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## ASSIGNMENT NAME: NETWORKING.

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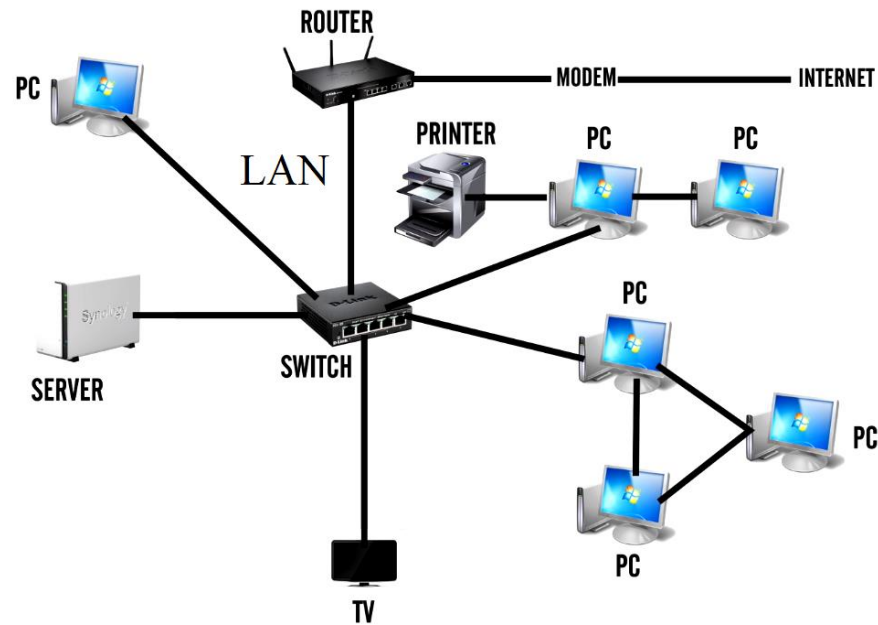
The principles of networking and protocols.

#### Computer network concept

A computer network is a system of computers and devices connected together by transmission physics under one architecture (Network Architecture) certain to collect data exchange and sharing of resources for many uses. The computers are connected to each other can be in the same room of a building a city or on a global scale.

1. Different types of networks.

- Local Area Network (LAN):

