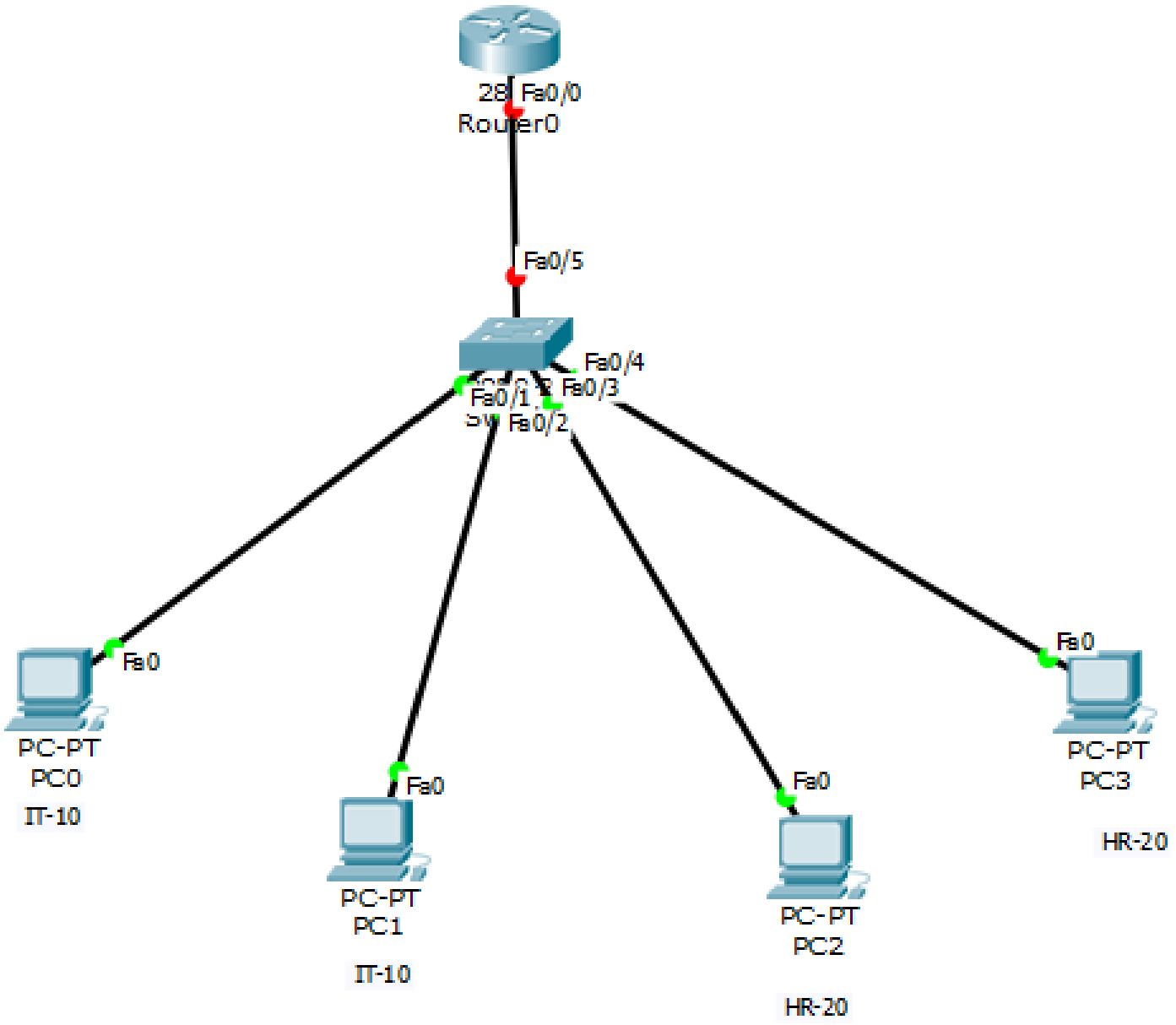


- Need a at-least one router
- Every VLAN must have a default gateway

1, 2, 10 - vlan 10

3, 4 , 11 – vlan 20

Inter VLAN-Configuration



Sub Interface

Interface fa0/0.1

192.168.10.0/24

Interface fa0/0.2

192.168.20.0/24

Inter-Vlan এর আগে আমাদের আগে VLAN Configuration করতে হবে:

```
Switch>enable
Switch#configure terminal
Switch(config)#vlan 10
Switch(config-vlan)#name IT
Switch(config-vlan)# exit
Switch(config)#vlan 20
Switch(config-vlan)#name HR
Switch(config-vlan)# exit
Switch(config)# exit
```

```
Switch#configure terminal
Switch(config)#interface fastEthernet 0/1
Switch(config-if)#switchport access vlan 10
Switch(config-if)#exit
Switch(config)#interface fastEthernet 0/2
Switch(config-if)#switchport access vlan 10
Switch(config-if)#exit
Switch(config)#interface fastEthernet 0/3
Switch(config-if)#switchport access vlan 20
Switch(config-if)#exit
Switch(config)#interface fastEthernet 0/4
Switch(config-if)#switchport access vlan 20
Switch# write
```

Switch#show vlan brief

VLAN Name Status Ports

---- -------------------------------- --------- -------------------------------

1 default active 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, Fa0/21, Fa0/22, Fa0/23, Fa0/24

10 IT active Fa0/1, Fa0/2
20 HR active Fa0/3, Fa0/4

1003 token-ring-default active
1004 fddinet-default active
1005 trnet-default active

Inter-VLAN Configuration :

- **Router Configuration::-**

```
Router>enable
Router#configure terminal
Router(config)#interface fastEthernet 0/0
Router(config-if)#no shutdown
Router(config-if)#exit
Router(config)#exit
Router#configure terminal
Router(config)#interface fastEthernet 0/0.1
Router(config-subif)#encapsulation dot1Q 10
Router(config-subif)#ip address 192.168.10.1 255.255.255.0
Router(config)#interface fastEthernet 0/0.2
Router(config-subif)#encapsulation dot1Q 20
Router(config-subif)#ip address 192.168.20.1 255.255.255.0
```

- **Switch Configuration::-**

Trunk port configuration :

