(NPI000167),(NPI000168), (NPI000170),(NPI)))172), networking assignment

by Safal Acharya

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Assignment Group Members

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- ***Sajag Shrestha (NPI000172)***
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Abstract:

Seagate.co a computer storage device manufacturing company has planned to open up a new branch out in Cyberjaya and restructure the existing infrastructure in Penang. The new infrastructure will comprise of a new building in Cyberjaya and remodeling of the first building in Penang with two floors each. Our team is assigned for overall network designing inside the office premises. Each and every floor is made for appropriate network design for the new infrastructure.

The Configuration of a proper, working reliable network consisting of essential equipment for the staff working at the company is the objective of this project. All the logical networking diagram is done via *Cisco Packet Tracer* software.

Acknowledgement:

We would like to thank each and every one who assisted us for this assignment. Our team would also love to express our sincere gratefulness to our subject teacher, Mr. Yuvraj Sharma. His incredible support and daily motivation helped us a lot throughout the completion of this assignment. Likewise, we'd also like to commend each and every one of our group members for actively participating and cooperating during the assignment.

Floor Design:

Head Office (Seagate.co) Penang, Malaysia

We have dsigned all the floors using Microsoft visio.

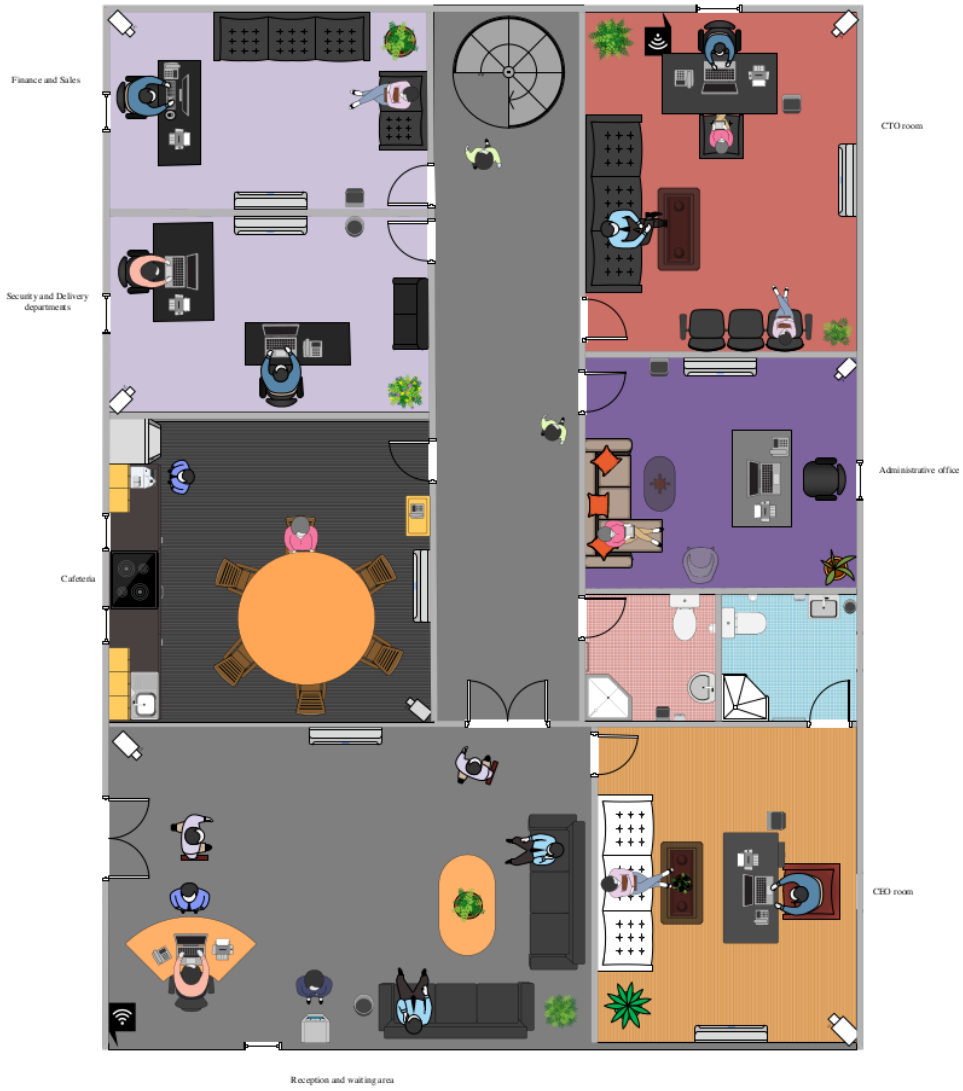


fig 1.0: ground floor head office (Seagate.co)

It is the ground floor of the head office of the company. It is located in Penang, Malaysia. It consists of reception area, waiting room, Cafeteria, Security and Delivery room, CEO room, CTO room, Finance and sales room, administrative office. Each room with the corridor area are continuously monitored with the help of high-quality CCTV. The main entrance of the building is joined with the waiting

room where receptionist is present to assist the visitors. Receptionist use a single PC to keep record of the visitors. A and line phone is connected on the receptionist table. Waiting room has pleasant sitting arrangement with Wi-Fi access point and water dispenser. For security reasons it is under continuous surveillance with high-quality CCTV. Long corridor instantly runs through the centre of the floor which joins all other rooms on the floor and ends with the upstairs at the end.

Cafeteria is along with the waiting room which is in easy access to all the staffs and the visitors too. A common rest room is at the side of corridor where it starts.

CEO room is at the side of waiting room with attached restroom. There is a PC, landline phone and a printer.

Chief technical officers (CTO) room and Finance and Sales room are at the middle way of the corridor. There are two PC and a landline in the finance room where as CTO room has one PC and landline.

Administrative room and security and delivery room are at the end of the ground floor on either side of the corridor. Each room consist of a PC and landline.

fig 2.1: first floor

First floor consists of seven rooms with two conference room, a Server room, a research and design room, Manufacturing room, a technical assistant room and a staff rest area. A long corridor in between the floor joins them and ends with two male and female rest rooms at the corner. The main conference room consist of router for good network strength and a display projector. Each room are secured with high quality surveillance camera. No staff has to worry about their belongings inside the office premises. CCTV are also most for the safety of office assets and

equipment. Server room consist of 10 servers. The floor consists of two routers and Wi-Fi access points. Main conference room is used for general meeting between all the staffs or with costumers and staffs while other conference room is used for small meetings conducted within departments.

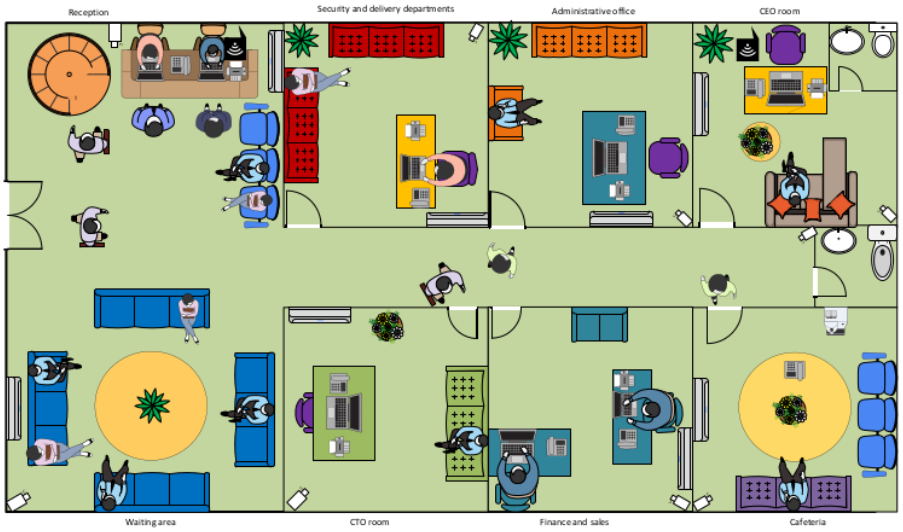


fig 2: Ground floor (Branch office Cyberjaya)

Seagate.co branch office in Cyberjaya has two floors with multiple rooms. Main entrance of the ground floor opens to reception and waiting room with staircase which leads to first floor of the building. All the rooms along with the corridors and waiting room are under surveillance of CCTV. It ensures the security of staffs, visitors, their belongings and office assets. All the offices are well furnished and designed for staff's comfort. Sitting arrangements for costumers and visitors are also specially considered for their best comfort. Costumers are not let bored waiting for their turn. Strong Wi-Fi access point in waiting room allows customers to be engaged. Delivery department is on the ground floor and near to the waiting room so that costumer can have quick access. Rest room at the end of corridor is easily visible and accessible for everyone.

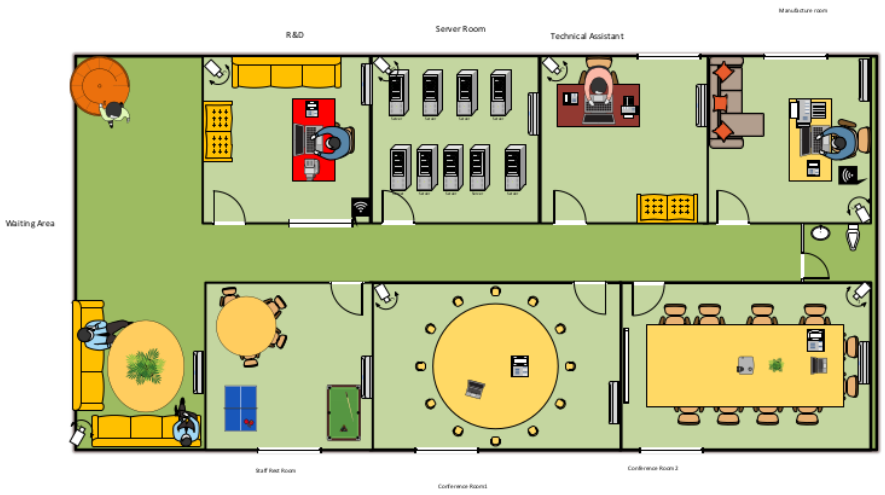


fig 2.1:First floor(Branch office (cyberjaya)

First floor of Branch Office (Cyberjaya) has small waiting room with a table two sofa with air conditioner. The floor comprises two conference room, a high dedicated server room, in the middle. Manufacturing room is at the end of the floor. Staff rest room with a snooker board and table tennis board refreshes and reenergizes the office staffs. Three switch are used in this floor and end devices are joined with star topology. Each room are monitored with high quality CCTV.

Topology:

We have used star topology inside the building permises.

Star Topology:

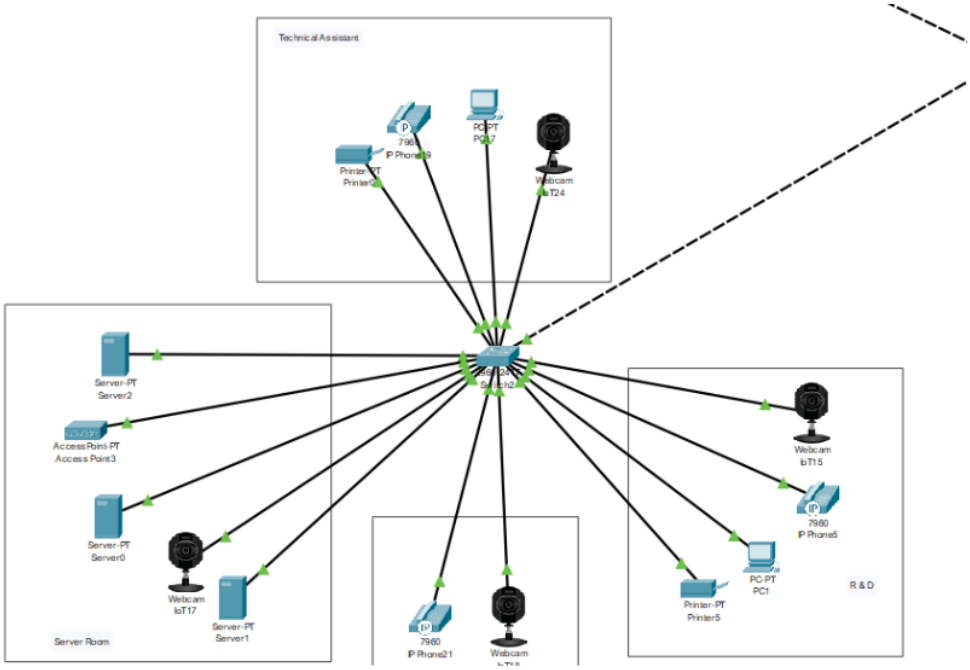


fig 3 :showing network using star topology

Star topology is one of the generally usd topology in networking. Here all the end devices ie Laptops pcs smartphones printer etc are connected to the common networking device switch with the cable which provides internet to all the devices. One of the main advantage of using star topology over other is simplicity in its management and maintainance. Since each end device has separate connection so failures affects a single device and is easy to detect and maintain. Here failure of connection in one device doesn't affect entire connection. Thus it has higher reliability compared other topologies in long run. Here no device has direct connection, instead a central networking device is used to connect them. The topology is designed in the form of star which includes one routers and 7 switches in each building.

