EC-4060

COMPUTER AND DATA NETWORK

SELF-LEARNING

ASRA S.A.F

2020/E/013

SEMESTER-04

1 MAY 2023

OBJECTIVE

To design a computer network to the new buildings of the university

REQUIREMENT GIVEN

IT CENTRE BLOCK

Number of data points 164

- Director Office-2 data points
- Network Manager Room-1 data points
- 2 Technical Officers Room-2 data points
- Staff Office-5 data points
- Meeting Room-3 data points(with WiFi coverage)
- Lobby area – 1 data points WiFi Coverage(use DHCP)
- Computer Lab 1-60 data points
- Computer lab 2-60 data points
- Digital Learning and Media Centre-30+1(printer) data points
- Printing Room-2 data points(printers)

DEPARTMENT BLOCK

Number of data points 203

- 4 lecture halls-8 data points (4 multimedia projecter)
- 14 staff rooms-14 data points
- 4 Technical Officers Rooms-4 data points
- Department Meeting Room-3 data points (with WiFi coverage)
- Computer Lab 1-50 data points
- Computer Lab 2-50 data points

- Network Engineering Lab-10 data points
- Microprocessor Lab-12 data points
- Computer Vision and Machine Learning Lab-50 data points
- Department Office-3 data points (with printer)

NOTE

Computers available at staff room can't be accessed from the network Engineering lab, department office, department meeting room, lecture halls, computer labs, Computer Vision and Machine Learning Lab, Microprocessor Lab, Technical Officers Rooms and the IT Centre (for security reason).

Computers available at the department office can't be accessed from the staff room, network Engineering lab, department office, department meeting room, lecture halls, computer labs, Computer Vision and Machine Learning Lab, Microprocessor Lab, Technical Officers Rooms and the IT Centre

REQUIREMENT

- Printer available at the depratment office can only be accessed by the depratment staffs.

- Printer available at the IT Centre printing room can only be accessed by the IT Centre staffs.

- Each network node can only be accessed by the administator, not others.

Grouping the nodes to reduce the number of switches

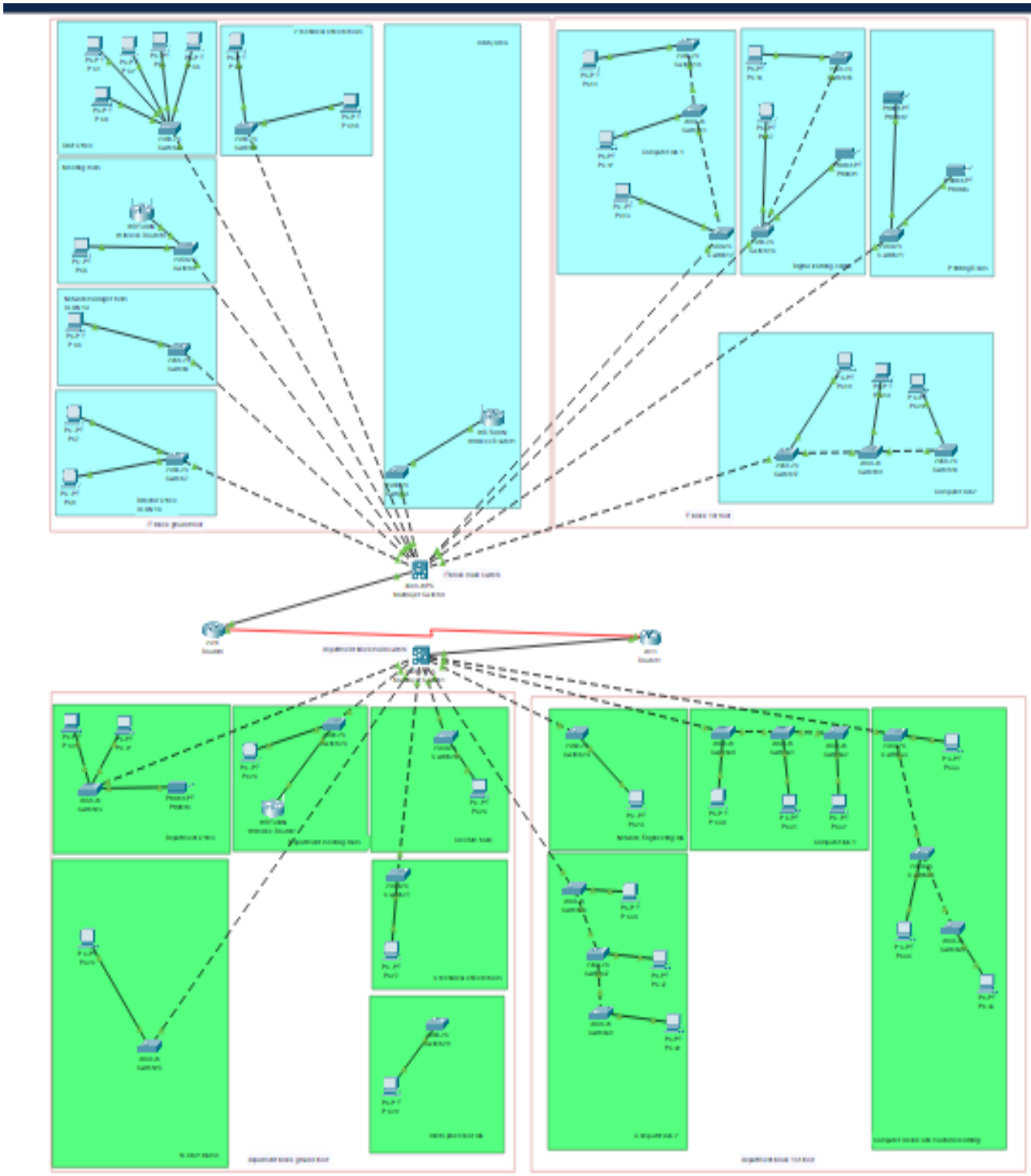
IT CENTER BLOCK

BLOCK	DATA POINTS
Computer lab 1	60
Computer lab 2	60
Digital learning and media centre	31
Staff office	5
Meeting room	3
Director office	2
2 technical officer	2
Printing room	2
Network manager room	1
Lobby	1