Switch#configure terminal

Switch(config)#interface fastEthernet 0/5

Switch(config-if)#switchport mode trunk

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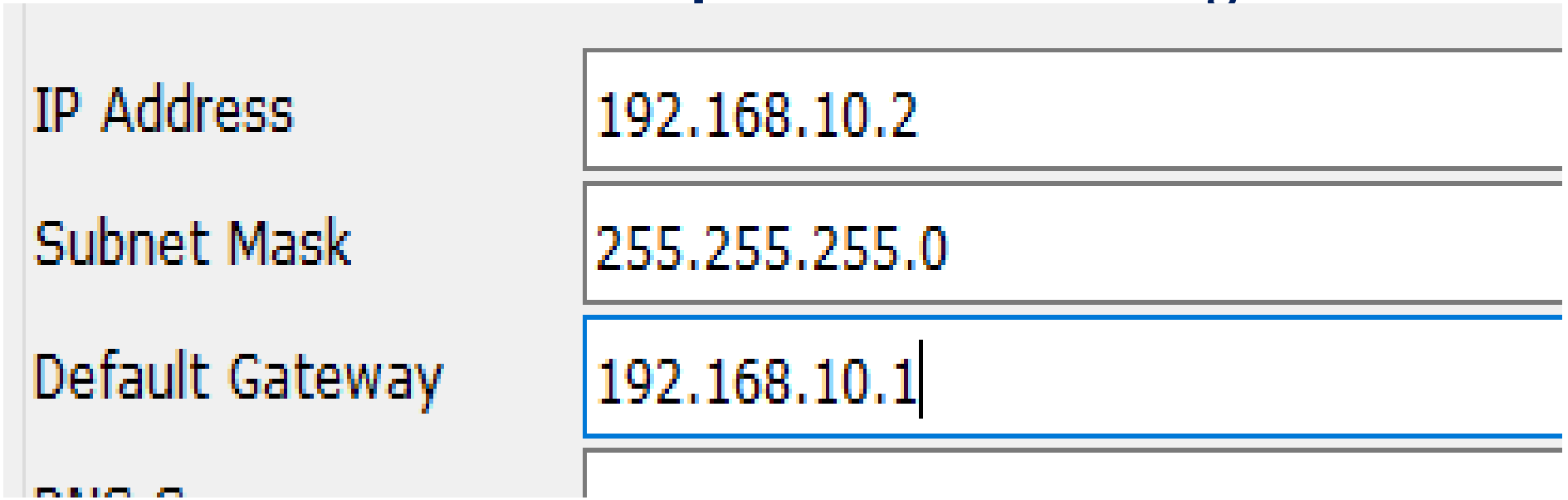
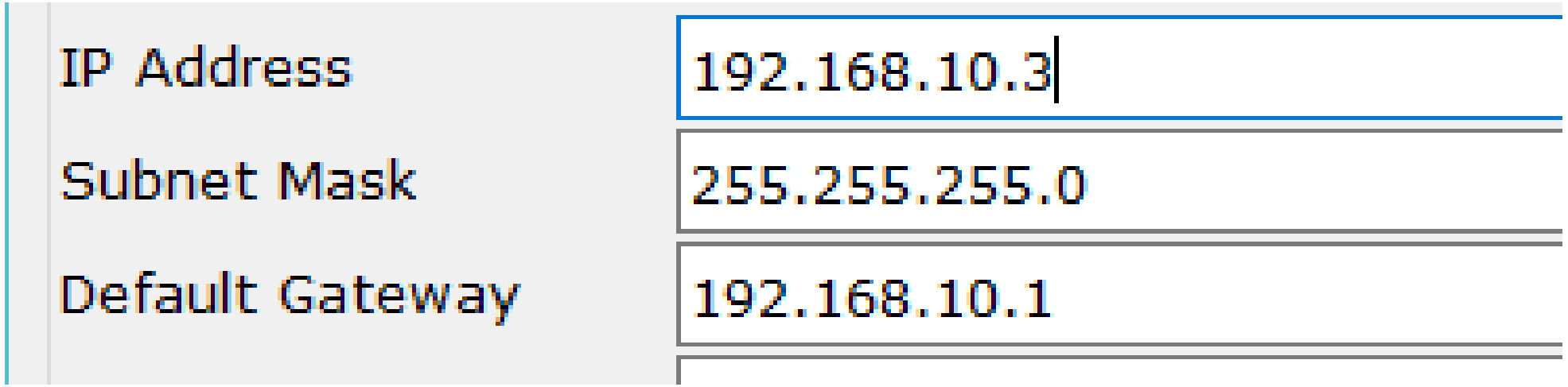
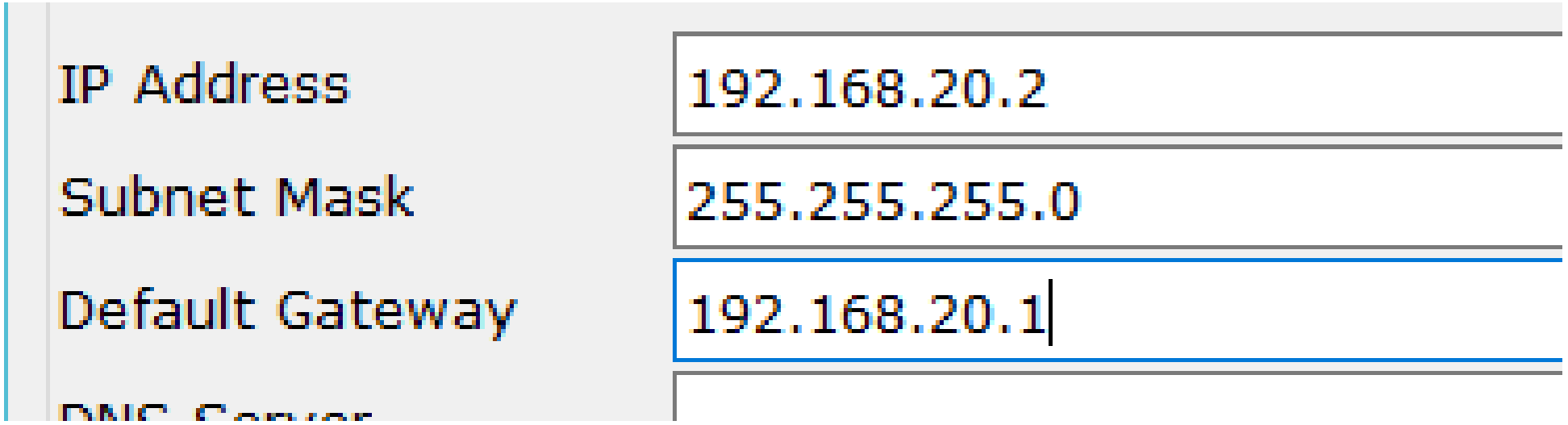