IP Addressing and Subnetting Plan:

Head Office, Penang Ground Floor:

Switch 4:

Reception and Waiting room

Device Name	IP Address	Subnet mask	Default Gateway
IP phone 2	192.168.2.12	255.255.255.0	192.168.2.1
PC 12	192.168.2.13	255.255.255.0	192.168.2.1
Printer 11	192.168.2.26	255.255.255.0	192.168.2.1
IOT 7 (CCTV)	192.168.2.25	255.255.255.0	192.168.2.1

1

CEO room

Device Name	IP Address	Subnet mask	Default Gateway
Printer 8	192.168.2.28	255.255.255.0	192.168.2.1
PC 9	192.168.2.10	255.255.255.0	192.168.2.1
IP phone 9	192.168.2.23	255.255.255.0	192.168.2.1
IOT 3(CCTV)	192.168.2.2	255.255.255.0	192.168.2.1

Administration Room:

Device Name	IP Address	Subnet mask	Default Gate way
PC 10	192.168.2.21	255.255.255.0	192.168.2.1
Printer 2	192.168.2.24	255.255.255.0	192.168.2.1
IP phone 8	192.168.2.22	255.255.255.0	192.168.2.1
IOT12 (CCTV)	192.168.2.27	255.255.255.0	192.168.2.1

Cafeteria:

Device Name	IP Address	Subnet mask	Default Gate way
IP phone 10	192.168.2.11	255.255.255.0	192.168.2.1
IOT (CCTV)	192.168.2.29	255.255.255.0	192.168.2.1

Switch 3:

Finance and Sales:

Device Name	IP Address	Subnet mask	Default Gate way
PC 11	192.168.2.51	255.255.255.0	192.168.2.1
Printer 10	192.168.2.33	255.255.255.0	192.168.2.1
IP phone 12	192.168.2.7	255.255.255.0	192.168.2.1
IOT16 (CCTV)	192.168.2.32	255.255.255.0	192.168.2.1

CTO Office:

Device Name	IP Address	Subnet mask	Default Gate way
PC 13	192.168.2.50	255.255.255.0	192.168.2.1
Printer 9	192.168.2.30	255.255.255.0	192.168.2.1
IP phone 11	192.168.2.6	255.255.255.0	192.168.2.1
IOT14 (CCTV)	192.168.2.31	255.255.255.0	192.168.2.1

Security and Delivery Department:

Device Name	IP Address	Subnet mask	Default Gate way
PC 14	192.168.2.4	255.255.255.0	192.168.2.1
Printer 22	192.168.2.34	255.255.255.0	192.168.2.1
IP phone 1	192.168.2.5	255.255.255.0	192.168.2.1
IOT13 (CCTV)	192.168.2.33	255.255.255.0	192.168.2.1
PC 15	192.168.2.3	255.255.255.0	192.168.2.1

Networking and Host Devices:

Router

fig 4:Router

A router is a networking device that joins number of switches connected to several end devices to form a larger network. These switches can be inside a small area or may be apart in distant location. It works on network layer of the OSI model. It manages incoming and outgoing of data. It provides access to the internet for multiple devices within its network. It searches for the shortest and best possible route for data packets to move to the destinated Ip address. It stores Ip address in the routing table.

Technical Specification:

Manufacturer	Cisco Systems, Inc
Manufacturer Part Number	CISCO2811
Product Type	Cisco 2811 Router
Form Factor	External – modular – 1U
Dimensions (WxDxH)	43.8 cm x 41.7cm x 4.5cm
Weight	6.4 kg
DRAM Memory	512MB (installed) / 768 MB (max) – DDR SDRAM
Flash Memory	128 MB (installed) / 256 MB (max)
Data Link Protocol	Ethernet, Fast Ethernet
Network / Transport Protocol	IPSec
Remote Management Protocol	SNMP 3
Features	Cisco IOS IP Base, modular design, firewall protection, hardware encryption, VPN support, MPLS support, wall mountable, Quality of Service
Complaint Standards	IEEE 802.3af, IEEE 802.1x
Power	AC 120/230 V (50/60 Hz)

Switch

fig 5:Switch

The main and primary function of the switch is to connect end devices such as laptops, printers, desktops etc. in the network. It works on data link layer of the OSI model. It stores MAC address in the look up table which helps to know the source and the destination address. It is used in LAN.

Technical Specification:

Product Code	Cisco Catalyst 2960 24 PoE
Forwarding Bandwidth	16 Gbps
Switching Bandwidth	32 Gbps
Flash Memory	32 MB
DRAM	Memory: 64 MB
VLANs	Max: 255
VLAN IDs	4000
Maximum Transmission Unit	Up to 9000 bytes
Jumbo Frames	9018 bytes
Ports	24 Ethernet 10/100 ports
Uplinks	2 Dual-Purpose (10/100/1000 or SFP)
PoE	Available PoE Power: 370 W Maximum Number of PoE (IEEE 802.3af) Ports: 24 ports up to 15.4 W
Dimensions	1.73 x 17.7 x 13" (4.4 x 45 x 33.2 cm)
Weight	12 lb (5.4 kg)

Personal Computer (PC)

fig 6:PC

A personal computer is a digital computer intended to be used by one and only one person at a time. It is a multi-purpose microcomputer which has the size, capabilities, and price in a way which makes it feasible for individual/personal use.

Technical Specification:

Brand	Dell
Generation	Intel 12th Generation
Hard Drive	1 TB
RAM	12 GB
Model	I3950-5924BLU-PUS
Operating System	Windows OS
Processor	Intel Core i5
SSD	256 GB
Wireless Networking	WI-Fi 6
Graphic Card	Intel UHD

Closed-Circuit Television (CCTV)

fig 7Webcam

Closed-Circuit television (CCTV) is a TV system where signals aren't publicly circulated but are instead monitored, mainly for surveillances and security purposes to prevent theft, robbery and shoplifting, etc. CCTV should be strategically placed. The areas where it has maximum area coverage can be suitable for some location whereas it is intensely focused on areas having

higher sensitivity or area prone to criminal activities . Because of such technology the surveillance has seen significant growth preventing host of crimes throughout the world.

Technical Specification:

Manufacturer	Hikvision
Model code	DS-2CE16FIT-IT1
Night Vision	Yes
Resolution TVL	3 MP
Digital (DSP)	Yes
Sensitivity	0.01 lux
Electrical Specification	Voltage: 12 V DC Power Consumption: 5 W

Printer

fig 8:Printer

Printers are most common output device which gives us hard copy output. It is most commonly present in any kind of offices from small to big. Copying of data in mass numbers is possible with printers. The most common and used connection types for printers are via USB cable or Wi-Fi, both wired and wireless respectively.

Technical Specification:

Print Resolution	Up to 4800 x 1200 dpi
Print Technology	2 FINE Cartridges (Black and Color) Inkjet System with 2pl (min.) ink droplet size ChromaLife100 inks
Mono Print Speed	Approx. 9.9 ipm
Color Print Speed	Approx. 5.7 ipm
Photo Print Speed	Borderless 10x15cm : Approx. 44 seconds
Borderless Printing	Yes (A4, Letter, 20x25cm, 13x18cm, 10x15cm)
Two Sided Printing	Auto Duplex Print (A4, Letter)

Telephone

fig 9:telephone

A Telephone is a telecommuting device which is used to converse between two or more users from afar for clear and easy communication. A telephone converts sound i.e., end users voice into electrical signals to be carried out through cables and any other communication channels from one telephone to another to regenerate the sounds for the receiver.

Technical Specification:

Brand	Beetel
Model	M78 Corded Landline Phone
Type	Corded
Keypad	Yes
Memory features	3-One Touch Memory
Security features	Private Talk Feature

Server

fig 10:Server

A server is a system which delivers various data, resources, services, or programs to other clients over a network. Simply they are the computers that facilities the need or quires of other computer or any end devices. For a server to properly function, a device should be configured to take note to the requests from the clients on a network connection.

Technical Description:

Form Factor/Height	2U rack server
Processors	Up to 2 second-generation Intel® Xeon® Platinum processor, up to 205W
Memory	Up to 7.5TB in 24x DIMM slots using 128GB DIMMs and Intel® Optane™ DC Persistent Memory; 2666MHz / 2933MHz TruDDR4
Expansion Slots	Up to 7x PCIe 3.0 via multiple riser options including 1x dedicated PCIe slot for RAID adapter
Drive Bays	Up to 14x 3.5" or up to 24. 2.5" hot-swap bays (up to 12 AnyBay bays or up to 24 NVMe bays); up to 2x M.2 boot drives (RAID 1)
HBA/RAID Support	HW RAID (up to 24 ports) with flash cache; up to 16-port HBAs
Security and Availability Features	TPM 1.2/2.0; PFA; hot-swap/redundant drives, fans, and PSUs; 45°C continuous operation; light path diagnostic LEDs; front-access diagnostics via dedicated USB port
Network Interface	2/4-port 1GbE LOM; 2/4-port 10GbE LOM (Base-T or SFP+); 1x dedicated 1GbE management port
Power (Energy Star 2.0 compliant)	2x hot swap/redundant: 550W/750W/1100W/1600W 80 PLUS Platinum; or 750W 80 PLUS Titanium; or -48V DC 80 PLUS Platinum
Systems Management	XClarity Controller embedded management, XClarity Administrator centralized infrastructure delivery, XClarity Integrator plugins, and XClarity Energy Manager centralized server power management
Operating Systems Supported	Microsoft, Red Hat, SUSE, VMware

Wireless Access Point

fig 11:Access point

Wireless Access Point are simply radio transmitters that represents a node, pretty much like a computer, on a Local Area Network (LAN). It is a device which allows various types of wireless networking cards that connects without any use of cables i.e., wireless, for

connecting to LAN's and accessing resources, including the Internet. Most importantly it takes your Wi-Fi outside from your room. It improves wireless network, its range and speed.

Technical Specifications:

Model	AIR-AP3802P-H-K9C - Cisco Aironet 3802P Access Point
Input power requirements	50W power supply
Description	Dual-band controller-based 802.11a/g/n/ac, configurable
Interface	2 Ethernet ports - 100/1000/2500/5000 Multigigabit Ethernet (RJ-45)
Power draw	30W at the PSE with all features enabled except for the USB 2.0 port 34W at the PSE with the USB 2.0 port enabled
System memory	1024 MB DRAM 256 MB flash
Indicators	Status LED indicates boot loader status, association status, operating status, boot loader warnings, boot loader errors
Permit Antenna Gains	Up to 13 dBi
Dimensions (W x L x H)	8.66 x 8.68 x 2.62 in. (22 x 22 x 6.7 cm)
Weight	4.6 lb (2.09 kg)

Description of the Network configuration

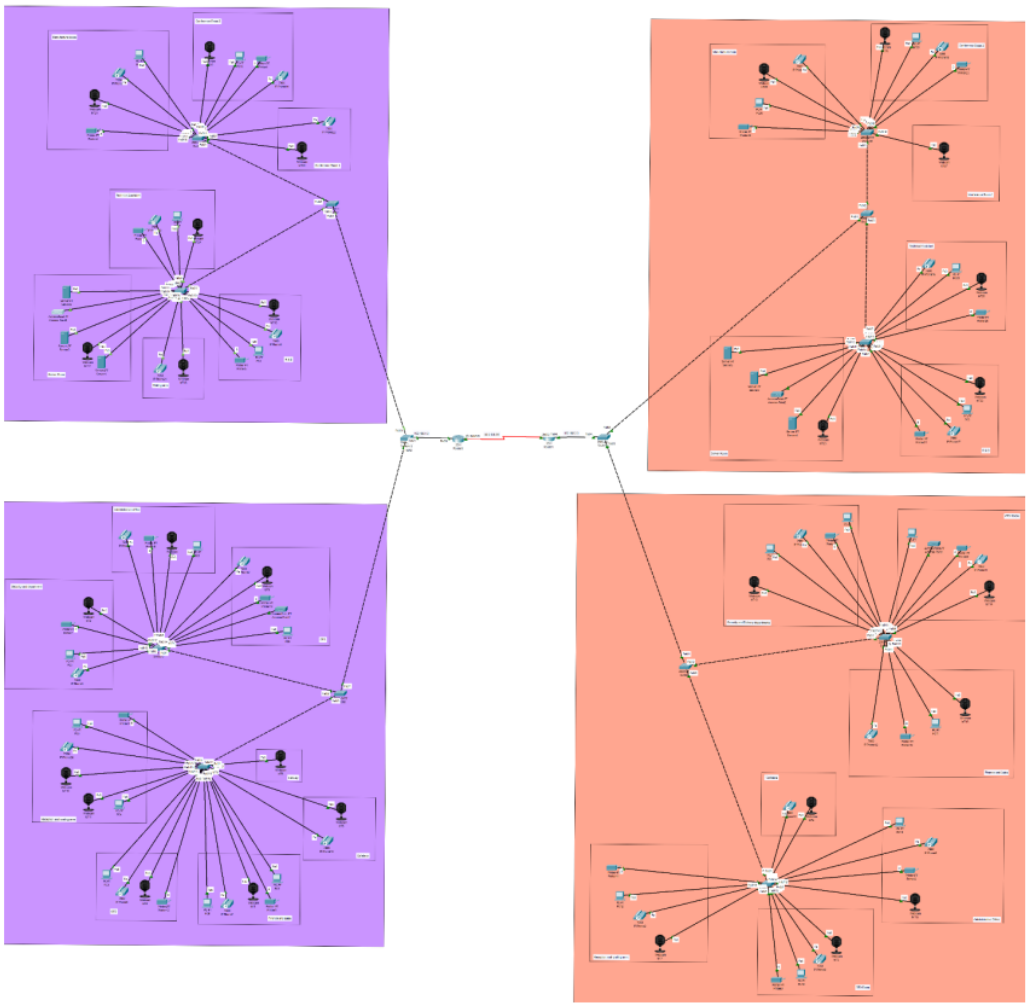


Fig: network diagram

The above network diagram illustrates about the computer telecommunication through the network system. It represents the many different purposes of networks such as to manage the networks between a large field like industries or companies. The network diagram also shows the distribution of the ip address throughout the field which diversely helps in the tracing of telecommunication. The above network diagram is designed with the help of cisco packet tracer and as per the information, the network diagram is labelled with different rooms and

the buildings and floors are labelled with different colours as shown in the figure above. Each building of the company has a single router and each floor has 3 switches. Altogether there are two routers, twelve switches being used.