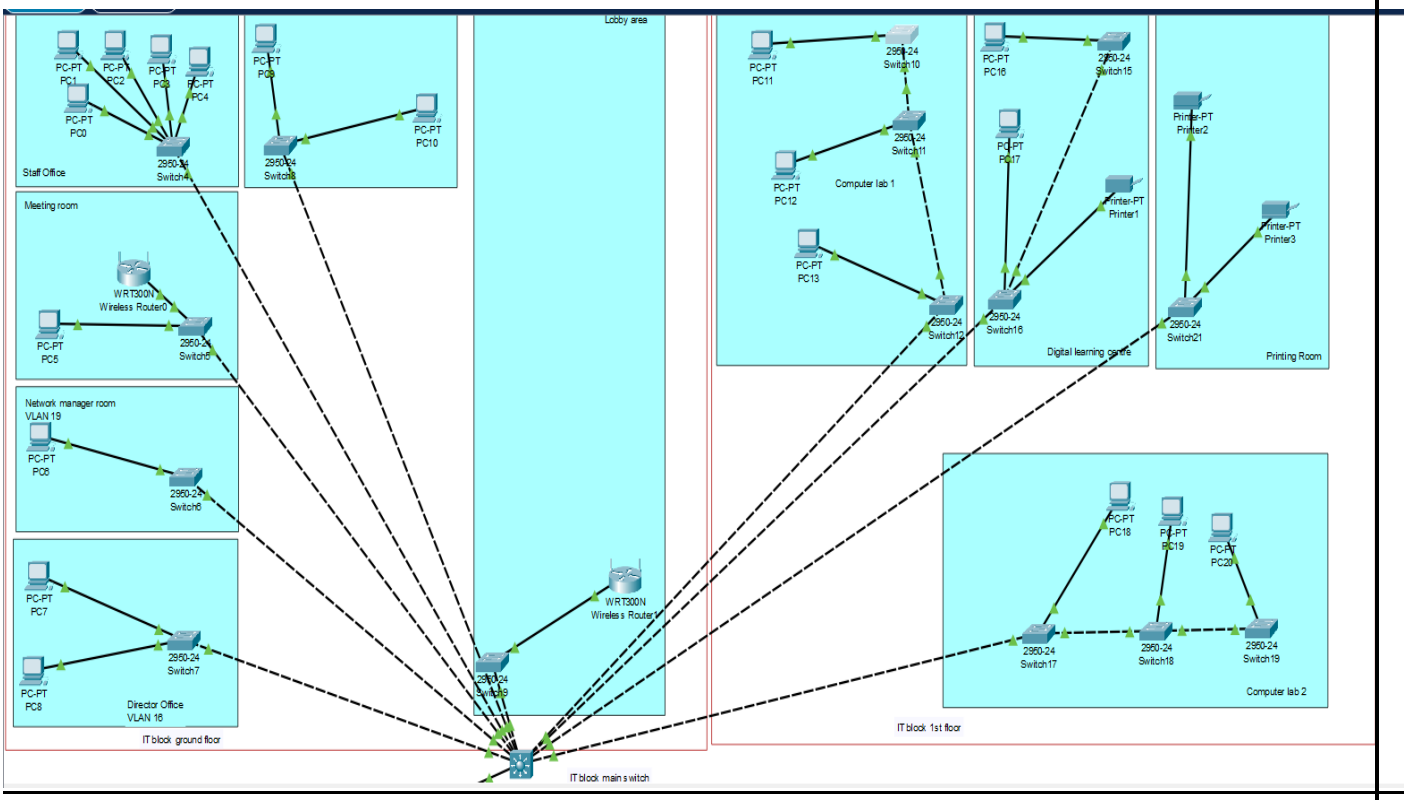
DEPARTMENT BUILDING

BLOCK	DATA POINTS
Computer lab 1	50
Computer lab 2	50
Computer Vision and Machine Learning Lab	50
14 staff rooms	14
Micro processor lab	12
Network Engineering lab	10
4 lecture hall	8
4 technical officers room	4
Department meeting room	3
Department office	3