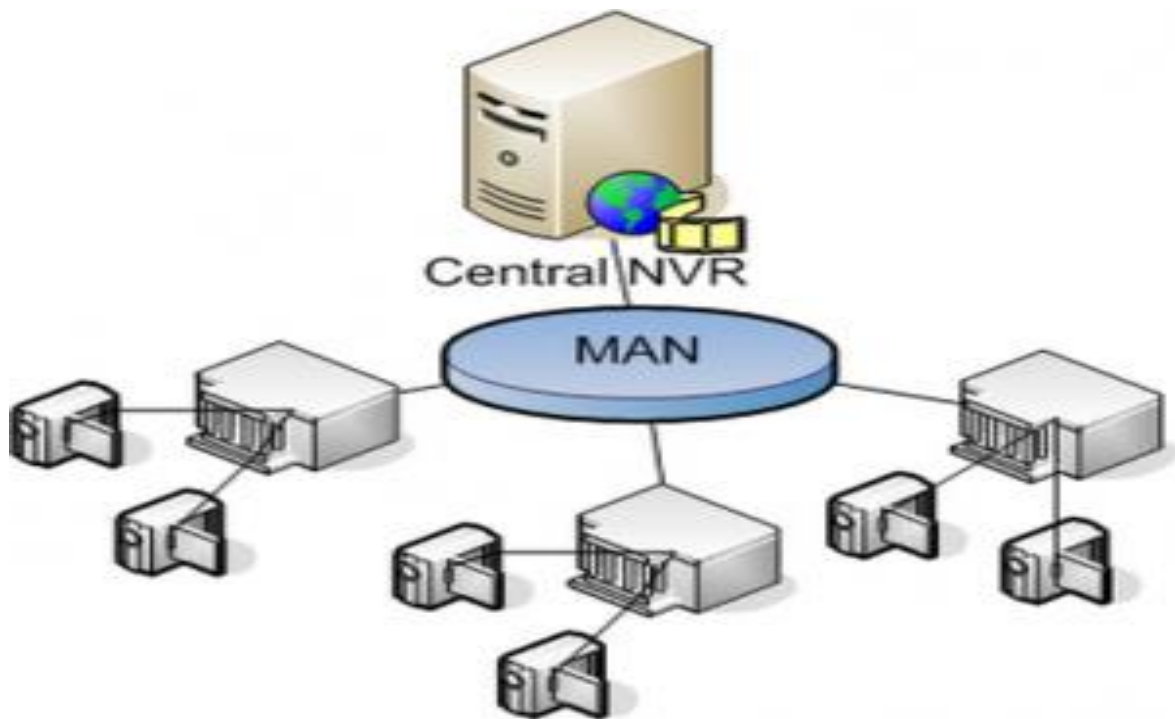


A local area network (LAN) is a group of computers and associated devices that share a common communications line or wireless link to a server. Typically, a LAN encompasses computers and peripherals connected to a server within a distinct geographic area such as an office or a commercial establishment. Computers and other mobile devices use a LAN connection to share resources such as a printer or network storage. (Network topologies, 2016)

Advantages:

- ≡ Sharing of resources:
  - ≡ Client and server relationship:
  - ≡ Sharing of the internet:
  - ≡ Software program sharing:
  - ≡ Securing of data:
  - ≡ Communication is easy, fast, and time-saving:
  - ≡ Computer identification:
- Disadvantages
- ≡ Data security problem:
  - ≡ Limitation of distance:
  - ≡ Server crashes may affect all computers:
  - ≡ Setting up a LAN is expensive (Advantages and disadvantages of local area network (LAN), 2018)

## Metropolitan Area Network (MAN)



These types of networks are larger than LANs but smaller than WANs – and incorporate elements from both types of networks. MANs span an entire geographic area (typically a town or city, but sometimes a campus). Ownership and maintenance are handled by either a single person or company (a local council, a large company, etc.).

### *Advantages*

- ⌚ Less expensive:
- ⌚ Sending local emails:
- ⌚ High speed than WAN:
- ⌚ Sharing of the internet:
- ⌚ Conversion from LAN to MAN is easy:
- ⌚ High Security:

### *Disadvantages*

- ⌚ Difficult to manage:
- ⌚ Internet speed difference:
- ⌚ Hackers attack:
- ⌚ Technical people required to set up:
- ⌚ More wires required:

## Wide Area Network (WAN)



Wide Area Network (WAN) is a network that exists over a large-scale geographical area. A WAN connects different smaller networks. Including local area networks(LANs)

### *Advantages of a wide area network (WAN)*

- ⌌ Covers large geographical area:
- ⌌ Centralized data:

Get updated files and data:

A lot of application to exchange messages:

Sharing of software and resources:

Global business:

High bandwidth:

Distribute workload and decrease travel charges:

### *Disadvantages of a wide area network (WAN)*

Security problems:

Needs firewall and antivirus software:

The setup cost is high

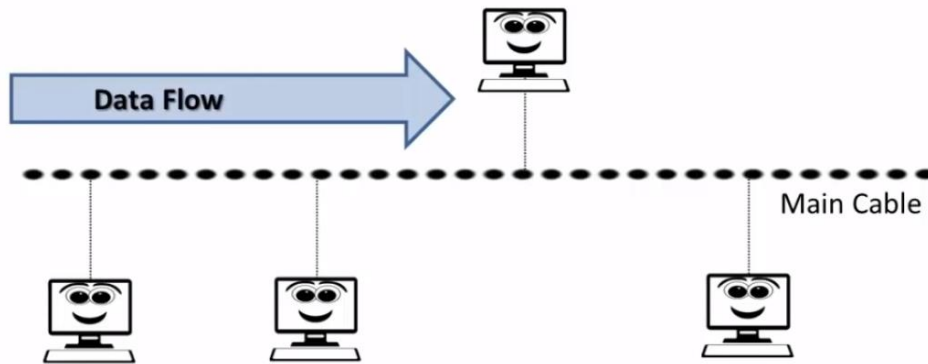
Troubleshooting problems:

Server down and disconnection issue: (Advantages and disadvantages of wide area network (WAN), 2018)

## 2. Network topology.

### - Bus Network Connections (Bus).

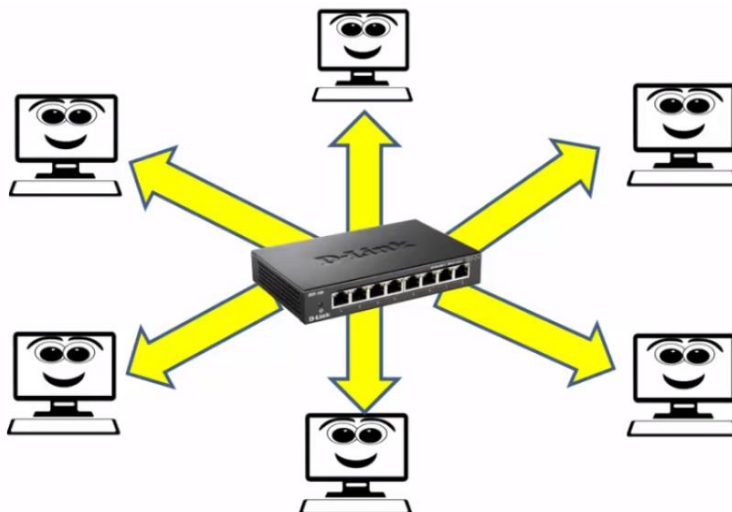
Bus network topology is the method of computer networking simple and most common. Bus network topology consists of a single cable connecting all the computers in a row. Computer on the network bus communication by sending data to a computer identify and bring that to the cable in the form of electronic signals.



## Bus Topology

Hit me

- Star Network Link structure (Star).