In the head office building switch four and three are connected to the end devices on the ground floor which connects to switch nine. Switch nine connects to switch twelve which connects to the router present in the building.

Switch four, joins CEO room, administrative office Reception and waiting room and Cafeteria within a network. Whereas switch three, joins security and delivery room, CTO room and finance and sales room within a network.

In the first-floor switch seven joins end devices on service room, research and design room and technical assistance room. Switch six joins end devices on two conference halls and manufacturing room. Similarly, in first floor switch six and seven are connected to the end devices and connects to switch eleven. Switch eleven connects to switch 12 which connects to the only router in the building.

In branch office, Cyberjaya, switch one and zero joins the end devices on ground floor which is connected to switch eight. Switch eight is connected to switch thirteen which joins with the router0.

CEO room, administrative office, and security and delivery room are joined to switch zero. CTO room reception and waiting room with cafeteria and Finance and sales room are joined with switch one.

In the first floor two conferencing room with manufacturing room are joined to switch five. Technical assistant room, waiting area, R&D room, service room are joined to switch two.

Second floor of branch office (Cyberjaya)

The network of the IOT, Servers, Printers and Access points are managed through the static protocols. The networks were manually assigned to the destination from the source.

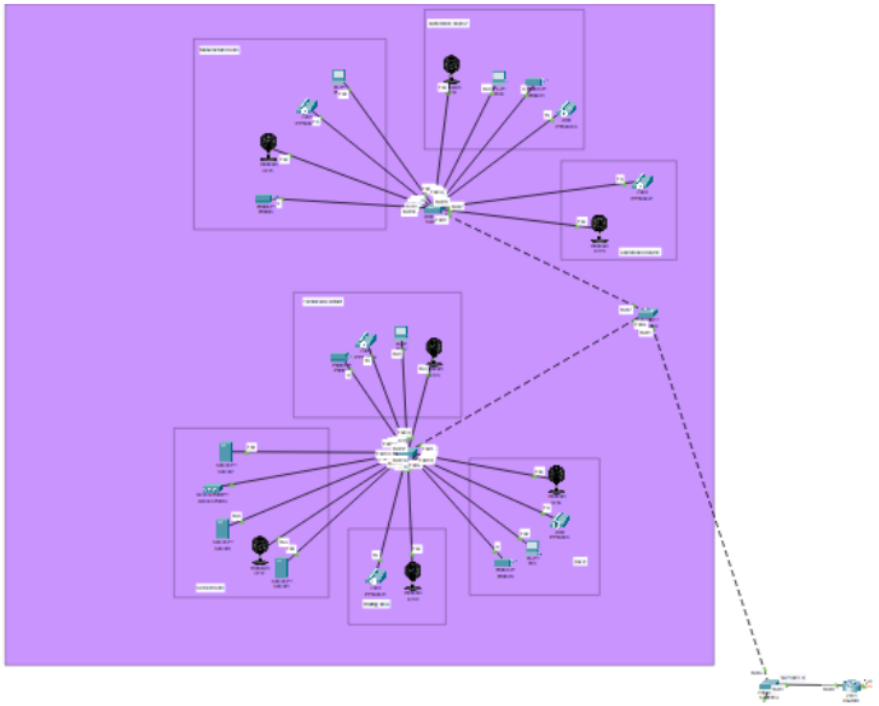


fig 12:second floor

Static IP of webcam (IOT)

Webcam	Static IP address	Subnet mask
IOT 18	192.168.1.88	255.255.255.0
IOT 15	192.168.1.41	255.255.255.0
IOT 24	192.168.1.115	255.255.255.0
IOT 20	192.168.1.110	255.255.255.0
IOT 19	192.168.1.111	255.255.255.0
IOT 21	192.168.1.116	255.255.255.0
IOT 17	192.168.1.59	255.255.255.0

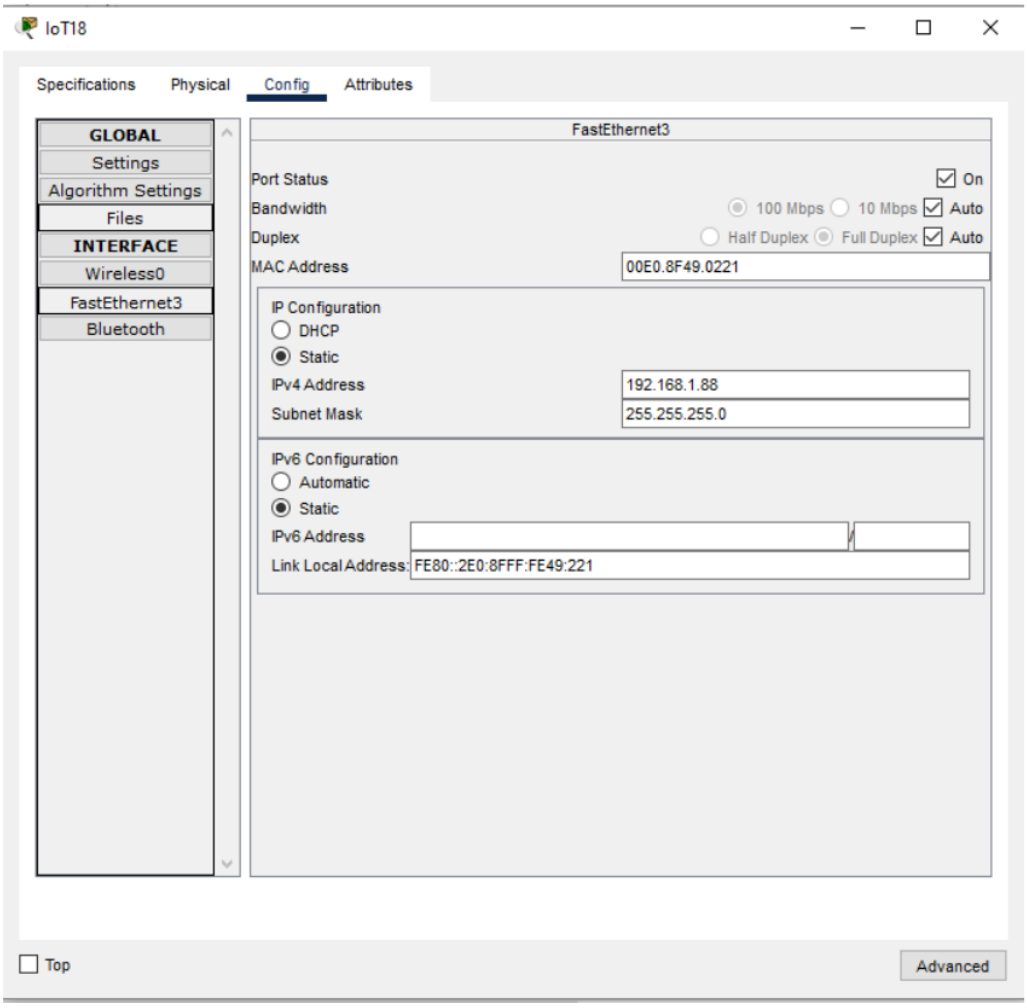

IoT18
Specifications
Physical
Config
Attributes
GLOBAL
Settings
Algorithm Settings
Files
INTERFACE
Wireless0
FastEthernet3
Bluetooth
FastEthernet3
Port Status
On
Bandwidth
100 Mbps
10 Mbps
Auto
Duplex
Half Duplex
Full Duplex
Auto
MAC Address
00E0.8F49.0221
IP Configuration
DHCP
Static
IPv4 Address
192.168.1.88
Subnet Mask
255.255.255.0
IPv6 Configuration
Automatic
Static
IPv6 Address
Link Local Address:
FE80::2E0:8FFF:FE49:221
Top
Advanced

fig 13:IOT18

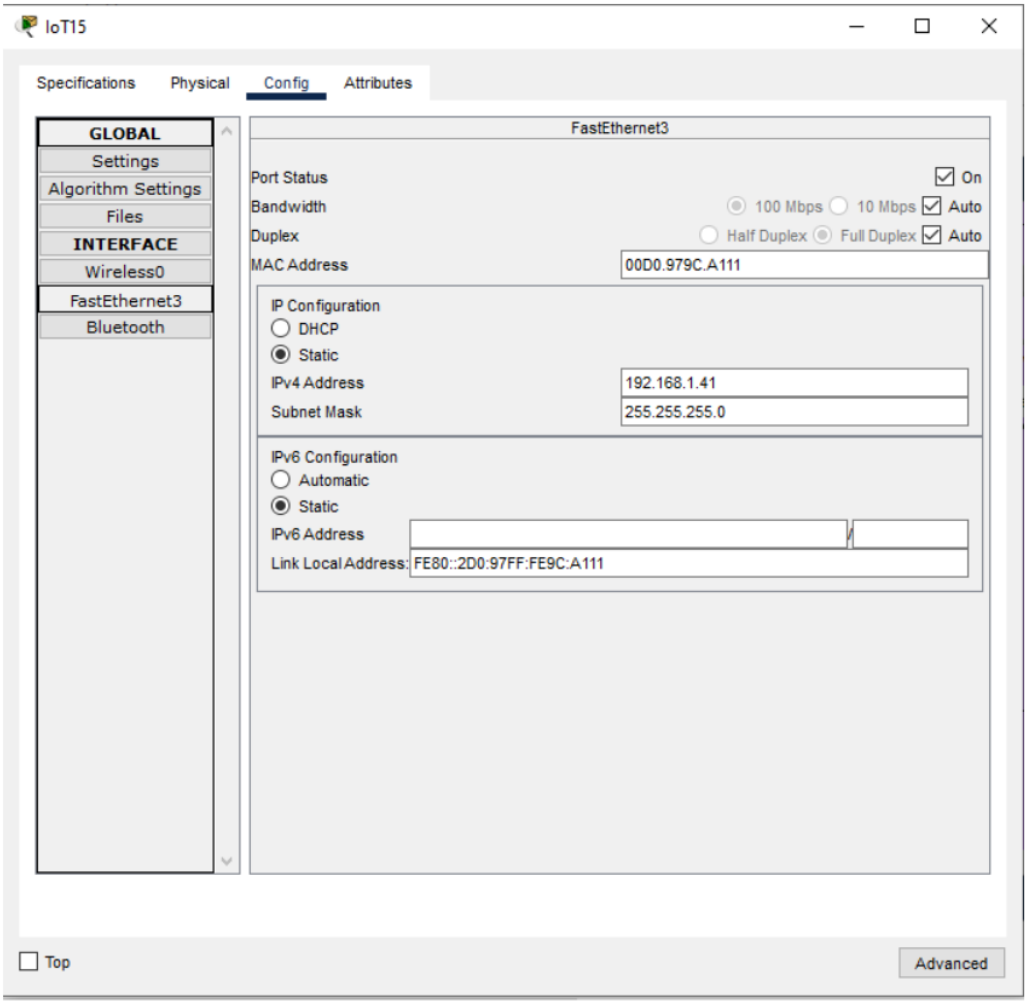

IoT15
Specifications
Physical
Config
Attributes
GLOBAL
Settings
Algorithm Settings
Files
INTERFACE
Wireless0
FastEthernet3
Bluetooth
FastEthernet3
Port Status
On
Bandwidth
100 Mbps
10 Mbps
Auto
Duplex
Half Duplex
Full Duplex
Auto
MAC Address
00D0.979C.A111
IP Configuration
DHCP
Static
IPv4 Address
192.168.1.41
Subnet Mask
255.255.255.0
IPv6 Configuration
Automatic
Static
IPv6 Address
Link Local Address:
FE80::2D0:97FF:FE9C:A111
Top
Advanced