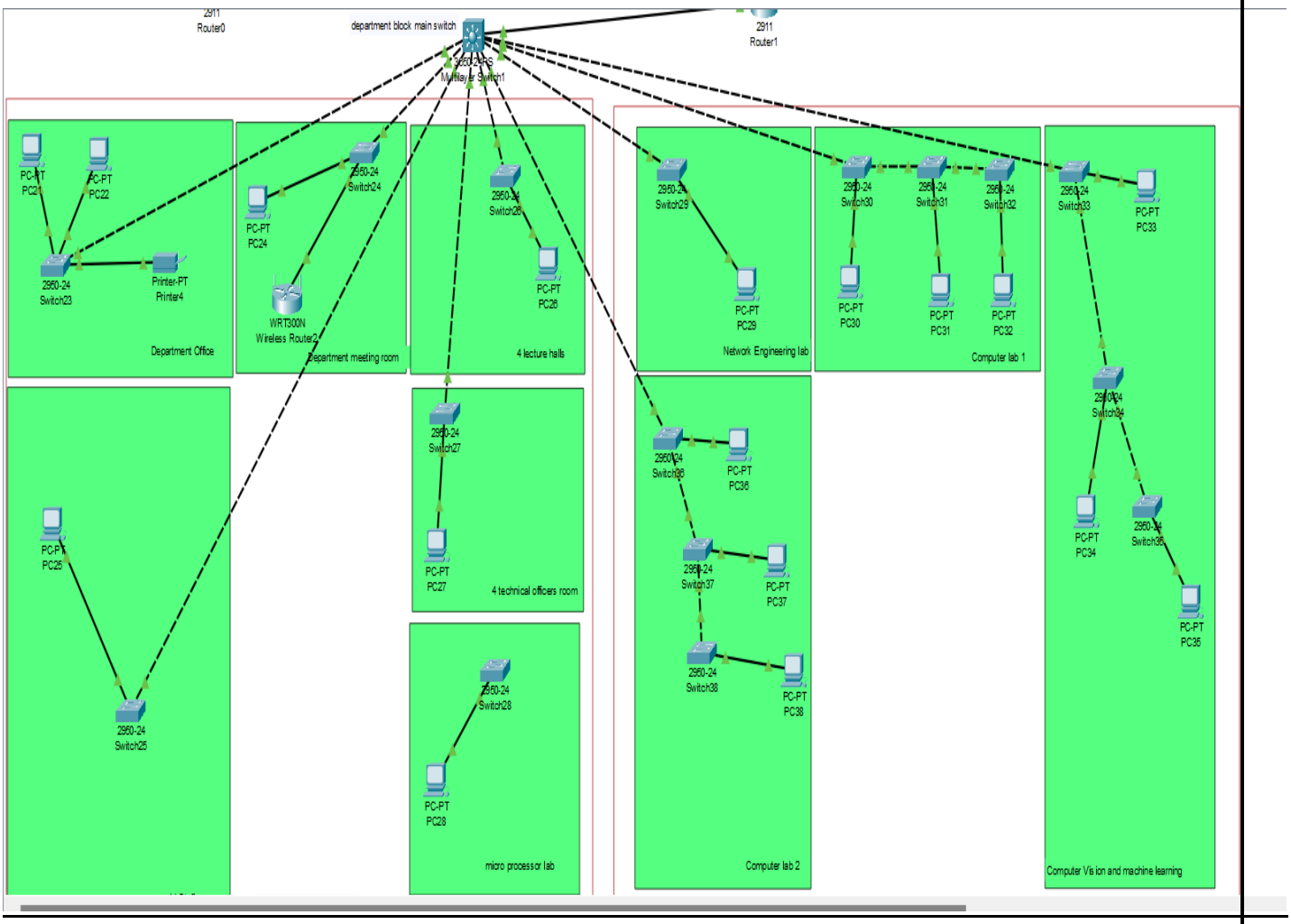
NETWORK DIAGRAM OF IT BLOCK AND DEPARTMENT BUILDING



IT BLOCK


Staff Office
PC-PT PC1
PC-PT PC2
PC-PT PC3
PC-PT PC4
PC-PT PC0
2960-24 Switch4
Lobby area
PC-PT PC9
2960-24 Switch8
PC-PT PC10
Meeting room
WRT300N Wireless Router0
PC-PT PC5
2960-24 Switch5
Network manager room
VLAN 19
PC-PT PC6
2960-24 Switch6
PC-PT PC7
2960-24 Switch7
PC-PT PC8
Director Office
VLAN 18
IT block ground floor
WRT300N Wireless Router1
2960-24 Switch9
IT block main switch
PC-PT PC11
2960-24 Switch10
2960-24 Switch11
Computer lab 1
PC-PT PC12
PC-PT PC13
2960-24 Switch12
PC-PT PC16
2960-24 Switch15
PC-PT PC17
Printer-PT Printer1
2960-24 Switch16
Digital learning centre
Printer-PT Printer2
Printer-PT Printer3
2960-24 Switch21
Printing Room
PC-PT PC18
PC-PT PC19
PC-PT PC20
2960-24 Switch17
2960-24 Switch18
2960-24 Switch19
Computer lab 2
IT block 1st floor