পরবর্তীতে IP Address, Subnet Mask দিয়ে উপরে Cross এ Click দিতে হবে।

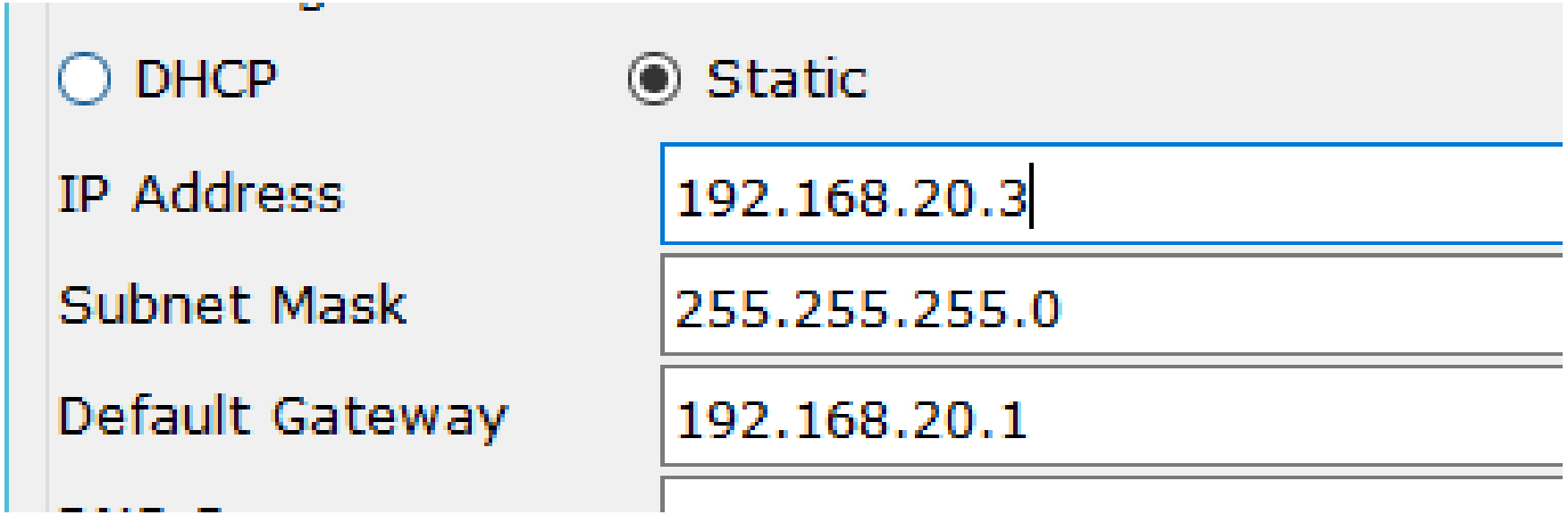
2. Go to PC1 => Click Desktop => Click IP Configuration