fig 14:IOT15

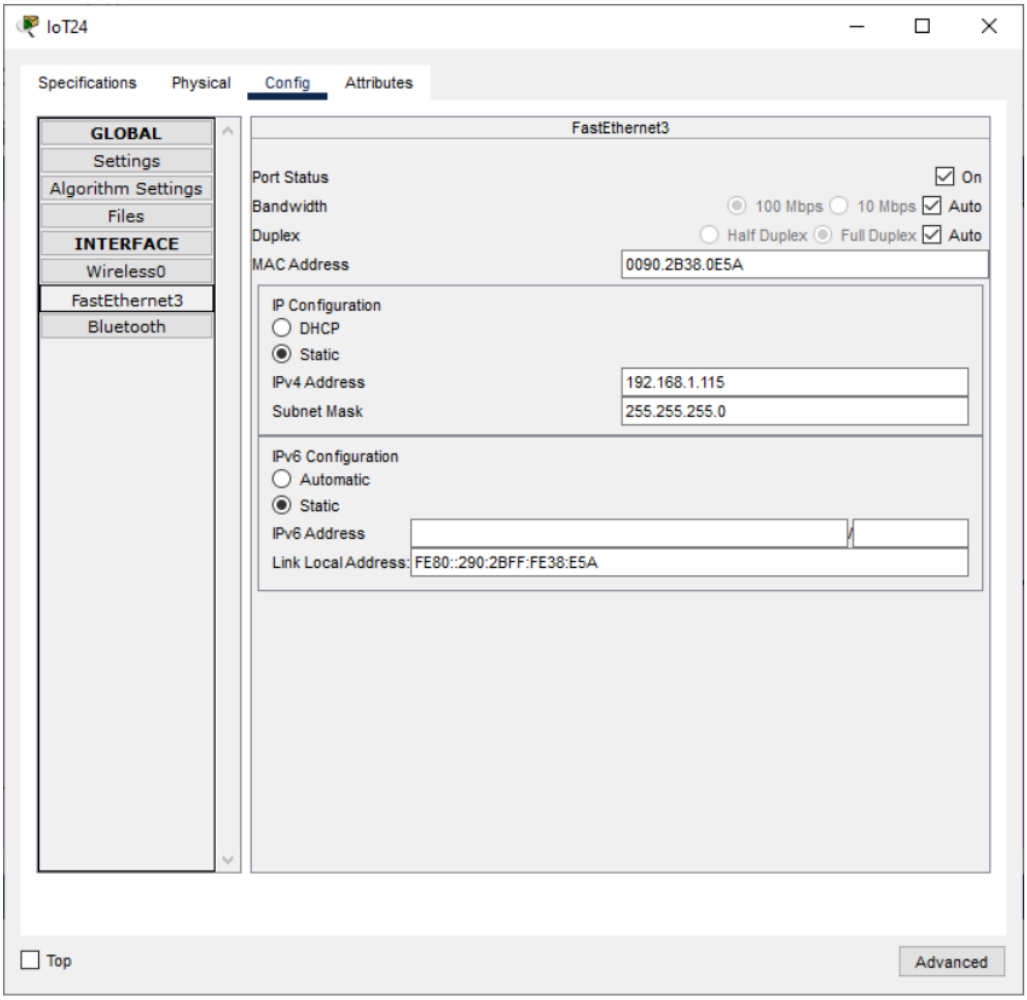
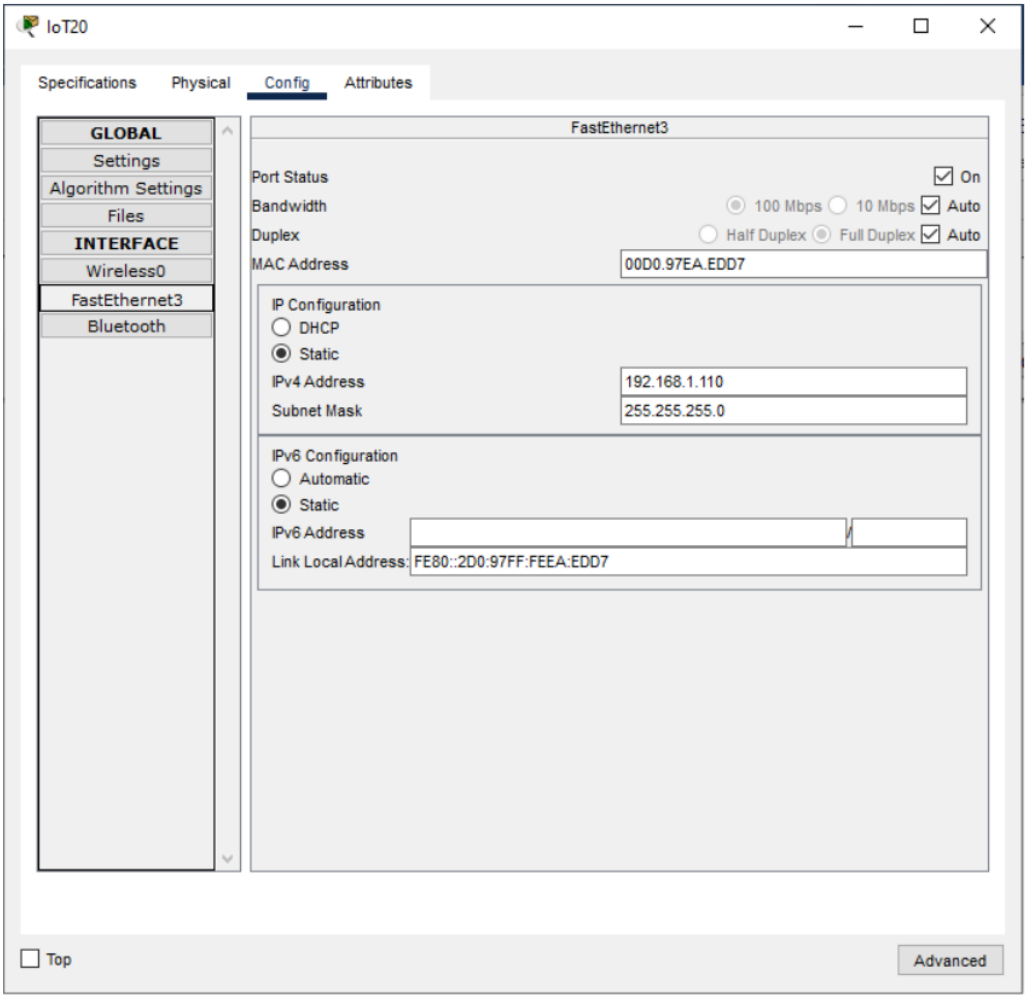

IoT24
Specifications
Physical
Config
Attributes
GLOBAL
Settings
Algorithm Settings
Files
INTERFACE
Wireless0
FastEthernet3
Bluetooth
FastEthernet3
Port Status
On
Bandwidth
100 Mbps
10 Mbps
Auto
Duplex
Half Duplex
Full Duplex
Auto
MAC Address
0090.2B38.0E5A
IP Configuration
DHCP
Static
IPv4 Address
192.168.1.115
Subnet Mask
255.255.255.0
IPv6 Configuration
Automatic
Static
IPv6 Address
Link Local Address:
FE80::290:2BFF:FE38:E5A
Top
Advanced

fig 15:IOT24


IoT20
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Settings
Algorithm Settings
Files
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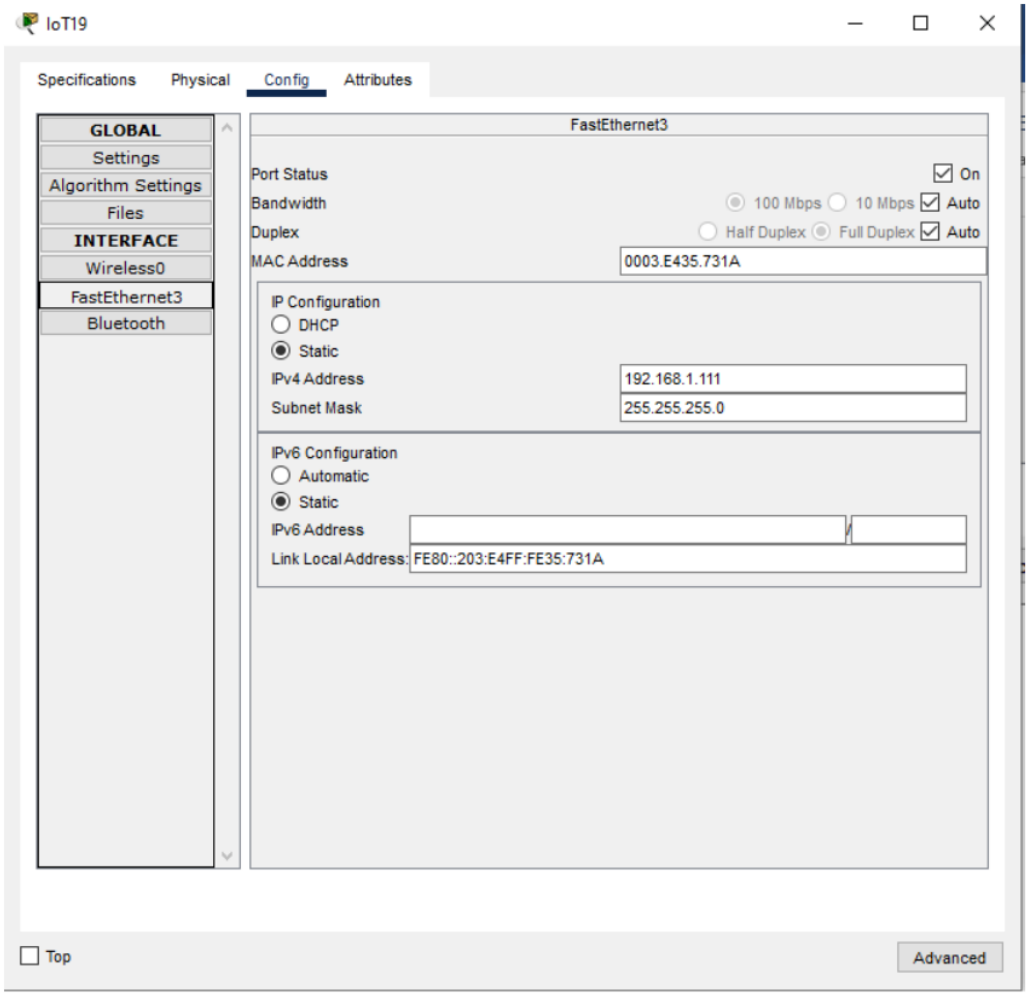
Bluetooth
FastEthernet3
Port Status
On
Bandwidth
100 Mbps
10 Mbps
Auto
Duplex
Half Duplex
Full Duplex
Auto
MAC Address
00D0.97EA.EDD7
IP Configuration
DHCP
Static
IPv4 Address
192.168.1.110
Subnet Mask
255.255.255.0
IPv6 Configuration
Automatic
Static
IPv6 Address
Link Local Address:
FE80::2D0:97FF:FEEA:EDD7
Top
Advanced

fig 16:IOT20


IoT19
Specifications
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Config
Attributes
GLOBAL
Settings
Algorithm Settings
Files
INTERFACE
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Bluetooth
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Port Status
On
Bandwidth
100 Mbps
10 Mbps
Auto
Duplex
Half Duplex
Full Duplex
Auto
MAC Address
0003.E435.731A
IP Configuration
DHCP
Static
IPv4 Address
192.168.1.111
Subnet Mask
255.255.255.0
IPv6 Configuration
Automatic
Static
IPv6 Address
Link Local Address:
FE80::203:E4FF:FE35:731A
Top
Advanced