DEPARTMENT BLOCK



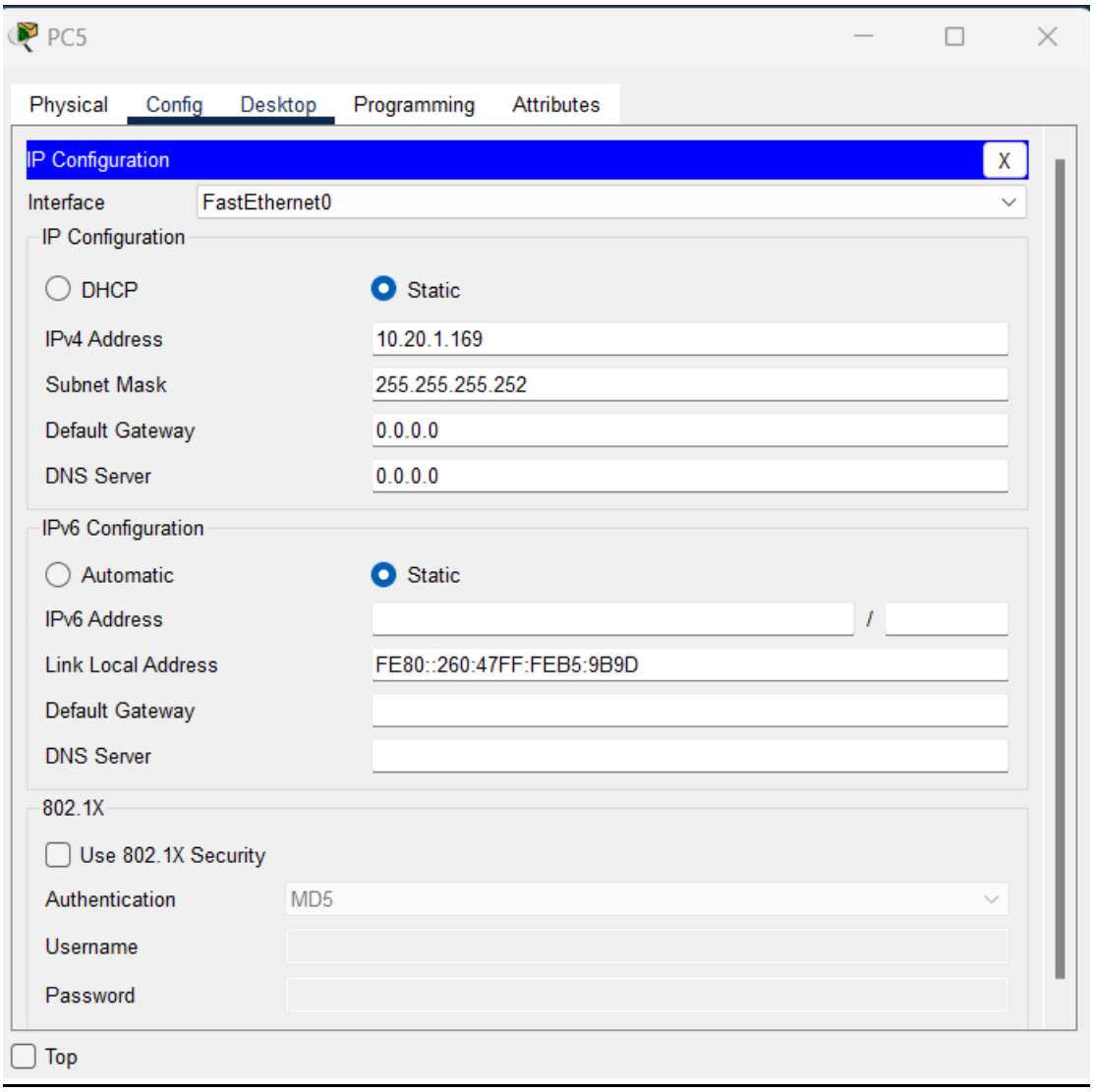
IP ADDRESS ALLOCATED FOR IT BLOCK

VLAN name	VLAN No	Needed size	Subnet generator	IP Address Range	Mask	Subnet Mask
Computer Lab 1	11	60	64	10.20.1.0-10.20.1.63	/26	255.255.255.192
Computer Lab 2	12	60	64	10.20.1.64 - 10.20.1.127	/26	255.255.255.192
Digital Learning and Media Centre	13	31	32	10.20.1.128 - 10.20.1.159	/27	255.255.255.224
Staff Office	14	5	8	10.20.1.160 - 10.20.1.167	/29	255.255.255.248
Meeting Room	15	3	4	10.20.1.168 - 10.20.1.171	/30	255.255.255.252
Director Office	16	2	4	10.20.1.172 - 10.20.1.175	/30	255.255.255.252
2 Technical Officers Room	17	2	4	10.20.1.176 - 10.20.1.179	/30	255.255.255.252
Printing room	18	2	4	10.20.1.180 - 10.20.1.183	/30	255.255.255.252
Network Manager Room	19	1	2	10.20.1.184 - 10.20.1.185	/31	255.255.255.254
lobby	20	1	2	10.20.1.186-10.20.1.187	/31	255.255.255.254