3. Go to PC2 => Click Desktop => Click IP Configuration



4. Go to PC3 => Click Desktop => Click IP Configuration



পরবর্তীতে আমরা প্রথমে একটি IT-10 Department এর প্রথম কম্পিউটারের প্রবেশ করে IT-10 এর অন্য কম্পিউটারকে Ping করে দেখবো যে, Connectivity আছে কীনা।

1. Go to PCO => Click Desktop => Click Command Prompt

PC>ping 192.168.10.3

Pinging 192.168.10.3 with 32 bytes of data:
Reply from 192.168.10.3: bytes=32 time=0ms TTL=128
Reply from 192.168.10.3: bytes=32 time=0ms TTL=128
Reply from 192.168.10.3: bytes=32 time=0ms TTL=128
Reply from 192.168.10.3: bytes=32 time=0ms TTL=128

Ping statistics for 192.168.10.3:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 0ms, Maximum = 0ms, Average = 0ms

যদি এইরকম আসে তাহলে আমি অন্য কম্পিউটারের সাথে সংযুক্ত আছি। আর সংযুক্ত না থাকলে Request Time Out আসবে।

পরবর্তীতে আমরা প্রথমে একটি IT-10 Department এর প্রথম কম্পিউটারের থেকে HR-20 এর অন্য কম্পিউটারকে Ping করে দেখবো যে, Connectivity আছে কীনা।

1. Go to PCO => Click Desktop => Click Command Prompt

PC>ping 192.168.20.2

Pinging 192.168.20.2 with 32 bytes of data:
Reply from 192.168.20.2: bytes=32 time=0ms TTL=128
Reply from 192.168.20.2 : bytes=32 time=0ms TTL=128
Reply from 192.168.20.2 : bytes=32 time=0ms TTL=128
Reply from 192.168.20.2 : bytes=32 time=0ms TTL=128

Ping statistics for 192.168.20.2 :
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 0ms, Maximum = 0ms, Average = 0ms

যদি এইরকম আসে তাহলে আমি অন্য কম্পিউটারের সাথে সংযুক্ত আছি। আর সংযুক্ত না থাকলে Request Time Out আসবে।

এইবার আমরা একটি HR-20 Department এর প্রথম কম্পিউটারের প্রবেশ করে HR-20 এর অন্য কম্পিউটারকে Ping করে দেখবো যে, Connectivity আছে কীনা।

1. Go to PC2 => Click Desktop => Click Command Prompt

PC>ping 192.168.20.3

Pinging 192.168.20.3 with 32 bytes of data:
Reply from 192.168.20.3 : bytes=32 time=0ms TTL=128
Reply from 192.168.20.3 : bytes=32 time=0ms TTL=128
Reply from 192.168.20.3 : bytes=32 time=0ms TTL=128
Reply from 192.168.20.3 : bytes=32 time=0ms TTL=128

Ping statistics for 192.168.20.3 :
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 0ms, Maximum = 0ms, Average = 0ms

যদি এইরকম আসে তাহলে আমি অন্য কম্পিউটারের সাথে সংযুক্ত আছি। আর সংযুক্ত না থাকলে Request Time Out আসবে।

পরবর্তীতে আমরা প্রথমে একটি HR-20 Department এর প্রথম কম্পিউটারের থেকে IT-10 এর অন্য কম্পিউটারকে Ping করে দেখবো যে, Connectivity আছে কীনা।

1. Go to PC2 => Click Desktop => Click Command Prompt

PC>ping 192.168.10.2

Pinging 192.168.10.2 with 32 bytes of data:
Reply from 192.168.10.2: bytes=32 time=0ms TTL=128
Reply from 192.168.10.2: bytes=32 time=0ms TTL=128
Reply from 192.168.10.2: bytes=32 time=0ms TTL=128
Reply from 192.168.10.2: bytes=32 time=0ms TTL=128

Ping statistics for 192.168.10.2:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 0ms, Maximum = 0ms, Average = 0ms

যদি Request Time Out আসে তাহলে আমি অন্য কম্পিউটারের সাথে সংযুক্ত নেই। এটাই মূলত Vlan Configuration


Thank You