fig 17:IOT19

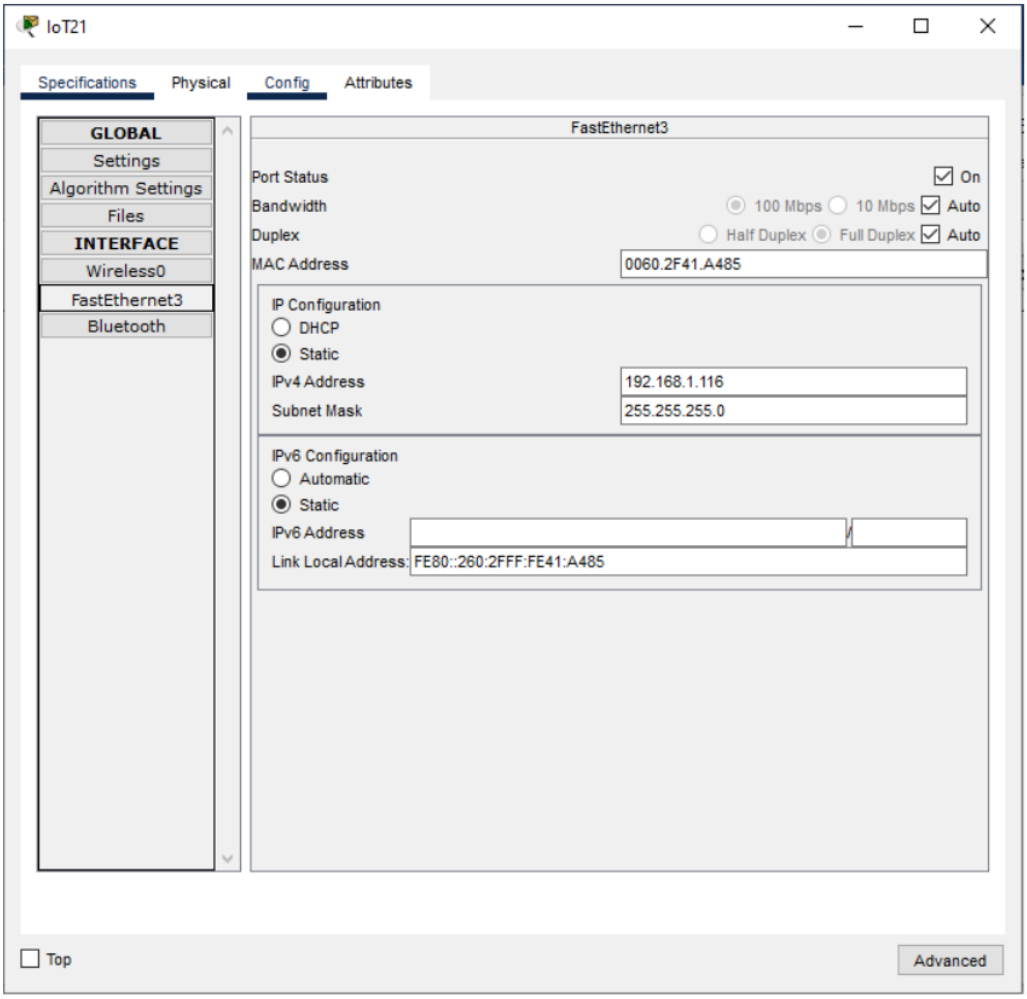

IoT21
Specifications
Physical
Config
Attributes
GLOBAL
Settings
Algorithm Settings
Files
INTERFACE
Wireless0
FastEthernet3
Bluetooth
FastEthernet3
Port Status
On
Bandwidth
100 Mbps
10 Mbps
Auto
Duplex
Half Duplex
Full Duplex
Auto
MAC Address
0060.2F41.A485
IP Configuration
DHCP
Static
IPv4 Address
192.168.1.116
Subnet Mask
255.255.255.0
IPv6 Configuration
Automatic
Static
IPv6 Address
Link Local Address:
FE80::260:2FFF:FE41:A485
Top
Advanced

fig 18:IOT21

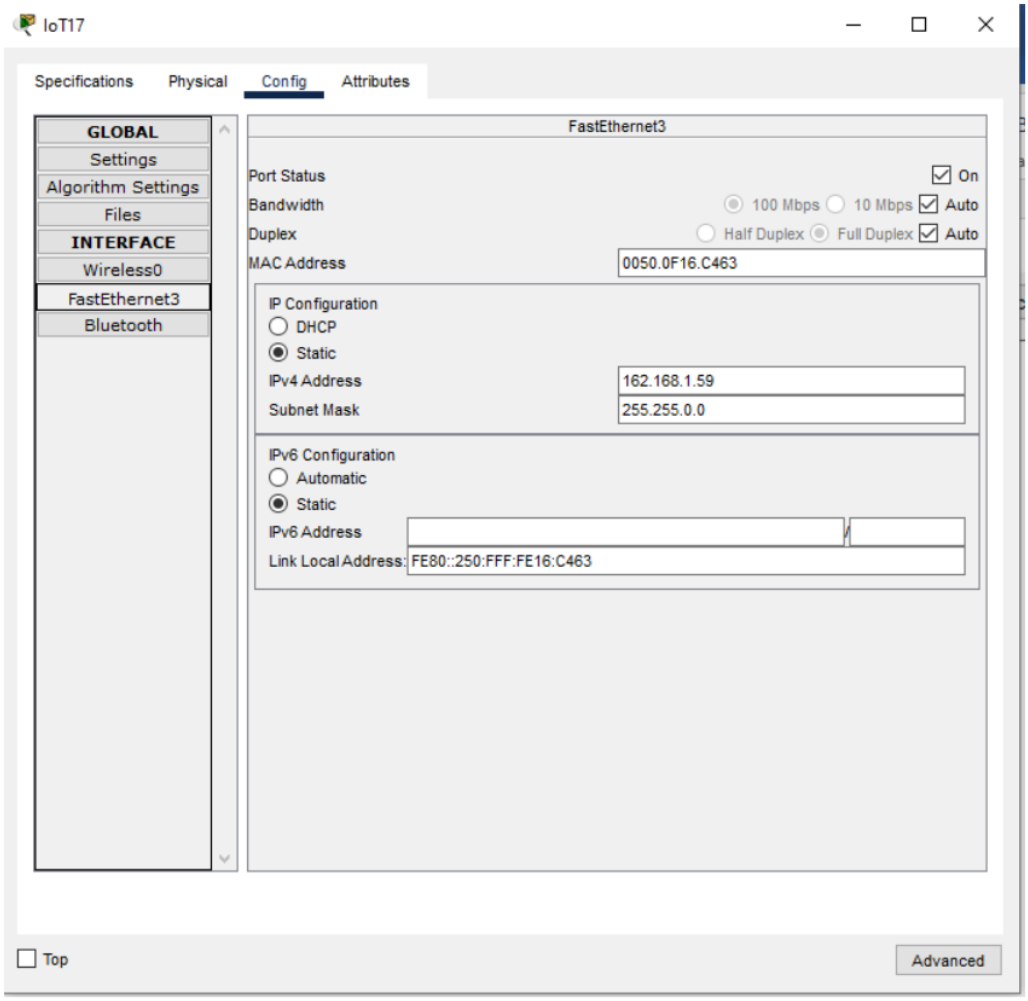


fig 19:IOT17

Static IP of Servers

Servers	Static IP	Subnet mask
Server 0	192.168.1.118	255.255.255.0
Server 1	192.168.1.119	255.255.255.0
Server 2	192.168.1.117	255.255.255.0