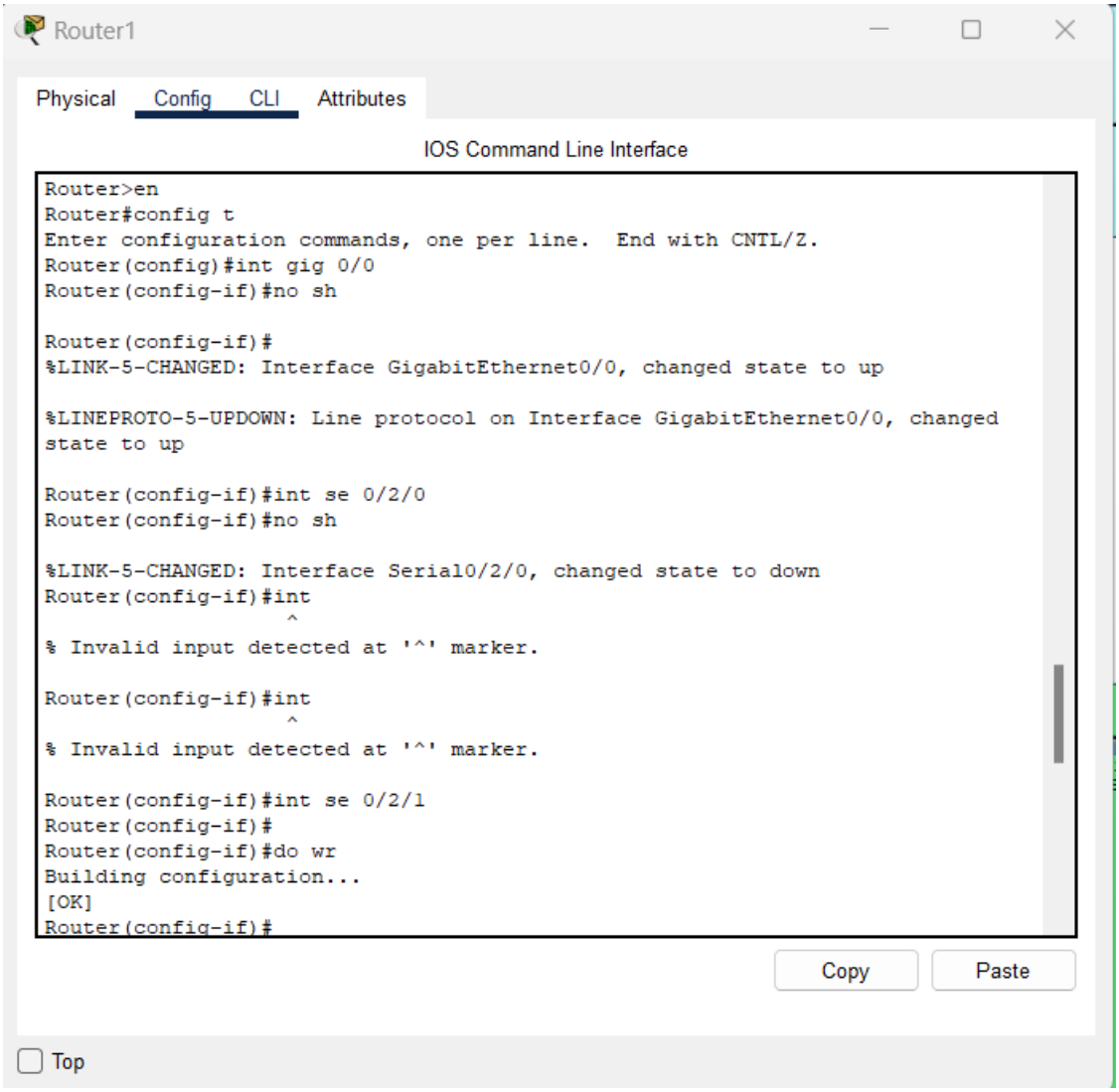
IP ADDRESS ALLOCATED FOR DEPARTMENT BLOCK

VLAN name	VLAN no	Needed size	Subnet Generator	IP Address Range	Mask	Subnet Mask
Computer Lab 1	21	50	64	10.20.2.0 - 10.20.2.63	/26	255.255.255.192
Computer Lab 2	22	50	64	10.20.2.64 - 10.20.2.127	/26	255.255.255.192
Computer Vision and Machine Learning Lab	23	50	64	10.20.2.128 - 10.20.2.191	/26	255.255.255.192
14 staff rooms	24	14	16	10.20.2.192 - 10.20.2.207	/28	255.255.255.240
Microprocessor Lab	25	12	16	10.20.2.208 -10.20.2.223	/28	255.255.255.240
Network Engineering Lab	26	10	16	10.20.2.224 - 10.20.2.239	/28	255.255.255.240
4 lecture halls	27	8	16	10.20.2.240 - 10.20.2.255	/28	255.255.255.248
4 Technical Officers Rooms	28	4	4	10.20.3.0- 10.20.3.3	/29	255.255.255.248
Department Meeting Room	29	3	4	10.20.3.4 - 10.20.3.7	/30	255.255.255.252
Department Office	30	3	2	10.20.3.8-10.20.3.11	/30	255.255.255.252

IP CONFIGURATION OF PC



ROUTER CONFIGURATION



```
Router>en
Router#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#int gig 0/0
Router(config-if)#no sh

Router(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

Router(config-if)#int se 0/2/0
Router(config-if)#no sh

%LINK-5-CHANGED: Interface Serial0/2/0, changed state to down
Router(config-if)#int
                   ^
% Invalid input detected at '^' marker.

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

Router(config-if)#int se 0/2/1
Router(config-if)#
Router(config-if)#do wr
Building configuration...
[OK]
Router(config-if)#
```

Switch configuration

Director office

```
Switch>en
Switch#configure t
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#int range fa0/1-24
Switch(config-if-range)#switchport mode access
Switch(config-if-range)#switchport access vlan 16
% Access VLAN does not exist. Creating vlan 16
Switch(config-if-range)#do wr
%CDP-4-NATIVE_VLAN_MISMATCH: Native VLAN mismatch discovered on
FastEthernet0/3 (16), with Switch FastEthernet0/1 (1).

Building configuration...
[OK]
Switch(config-if-range)#exit
Switch(config)#
Switch(config)#
%CDP-4-NATIVE_VLAN_MISMATCH: Native VLAN mismatch discovered on
FastEthernet0/3 (16), with Switch FastEthernet0/1 (1).
```

Network manager room

```
Switch>en
Switch#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#int range fa0/1-24
Switch(config-if-range)#switchport mode access
Switch(config-if-range)#switchport access vlan 19
% Access VLAN does not exist. Creating vlan 19
Switch(config-if-range)#do wr
Building configuration...
[OK]
Switch(config-if-range)#exit
Switch(config)#
%CDP-4-NATIVE_VLAN_MISMATCH: Native VLAN mismatch discovered on
FastEthernet0/2 (19), with Switch FastEthernet0/3 (1).

Switch(config)#
```

Computers available at staff room can't be accessed from the network Engineering lab, department office, department meeting room, lecture halls, computer labs, Computer Vision and Machine Learning Lab, Microprocessor Lab, Technical Officers Rooms and the IT Centre (for security reason).