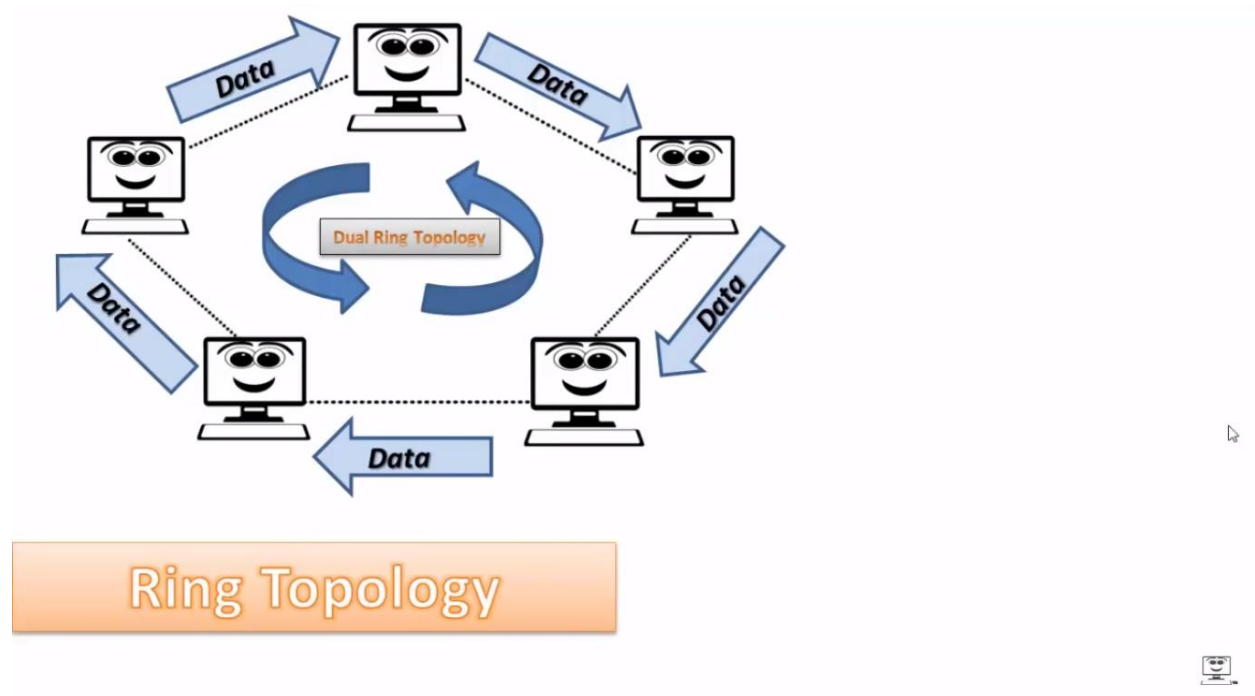
## Star Topology

In the star network topology (star) computers are connected by cable to a device called HUB (ie central connector). Signals are transmitted from the computer through the hub to send data to all computers on the network. This topology is derived from the first period when the calculation is based on the computer system connected to a main computer center. Star Network provides resources and centralized management mode. But because each computer is connected to a central point topology so this needs a lot of cable network installation on a large scale. Also if the heart gets broken, the entire

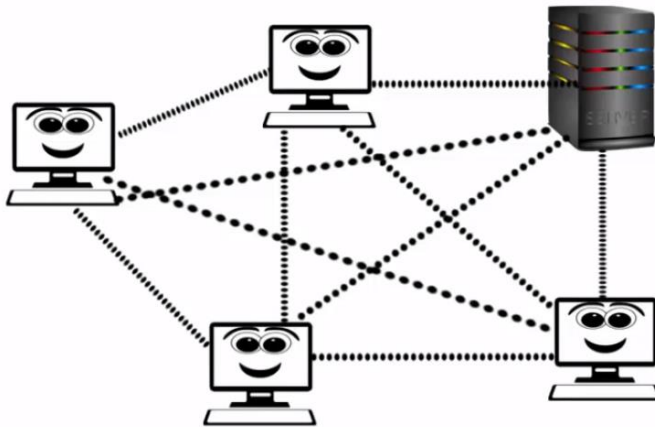
network goes down. Where a computer or the cable that connects it to the hub computer network Star broken, only that computer can no longer new to send or receive network data. The remaining computers on the network is still operating normally.

- Ring network connection structure (Ring).

Ring network topology (closed loop) connects computers on a cable loop no terminated ends. Signals transmitted in one direction and pass through each computer. Other bus topology with passive each computer acts as a signal amplifier forward and sends it to the next computer. Because the signal passes through each computer, the failure of a machine can affect the entire network.



- Mesh structure (mesh).



## Mesh Topology

(Network topologies, 2016)

Topology is a device that is connected to all other devices in the network. Often used in the core network connectivity to create the backup connection when a connection is broken.

### Standards of network:

Networking standards ensure the interoperability of networking technologies by defining the rules of communication among networked devices. Networking standards exist to help ensure products of different vendors are able to work together in a network without risk of incompatibility. (Networking Standards, 2018)

Some standards of network :

- IEEE 802.1 (LAN/MAN)
- IEEE 802.3 (Ethernet)
- IEEE 802.5 (Token Ring)
- IEEE 802.11 (Wireless LAN)
- OSI model.



## II. Networking devices and operations.

### 1. Network device.

- The operating principles of networking devices.

- **(Router)** is a computer network used to transfer data packets through the Internet and to the terminal through a process called "routing". It works on the 3rd floor (transport layer) of the OSI model.
- **Switch (switches)** is a device used to connect network segments together in a star network topology (star). According to this model the switch acts as the central device all the computers are connected to it. In the OSI reference model switches operate at the data link layer in addition there is some kind of high-end switches operate at the network layer.
- **Hub** is a central connection point for all the other devices in the network connection to the (same switch). Hub to connect segments of a LAN A hub connects multiple computers (or other network devices) together to form a single network segment in the center of the system.
- **Repeater** signal amplifier thereby ensures signal transmission can go further but not weakened di. A repeater is a device in class 1 (Physic Layer) of the OSI model. When we use the physical signal repeater in repeater input will be obtained later amplified signal thereby providing stable and reliable than the output to reach the more remote locations. If you want to ensure signal with office area large work apart, then you can use a repeater to amplify the signal
- **Bridge** is a device used to connect two different network puzzle to form a single large network. Bridge observe packets (packet) on all the different networks. If a packet is sent from the network to a guest network. Bridge will be reproduced in this packet and send it to the destination network
- **Gateway** is a device used to connect networks as network protocol used different IP protocol to a network using Novell IPX protocol DECnet SNA ... With the computer in the network use different protocols can easily connect with one another.
- **Brouter** – It is also known as bridging router is a device which combines features of both bridge and router. It can work either at data link layer or at network layer. Working as router, it is capable of routing packets across networks and working as bridge, it is capable of filtering local area network traffic. (Network Devices, 2017)