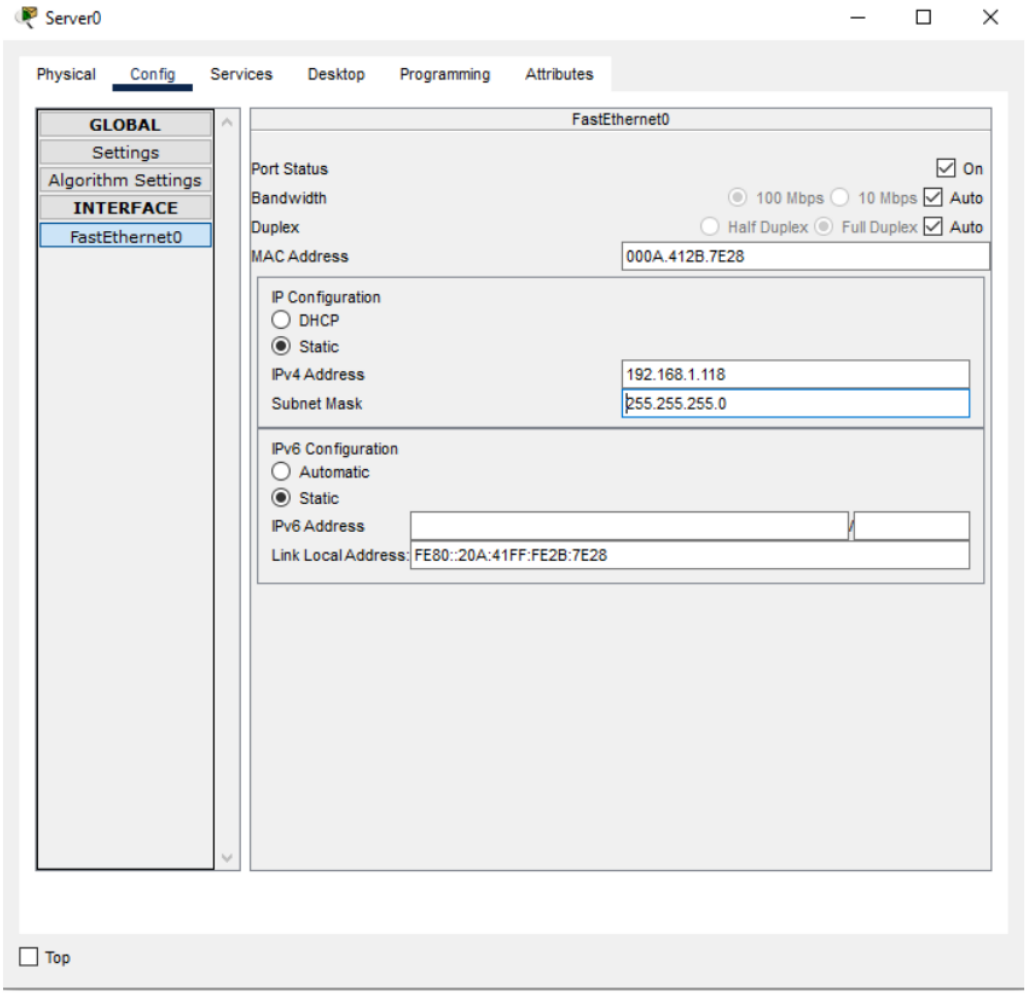


fig 20:Server0

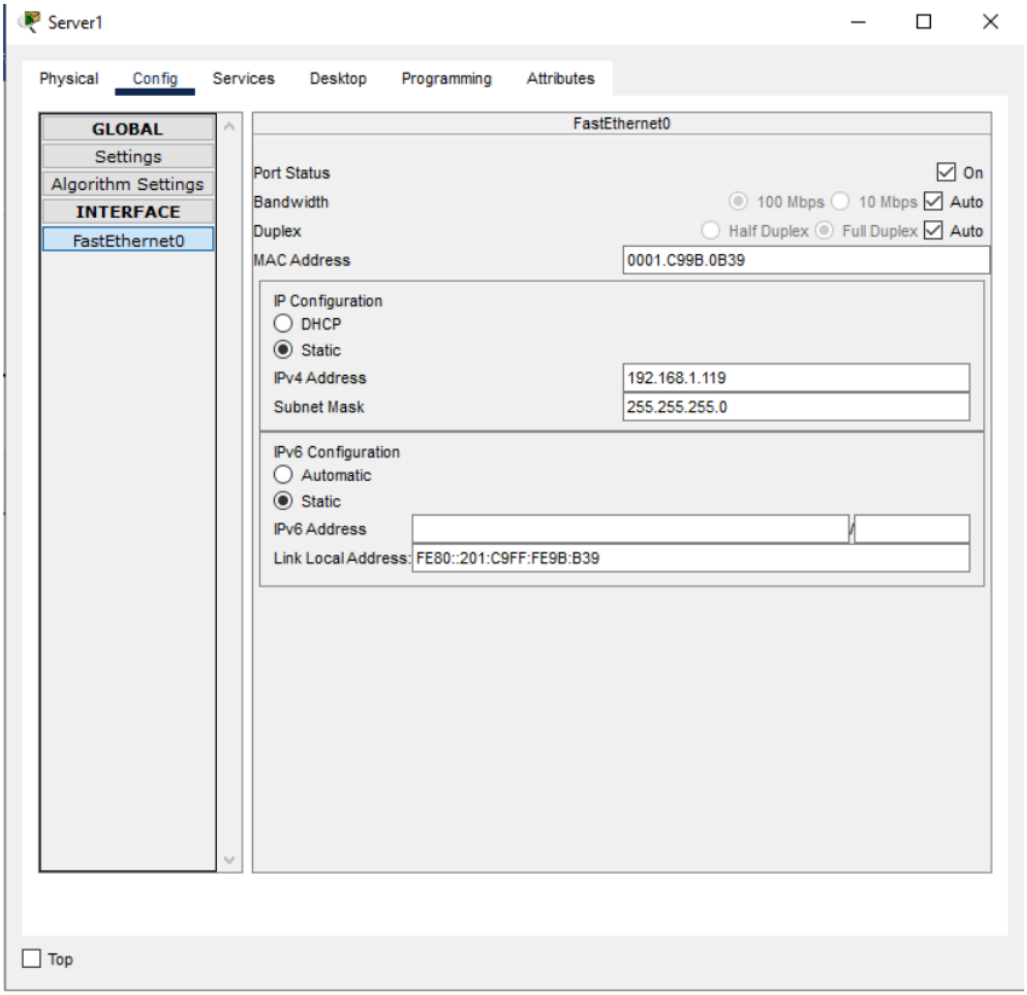


fig 21:Server1

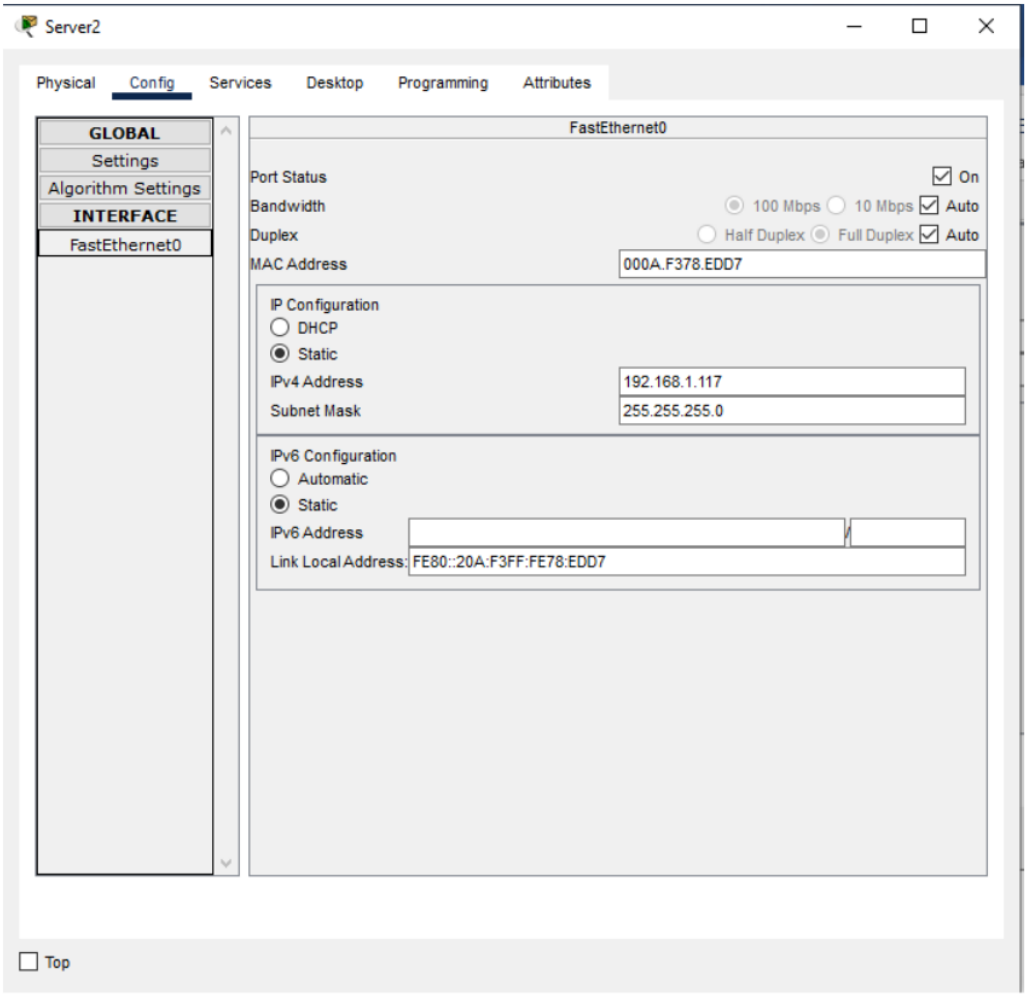


fig 22:Server2

Static IP of Printer

Printer	Static IP	Subnet Mask
P0	192.168.1.114	255.255.255.0
P1	192.168.1.112	255.255.255.0
P4	192.168.1.20	255.255.255.0
P5	192.168.1.43	255.255.255.0