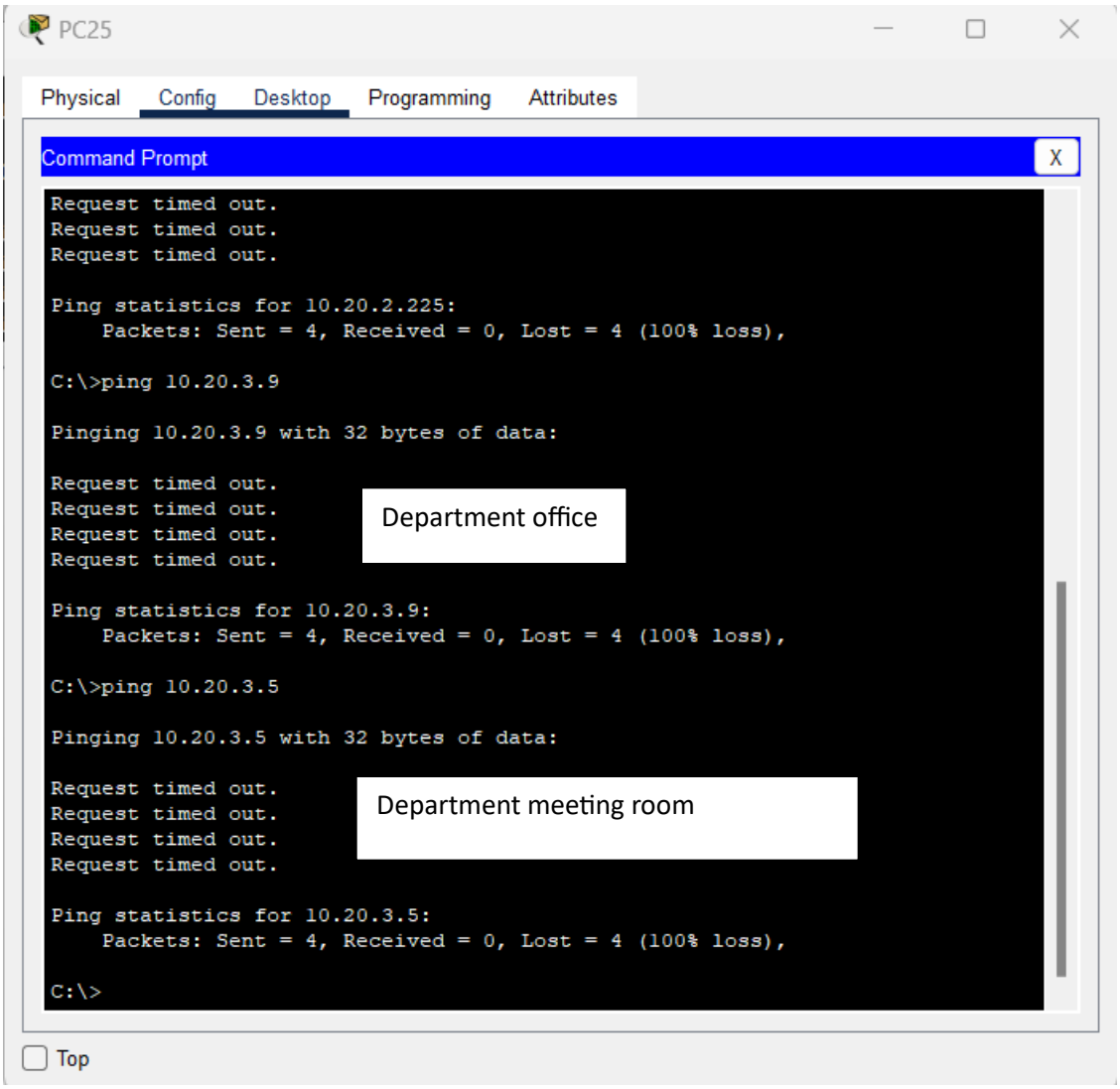
PC25

Physical | Config | Desktop | Programming | Attributes

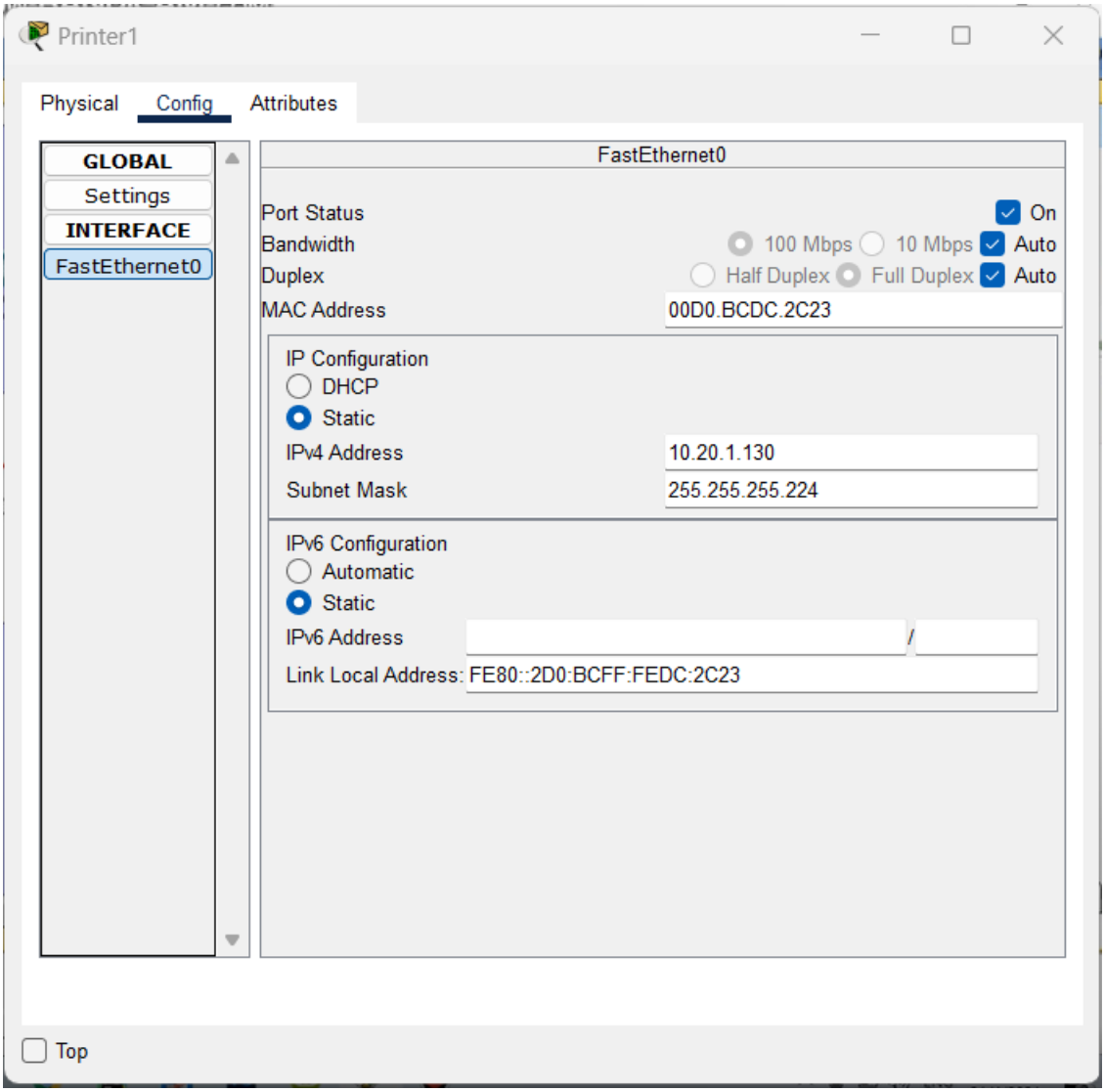
Command Prompt

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ipconfig

FastEthernet0 Connection:(default port)

   Connection-specific DNS Suffix..:
   Link-local IPv6 Address.....: FE80::2E0:B0FF:FE96:8184
   IPv6 Address.....: ::
   IPv4 Address.....: 10.20.1.193
   Subnet Mask.....: 255.255.255.240
   Default Gateway.....: ::
                                 0.0.0.0

Bluetooth Connection:

   Connection-specific DNS Suffix..:
   Link-local IPv6 Address.....: ::
   IPv6 Address.....: ::
   IPv4 Address.....: 0.0.0.0
   Subnet Mask.....: 0.0.0.0
   Default Gateway.....: ::
                                 0.0.0.0

C:\>ping 10.20.2.225

Pinging 10.20.2.225 with 32 bytes of data:

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

Network engineering lab


PC25
Physical
Config
Desktop
Programming
Attributes
Command Prompt
X
Request timed out.
Request timed out.
Request timed out.
Ping statistics for 10.20.2.225:
Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
C:\>ping 10.20.3.9
Pinging 10.20.3.9 with 32 bytes of data:
Request timed out.
Request timed out.
Request timed out.
Request timed out.
Department office