### 2 . Server.

- The operating principle of server types.

- **a web server** is a computer that stores the component files of a website (eg HTML documents, image files CSS and JavaScript files) and may distribute them to the devices of end users (end-user) . It connects to the Internet and have access to through a domain name like mozilla.org.
- **Proxy Server (Proxy Server)** acting as a gateway between the user and the Internet. This is an intermediary server between the end user and the sites they visit. The proxy server provides security functions and privacy vary depending on your needs or company policy.
- **FTP** stands for File Transfer Protocol (protocol file transfer) is a protocol that helps you easily exchange data between your PC with the host and vice versa.

- **Applications Server application server** called AppServer. Is a program that handles all application operations between users and applications the last floor of a business organization or the database.
- **MAIL Server:** It can store and transfer mail via internet, LAN, WAN.
- **CHAT Server:** It is used to exchange data in the same environment as the internet provides real-time discussion

### 3. Networking software.

Networking software is a foundational element for any network. It helps administrators deploy, manage and monitor a network. Traditional networks are made up of specialized hardware, such as routers and switches, that bundle the networking software into the solution. Software-defined networking (SDN) separates that software from the hardware, making it easier to innovate and adapt the network to quickly meet changing network demands.

Network software is not the same as software applications. Network software exposes the inner-workings of the network to administrators, while software applications enable end users to perform specific tasks. Network software is “invisible” to end users – it is simply used to facilitate the access those users have to network resources, in a seamless way.

The basic functionality of network software includes:

- User management – enables administrators to add or remove users from the network.
- File management – allows administrators to define the location of data storage and user access to that data.

Network software allows multiple devices, such as desktops, laptops, mobile phones, tablets, and other systems to connect to one another, as well as other networks. The Internet is a prime example of a globally connected system of servers and computers that relies on networking software to ensure accessibility by end users. (What’s Networking Software?, 2018)

### 4. Workstation hardware.

Workstation client (also known as computer workstations workstation computer station ...) is a computer for personal or business use with more powerful configuration to run faster is designed to run applications engineering art or science and are more likely than a personal computer can usually connect with each other via a computer network and serves more User simultaneously workstations provide high performance than desktop especially CPU graphics memory and multitasking capabilities. It is optimized for the processing of complex data types such as 3D drawings of mechanical simulation in the design drawing and create the animation of mathematical logic.

Workstation hardware is simply a component of the computer

- External hardware like keyboard, mouse, printer, projector,...

- Internal hardware like CPU, drive, ram, modem, sound card, graphics card,....

### III. Design networked systems.

#### 1. Set problem.

You are employed as a network engineer by a high-tech networking solution development organization and are working on a project for a local educational institution. You will need to analyze the specification from the institution below for completion of this project within a given timeframe:

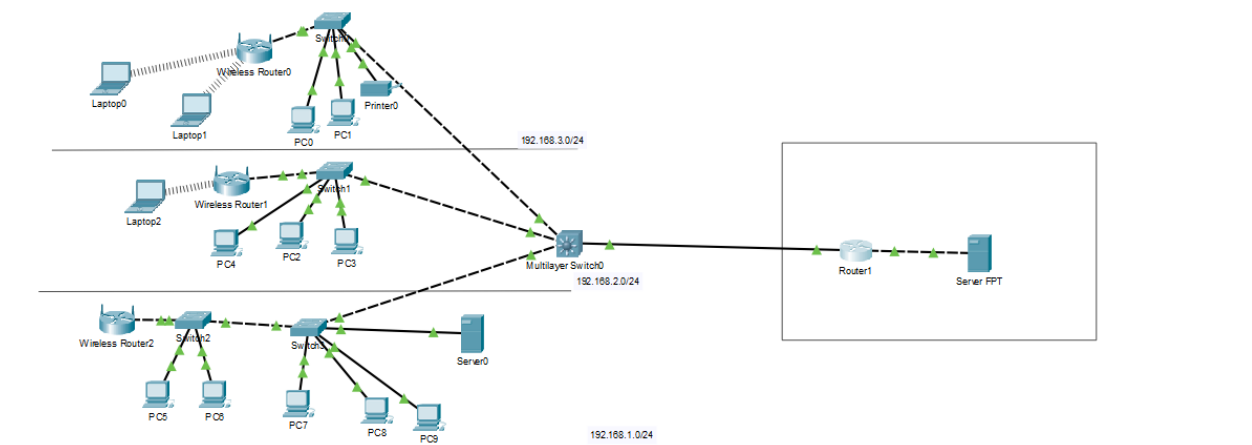
People: 200 students, 15 teachers, 12 marketing and administration staff, 5 higher managers including the head of academics and the programmed manager, 3 computer network administrators

Resources: 50 student lab computers, 35 staff computers, 3 printers

Building: 3 floors, all computers and printers are on the ground floor apart from the IT labs – one lab located on the first floor and another located on the second floor.

#### 2. Design.

##### 2.1 Logical model



here I am designing a logic diagram of the network system for a 3-storey building. The first floor is for students to learn and work with computer 2nd floor for marketing staff and administrators of computer networks. 3rd is for higher management including academic department heads and managers programmer

##### 2.1.1. Explain the physical model

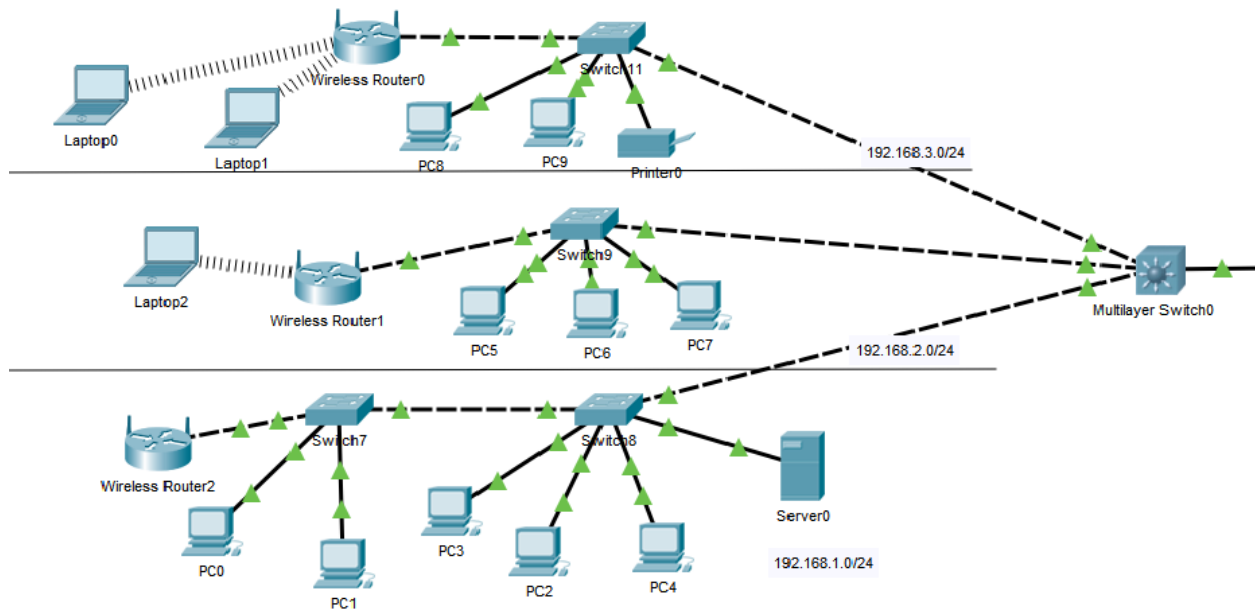
-Ip settings and wifi router settings.