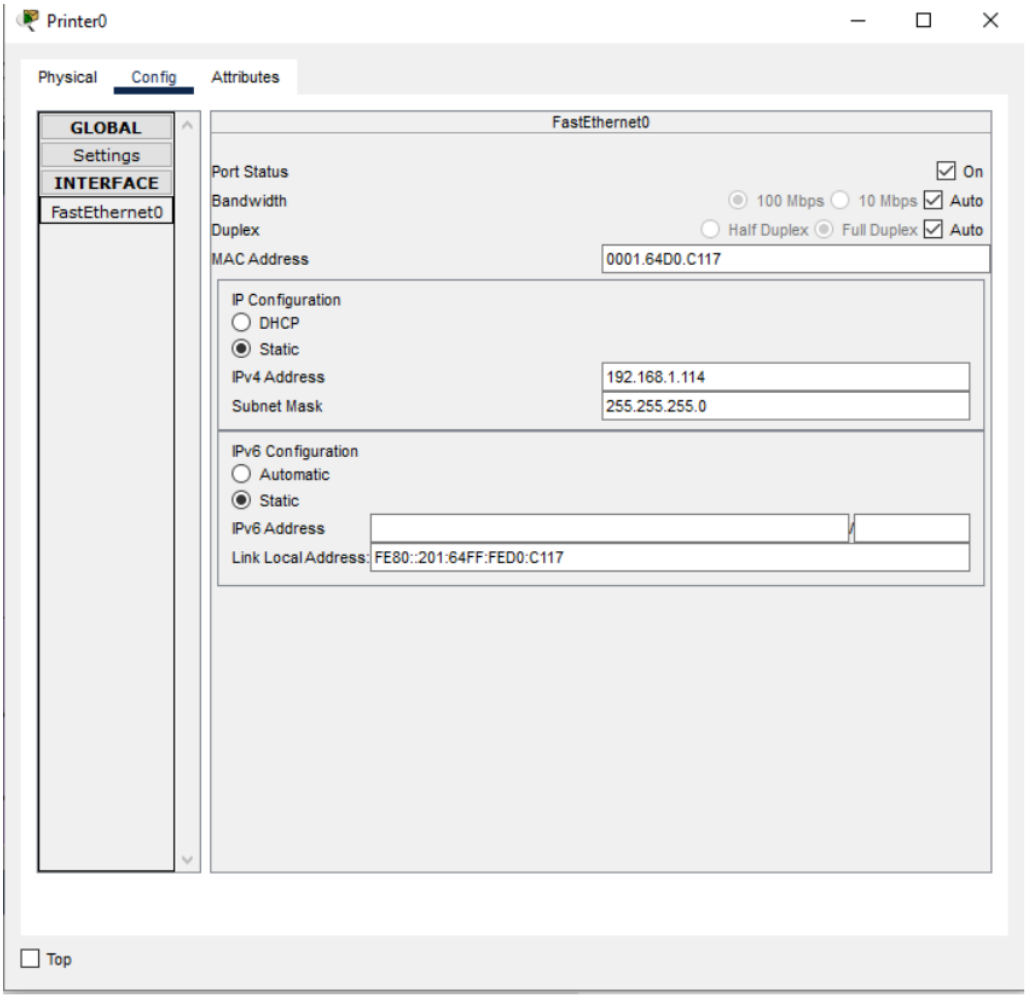


fig 23:printer0

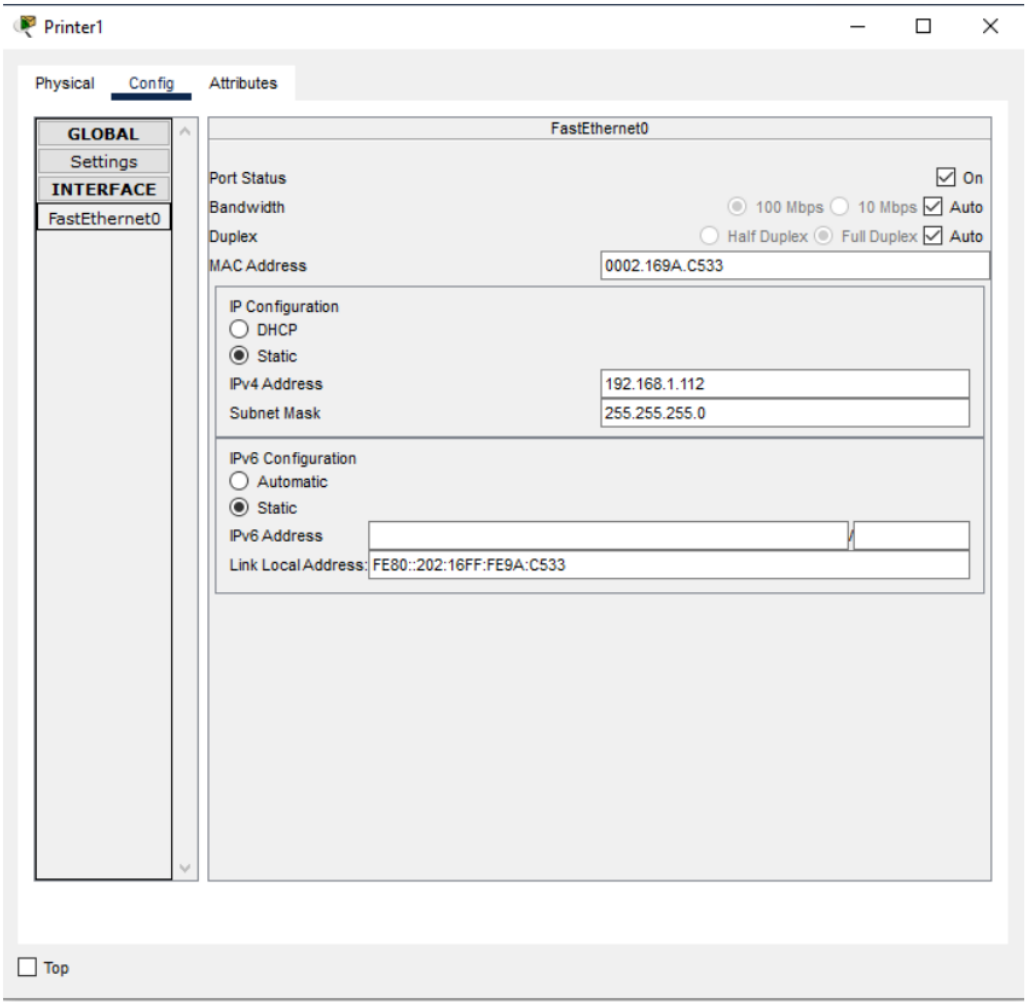


fig 24:Printer1

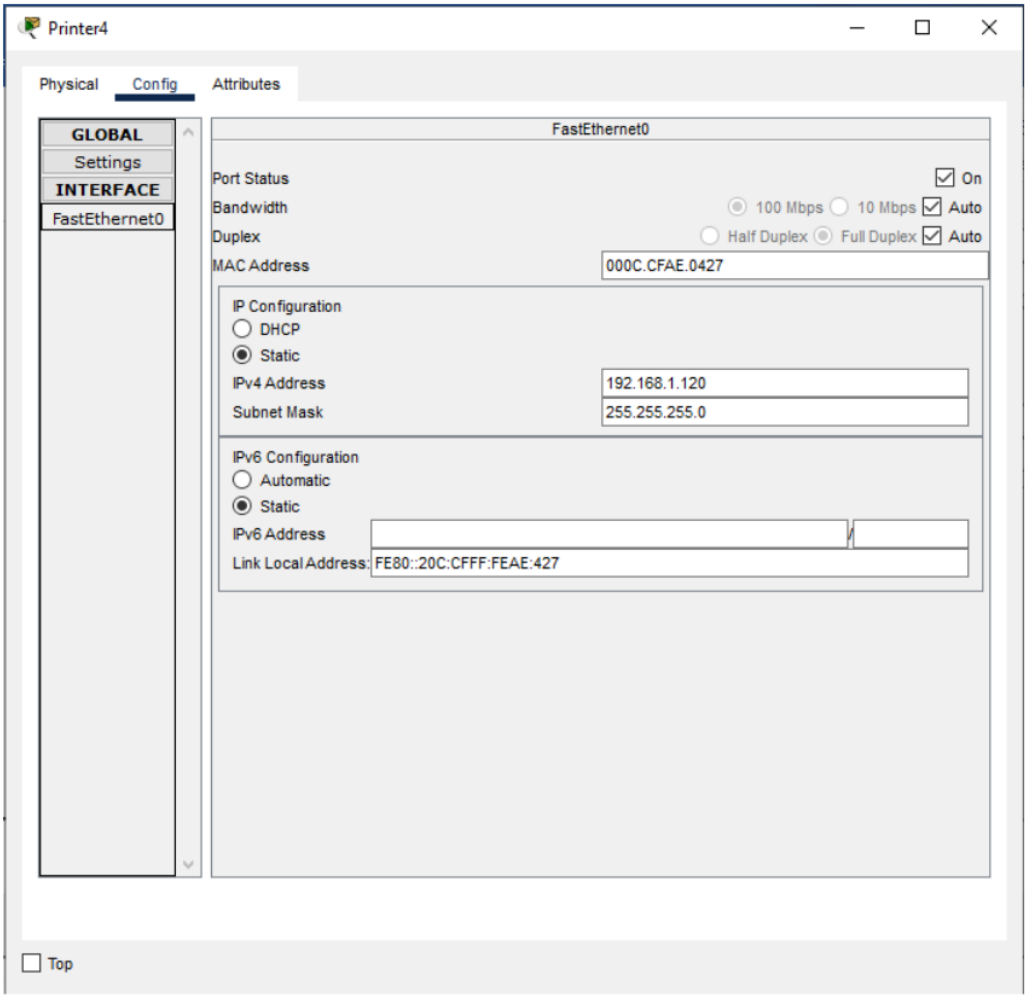


fig 25:Printer4

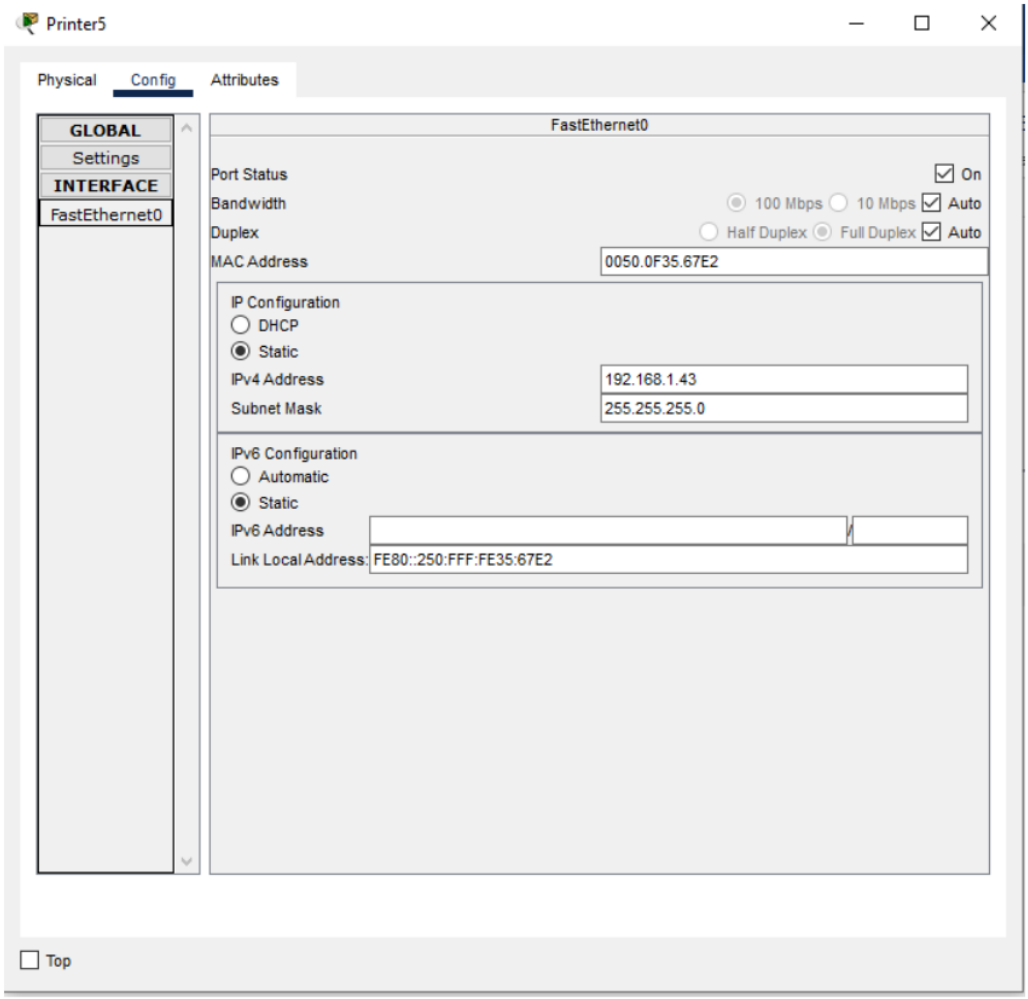


fig 26:Printer5

Static IP of Access Point

Access Point	Password
Access Point 3	homepass

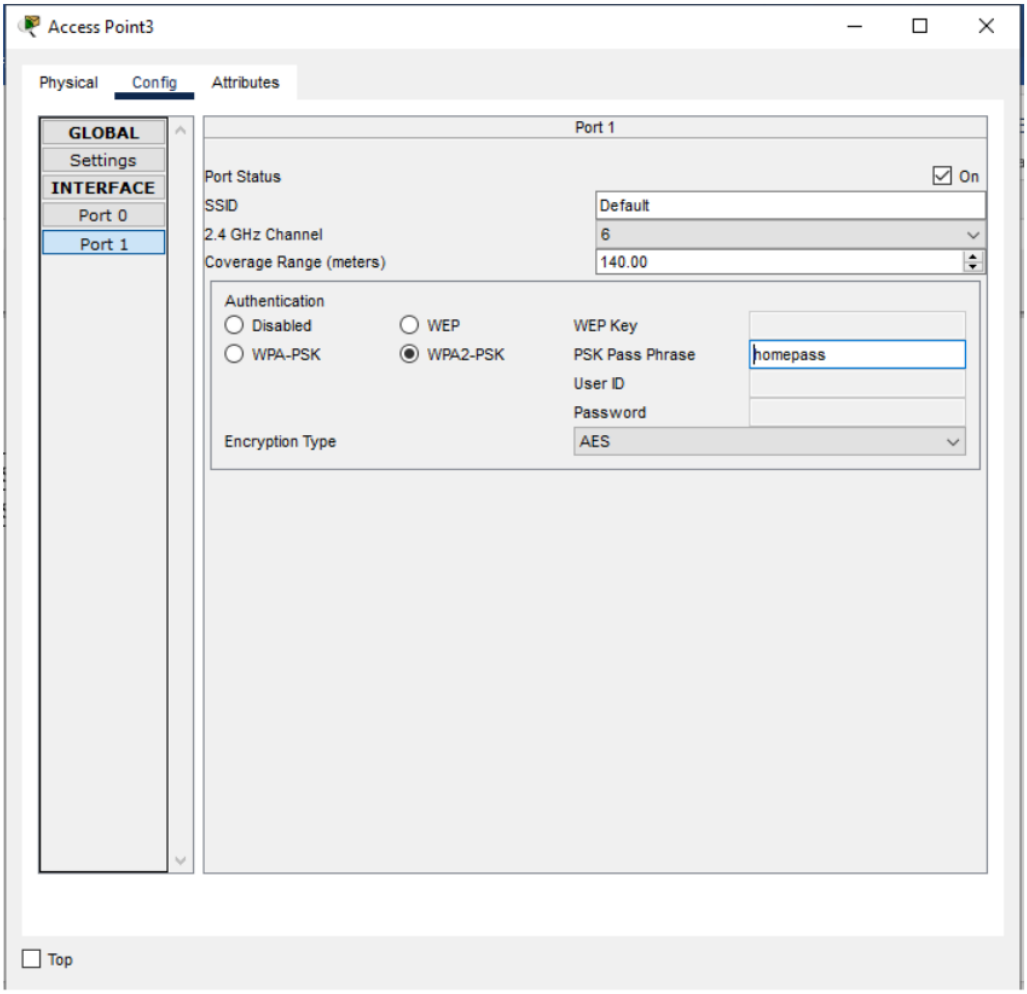


fig 27:Access point3

The networks of other PCs, Access points, Webcams, printers, and servers of other floors were managed through dhcp protocols.

Dynamic Host Configuration Protocol (DHCP):

It is the rule by which end devises connecting to the network are automatically assigned with the Ip- address, subnet mask, default gateway etc. DHCP servers are costly for organizations. Thus, router configuration is done to activate DHCP services. The client is provided with optional configuration parameters which describes about the availability of dhcp options. We did the dhcp configuration in our router1 and router2.

```
Router>
Router>en
Router#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#int fa0/0
Router(config-if)#ip address 192.168.1.1 255.255.255.0
Router(config-if)#no shut down

Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up

Router(config-if)#exit
Router(config)#do write
Building configuration...
[OK]
Router(config)#
Router(config)#ip dhcp pool voice
Router(dhcp-config)#netwrok 192.168.1.0 255.255.255.0
                    ^
% Invalid input detected at '^' marker.

Router(dhcp-config)#network 192.168.1.0 255.255.255.0
Router(dhcp-config)#default%DHCPD-4-PING_CONFLICT: DHCP address conflict:  server pinged
192.168.1.1.
-
% Incomplete command.
Router(dhcp-config)#default-router 192.168.1.1
Router(dhcp-config)#option 150 ip 192.168.1.1
Router(dhcp-config)#exit
Router(config)#ip dhcp excluded-address 192.168.1.1
```

fig 28-dhcp configuration in router 1

```
Router>en
Router#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#ip address 192.168.2.1 255.255.255.0
                  ^
% Invalid input detected at '^' marker.

Router(config)#int fa0/0
Router(config-if)#ip address 192.168.2.1 255.255.255.0
Router(config-if)#no shut down

Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up

Router(config-if)#exit
Router(config)#ip dhcp pool voice
Router(dhcp-config)#network 192.168.2.0 255.255.255.0
Router(dhcp-config)#de%DHCPD-4-PING_CONFLICT: DHCP address conflict:  server pinged
192.168.2.1
Router(dhcp-config)#default-router 192.168.2.1
Router(dhcp-config)#option 150 ip 192.168.2.1
Router(dhcp-config)#exit
Router(config)#ip dhcp excluded-address 192.168.2.1
```

fig 29:dhcp configuration in router 2

Cisco Telephony

The VOIP phones are connected to the switch which is then directly connected to the router. Then the telephony configuration is done on the router and the IP phone is automatically assigned to the VOIP phone system.

```
Router(config)#telephony-service
Router(config-telephony)#max-dn %DHCPD-4-PING_CONFLICT: DHCP address conflict:  server pinged 192.168.1.19.
%DHCPD-4-PING_CONFLICT: DHCP address conflict:  server pinged 192.168.1.21.
%DHCPD-4-PING_CONFLICT: DHCP address conflict:  server pinged 192.168.1.19.
%DHCPD-4-PING_CONFLICT: DHCP address conflict:  server pinged 192.168.1.21.
%DHCPD-4-PING_CONFLICT: DHCP address conflict:  server pinged 192.168.1.19.
%DHCPD-4-PING_CONFLICT: DHCP address conflict:  server pinged 192.168.1.21.

% Incomplete command.
Router(config-telephony)#tele
Router(config-telephony)#max-dn 15
Router(config-telephony)#max-ephone 15
Router(config-telephony)#ip source %DHCPD-4-PING_CONFLICT: DHCP address conflict:  server pinged 192.168.1.19.-%DHCPD-4-PING_CONFLICT: DHCP address conflict:  server pinged
192.168.1.21.
a%DHCPD-4-PING_CONFLICT: DHCP address conflict:  server pinged 192.168.1.19.
%DHCPD-4-PING_CONFLICT: DHCP address conflict:  server pinged 192.168.1.21.

% Incomplete command.
Router(config-telephony)#ip source-address 192.169.1.1 port 2000
Router(config-telephony)#auto assign 1 to 15
Router(config-telephony)#exit
Router(config)#ephone-dn 1%DHCPD-4-PING_CONFLICT: DHCP address conflict:  server pinged 192.168.1.19.
%DHCPD-4-PING_CONFLICT: DHCP address conflict:  server pinged 192.168.1.19.
%DHCPD-4-PING_CONFLICT: DHCP address conflict:  server pinged 192.168.1.21.

Router(config-ephone-dn)#%LINK-3-UPDOWN: Interface ephone_dsp DN 1.1, changed state to up

Router(config-ephone-dn)#number 101
Router(config-ephone-dn)#e
%IPPHONE-6-REGISTER: ephone-1 IP:192.168.1.17 Socket:2 DeviceType:Phone has registered.
Router(config-ephone-dn)#exit
Router(config)#ephone-dn 2
Router(config-ephone-dn)#%LINK-3-UPDOWN: Interface ephone_dsp DN 2.1, changed state to up

Router(config-ephone-dn)#number 102
Router(config-ephone-dn)#ephone-dn 3
Router(config-ephone-dn)#%LINK-3-UPDOWN: Interface ephone_dsp DN 3.1, changed state to up
```