Ping statistics for 10.20.3.9:
Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
C:\>ping 10.20.3.5
Pinging 10.20.3.5 with 32 bytes of data:
Request timed out.
Request timed out.
Request timed out.
Request timed out.
Department meeting room
Ping statistics for 10.20.3.5:
Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
C:\>
Top

IP CONFIGURATION OF PRINTER



Above figure shows a printer IP address which is connected in IT BLOCK. This printer can access only for IT center staffs. can not access department staffs .So the below figures show this requirement.

restrict access of printers by non-staffs

```
Switch#en
Switch#config terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#ip access-list extended printer
Switch(config-ext-nacl)#permit ip host 10.20.1.0 host 10.20.1.181
Switch(config-ext-nacl)#permit ip host 10.20.1.0 host 10.20.1.182
Switch(config-ext-nacl)#permit ip host 10.20.1.1 host 10.20.1.183
Switch(config-ext-nacl)#deny ip host 10.20.1.1 host 10.20.0.0
Switch(config-ext-nacl)#deny ip host 10.20.1.0 host 10.20.0.192
Switch(config-ext-nacl)#deny ip host 10.20.1.0 host 10.20.0.32
Switch(config-ext-nacl)#deny ip host 10.20.1.0 host 10.20.0.80
Switch(config-ext-nacl)#deny ip host 10.20.1.0 host 10.20.0.96
Switch(config-ext-nacl)#permit ip any any
Switch(config-ext-nacl)#
```