fig 30:telephony-service router1

```
Router(config-ephone-dn)#number 103
Router(config-ephone-dn)#ephone-dn 4
Router(config-ephone-dn)#%LINK-3-UPDOWN: Interface ephone_dsp DN 4.1, changed state to up

Router(config-ephone-dn)#number 104
Router(config-ephone-dn)#ephone-dn 5
Router(config-ephone-dn)#%LINK-3-UPDOWN: Interface ephone_dsp DN 5.1, changed state to up

Router(config-ephone-dn)#number 105
Router(config-ephone-dn)#ephone-dn 6
Router(config-ephone-dn)#%LINK-3-UPDOWN: Interface ephone_dsp DN 6.1, changed state to up

Router(config-ephone-dn)#number 106
Router(config-ephone-dn)#ephone-dn 7
Router(config-ephone-dn)#%LINK-3-UPDOWN: Interface ephone_dsp DN 7.1, changed state to up

Router(config-ephone-dn)#number 107
Router(config-ephone-dn)#ephone-dn 8
Router(config-ephone-dn)#%LINK-3-UPDOWN: Interface ephone_dsp DN 8.1, changed state to up

Router(config-ephone-dn)#number 108
Router(config-ephone-dn)#
Router(config-ephone-dn)#ephone-dn 9
Router(config-ephone-dn)#%LINK-3-UPDOWN: Interface ephone_dsp DN 9.1, changed state to up

Router(config-ephone-dn)#number 109
Router(config-ephone-dn)#ephone-dn 10
Router(config-ephone-dn)#%LINK-3-UPDOWN: Interface ephone_dsp DN 10.1, changed state to up

Router(config-ephone-dn)#number 110
Router(config-ephone-dn)#ephone dn 11
                         ^
% Invalid input detected at '^' marker.

Router(config-ephone-dn)#ephone-dn 11
Router(config-ephone-dn)#%LINK-3-UPDOWN: Interface ephone_dsp DN 11.1, changed state to up

Router(config-ephone-dn)#number 111
```

fig 30.1: telephony-service router 1

```
Router(config-ephone-dn)#ephone-dn 12
Router(config-ephone-dn)#%LINK-3-UPDOWN: Interface ephone_dsp DN 12.1, changed state to up

Router(config-ephone-dn)#number 112
Router(config-ephone-dn)#ephone-dn 13
Router(config-ephone-dn)#%LINK-3-UPDOWN: Interface ephone_dsp DN 13.1, changed state to up

Router(config-ephone-dn)#number 113
Router(config-ephone-dn)#ephone-dn 14
Router(config-ephone-dn)#%LINK-3-UPDOWN: Interface ephone_dsp DN 14.1, changed state to up

Router(config-ephone-dn)#number 114
Router(config-ephone-dn)#ephone-dn 15
Router(config-ephone-dn)#%LINK-3-UPDOWN: Interface ephone_dsp DN 15.1, changed state to up

Router(config-ephone-dn)#number 115
Router(config-ephone-dn)#exit
Router(config)#do write
Building configuration...
[OK]
Router(config)#
```

Fig 30.2: telephony-service router1

```
Router(config)#tele
Router(config-telephony)#max-dn %DHCPD-4-PING_CONFLICT: DHCP address conflict:  server pinged 192.168.2.22.

% Incomplete command.
Router(config-telephony)#max-dn 13
Router(config-telephony)#max-ephone 13
Router(config-telephony)#ip source-address 192.168.2.1 port 2000
Router(config-telephony)#auto %DHCPD-4-PING_CONFLICT: DHCP address conflict:  server pinged 192.168.2.22
% Ambiguous command: "aut"
Router(config-telephony)#auto assign 1 to 13
Router(config-telephony)#exit
Router(config)#ephone-dn 1
Router(config-ephone-dn)#%LINK-3-UPDOWN: Interface ephone_dsp DN 1.1, changed state to up

Router(config-ephone-dn)#number 201
Router(config-ephone-dn)#
%IPPHONE-6-REGISTER: ephone-1 IP:192.168.2.20 Socket:2 DeviceType:Phone has registered.

Router(config-ephone-dn)#ephone-dn 2
Router(config-ephone-dn)#%LINK-3-UPDOWN: Interface ephone_dsp DN 2.1, changed state to up

Router(config-ephone-dn)#number 202
Router(config-ephone-dn)#ephone-dn 3
Router(config-ephone-dn)#%LINK-3-UPDOWN: Interface ephone_dsp DN 3.1, changed state to up

Router(config-ephone-dn)#number 203
%IPPHONE-6-REGISTER: ephone-4 IP:192.168.2.21 Socket:2 DeviceType:Phone has registered.

Router(config-ephone-dn)#epho
%IPPHONE-6-REGISTER: ephone-2 IP:192.168.2.22 Socket:2 DeviceType:Phone has register
Router(config-ephone-dn)#ephone-dn 4
Router(config-ephone-dn)#%LINK-3-UPDOWN: Interface ephone_dsp DN 4.1, changed state to up

Router(config-ephone-dn)#number 204
Router(config-ephone-dn)#ephone-dn 5
```

fig 31:telephony-service router2

```
Router(config-ephone-dn)#%LINK-3-UPDOWN: Interface ephone_dsp DN 5.1, changed state to up

Router(config-ephone-dn)#number
%IPPHONE-6-REGISTER: ephone-3 IP:192.168.2.23 Socket:2 DeviceType:Phone has registered.
% Incomplete command.
Router(config-ephone-dn)#number 205
Router(config-ephone-dn)#ephone-dn 6
Router(config-ephone-dn)#%LINK-3-UPDOWN: Interface ephone_dsp DN 6.1, changed state to up

Router(config-ephone-dn)#number 206
Router(config-ephone-dn)#ephone-dn 7
Router(config-ephone-dn)#%LINK-3-UPDOWN: Interface ephone_dsp DN 7.1, changed state to up

Router(config-ephone-dn)#number 207
Router(config-ephone-dn)#ephone-dn 8
Router(config-ephone-dn)#%LINK-3-UPDOWN: Interface ephone_dsp DN 8.1, changed state to up

Router(config-ephone-dn)#number 208
Router(config-ephone-dn)#ephone-dn 9
Router(config-ephone-dn)#%LINK-3-UPDOWN: Interface ephone_dsp DN 9.1, changed state to up

Router(config-ephone-dn)#number 209
Router(config-ephone-dn)#ephone-dn 10
Router(config-ephone-dn)#%LINK-3-UPDOWN: Interface ephone_dsp DN 10.1, changed state to up

Router(config-ephone-dn)#number 210
Router(config-ephone-dn)#ephone-dn 11
Router(config-ephone-dn)#%LINK-3-UPDOWN: Interface ephone_dsp DN 11.1, changed state to up

Router(config-ephone-dn)#number 211
Router(config-ephone-dn)#ephone-dn 12
Router(config-ephone-dn)#%LINK-3-UPDOWN: Interface ephone_dsp DN 12.1, changed state to up

Router(config-ephone-dn)#number 212
```

Fig 31.1: telephony-service router2

```
Router(config-ephone-dn)#ephone-dn 13
Router(config-ephone-dn)#%LINK-3-UPDOWN: Interface ephone_dsp DN 13.1, changed state to up

Router(config-ephone-dn)#number 213
Router(config-ephone-dn)#exit
Router(config)#do write
Building configuration...
[OK]
```

Fig 31.2: telephony-service router2

Serial Configuration:

The serial configuration is done on the routers because the serial configuration is slightly faster than the other configurations. We added clock rate and bandwidth in this configuration to manage the time between two frames and maintain the speed respectively.

```
Router#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#int s0/3/0
Router(config-if)#ip address 50.0.0.0 255.255.255.252
Bad mask /30 for address 50.0.0.0
Router(config-if)#clock rate 64000
Router(config-if)#bandwidth 1024
Router(config-if)#no shut down

%LINK-5-CHANGED: Interface Serial0/3/0, changed state to down
Router(config-if)#^Z
Router#
%SYS-5-CONFIG_I: Configured from console by console

Router#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#int s0/3/0
Router(config-if)#ip address 50.0.0.1 255.255.255.252
Router(config-if)#exit
```

fig 32:serial configuration router1

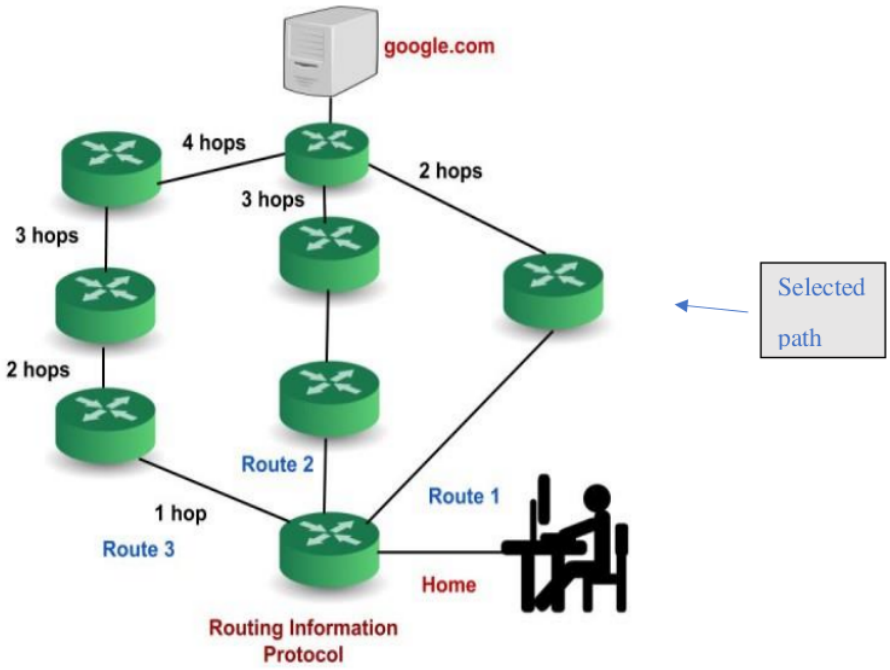
```
Router>
Router>en
Router# conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#int s0/3/0
Router(config-if)#ip address 50.0.0.2
% Incomplete command.
Router(config-if)#ip address 50.0.0.2 255.255.255.252
Router(config-if)#no shut down

Router(config-if)#
%LINK-5-CHANGED: Interface Serial0/3/0, changed state to up

Router(config-if)#^Z
Router#
%SYS-5-CONFIG_I: Configured from console by console
```

fig 33:serial configuration router2

Router RIP configuration:



It is a simultaneous routing protocol. In OSI model it performs its task on network layer. It helps to find the shortest way between the source and the destination network. It is easy to configure and is not complicated. Its system of measurement is based on trip count basis which is maximum 15. It is not suitable for very large-scale organization or network because it is not scalable.

```
Router(config)#
Router(config)#router rip
Router(config-router)#network 192.168.1.0
Router(config-router)#network 50.0.0.0
Router(config-router)#do write
Building configuration...
[OK]
Router(config-router)#
```

fig 34:router1 rip configuration

```
Router>
Router>en
Router#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#router rip
Router(config-router)#network 192.168.2.0
Router(config-router)#network 50.0.0.0
Router(config-router)#do write
Building configuration...
[OK]
Router(config-router)#
```

fig 35:router2 rip configuration

Dial Peer Configuration

Dial Peer Configuration is the gate way for processing any sort of dial plans and providing voice services over an IP packet network. Call source and destination endpoints are identified by using dial peers, it is also used for defining the characteristics applied to each call leg in call connection. Dial peers are considered a crucial component of VoIP.

For configuring VoIP dial peer, you must identify the dial peer by appointing it a unique tag number, defining its designated telephone number and its destination IP address.

```
Router(config-router)#
Router(config-router)#dial-peer voice 1 voip
Router(config-dial-peer)#session target ipv4:192.168.2.1
Router(config-dial-peer)#destination target 2..
                                            ^
% Invalid input detected at '^' marker.

Router(config-dial-peer)#destination 2..
Router(config-dial-peer)#do write
Building configuration...
[OK]
```

fig 36:dial-peer conf router1

```
Router>
Router>en
Router#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#router rip
Router(config-router)#network 192.168.2.0
Router(config-router)#network 50.0.0.0
Router(config-router)#do write
Building configuration...
[OK]
Router(config-router)#
Router(config-router)#
Router(config-router)#dial-peer voice 1 voip
Router(config-dial-peer)#session target ipv4:192.168.1.1
Router(config-dial-peer)#destination 1..
Router(config-dial-peer)#do write
Building configuration...
[OK]
```

fig 37:dial-peer conf router2

Switchport Voice VLAN

A voice VLAN is particularly assigned for voice data stream. It focusses to ensures the quality of voice traffic. The priority is always given to voice service although other data forms like video can transfer simultaneously. Source address of received voice packets and VLAN tags of the received packets are used to distinguish voice data streams.

```
Switch>
Switch>en
Switch# conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#int fa0/2
Switch(config-if)#exit
Switch(config)#int range fa0/2-24
Switch(config-if-range)#switchport voice vlan 1
Switch(config-if-range)#do write
Building configuration...
[OK]
Switch(config-if-range)#
```

fig 38:switch port configuration

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https://networkdirection.net/

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