Copy Paste

Top

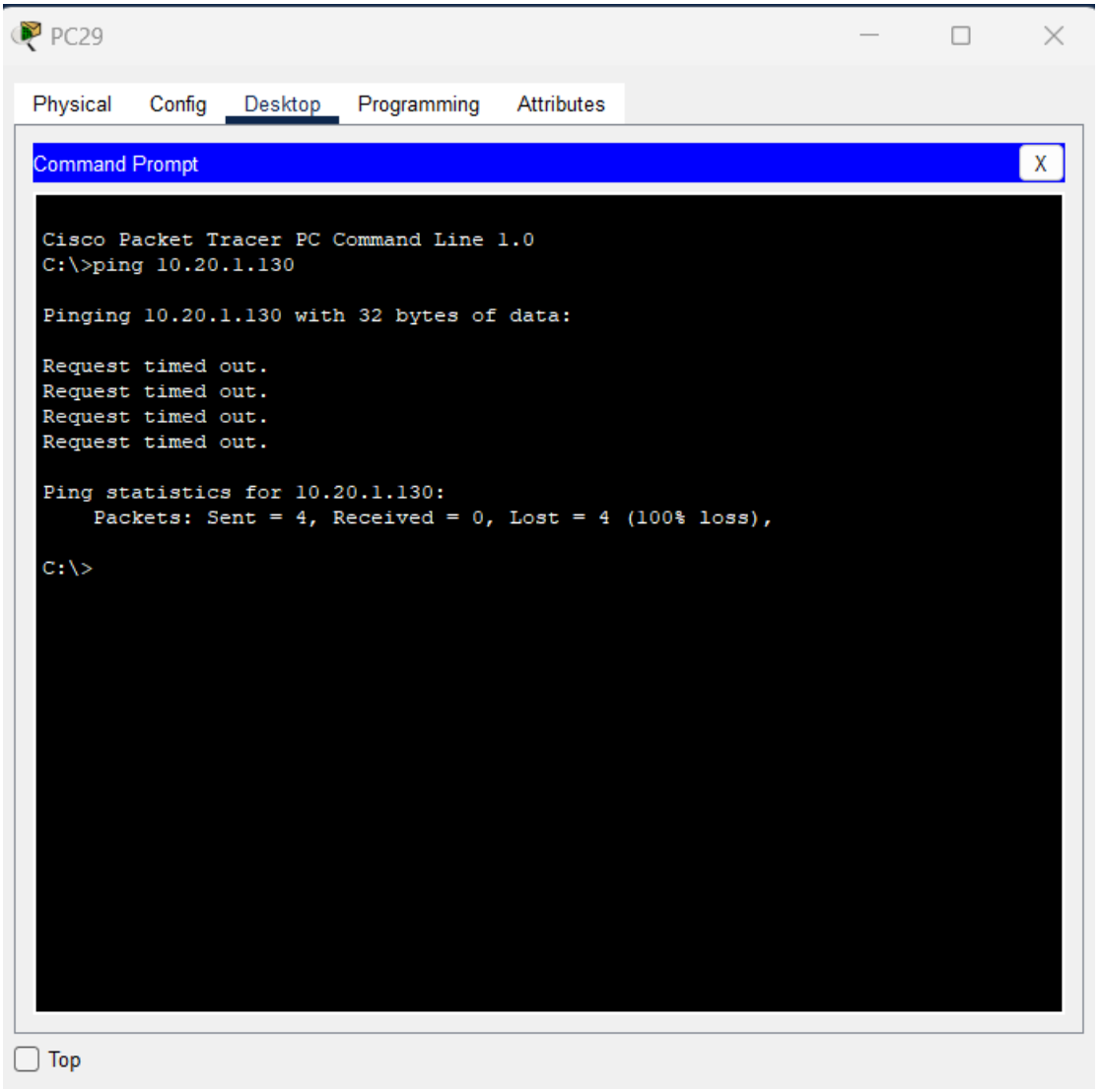
PC17

Physical Config Desktop Programming Attributes

Command Prompt X

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 10.20.1.130

Pinging 10.20.1.130 with 32 bytes of data:

Reply from 10.20.1.130: bytes=32 time<1ms TTL=128
Reply from 10.20.1.130: bytes=32 time<1ms TTL=128
Reply from 10.20.1.130: bytes=32 time<1ms TTL=128
Reply from 10.20.1.130: bytes=32 time<1ms TTL=128

Ping statistics for 10.20.1.130:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>
```

Top


PC29
Physical
Config
Desktop
Programming
Attributes
Command Prompt
X
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 10.20.1.130
Pinging 10.20.1.130 with 32 bytes of data:
Request timed out.
Request timed out.
Request timed out.
Request timed out.
Ping statistics for 10.20.1.130:
Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
C:\>
Top

REFLECTION

Switches, routers, and wireless access points are the essential networking basics. Through them, devices connected to your network can communicate with one another and with other networks, like the Internet. Switches, routers, and wireless access points perform very different functions in a network.

Switches

Switches are the foundation of most business networks. A switch acts as a controller, connecting computers, printers, and servers to a network in a building or a campus. Switches allow devices on your network to communicate with each other, as well as with other networks, creating a network of shared resources. Through information sharing and resource allocation, switches save money and increase productivity.

Routers

Routers connect multiple networks together. They also connect computers on those networks to the Internet. Routers enable all networked computers to share a single Internet connection, which saves money. A router acts a dispatcher. It analyses data being sent across a network, chooses the best route for data to travel, and sends it on its way. Routers connect your business to the world, protect information from security threats, and can even decide which computers receive priority over others. Beyond those basic networking functions, routers come with additional features to make networking easier or more secure. Depending on your security needs, for example, you can choose a router with a firewall, a virtual private network (VPN), or an Internet Protocol (IP) communications system.

WiFi Routers

Here we used wifi router to give wifi access in reading rooms etc. But We could use access point also. A wireless access point (AP) allows wireless devices to connect to the wireless network. Having a Cisco wireless network makes it easy to bring new devices online and provides flexible support to mobile workers. What a wireless access point does for your network is similar to what an amplifier does for your home stereo. An access point takes the bandwidth coming from a router and stretches it so that many devices can go on the network from farther distances away. But a wireless access point does more than simply extend Wi-Fi. It can also give useful data about the devices on the network, provide proactive security, and serve many other practical purposes. In conclusion, a network is two or more computers connected together using a telecommunication system for the purpose of communicating and sharing resources. Without having a network, Companies would not be able to share resources and increase productivity more effectively