with models on my network using IPV4, I chose IPV4 because it is very suitable for this network model

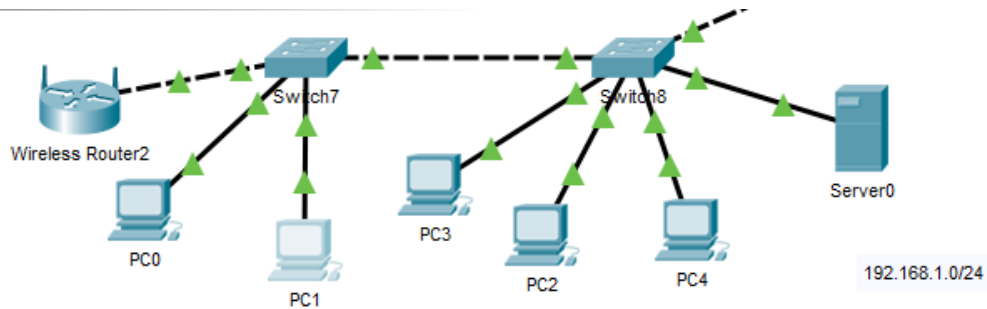
IP of 1st floor is 192.168.1.0/24.

IP of 2st floor is 192.168.2.0/24.

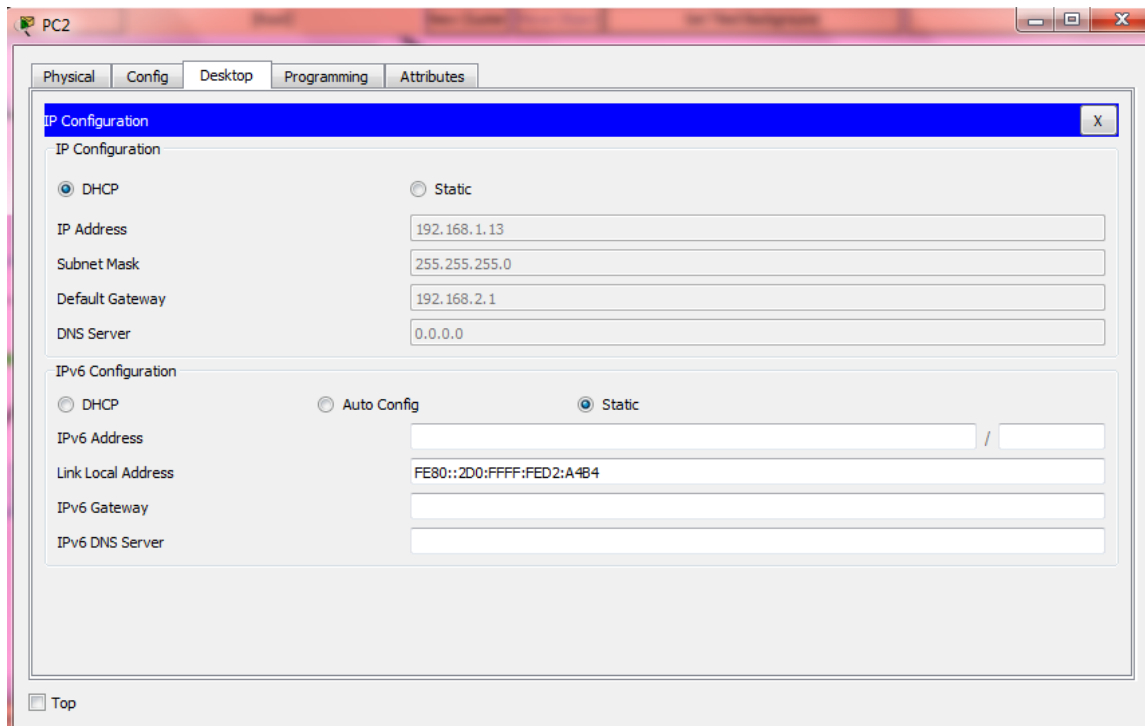
IP of 3st floor is 192.168.3.0/24.



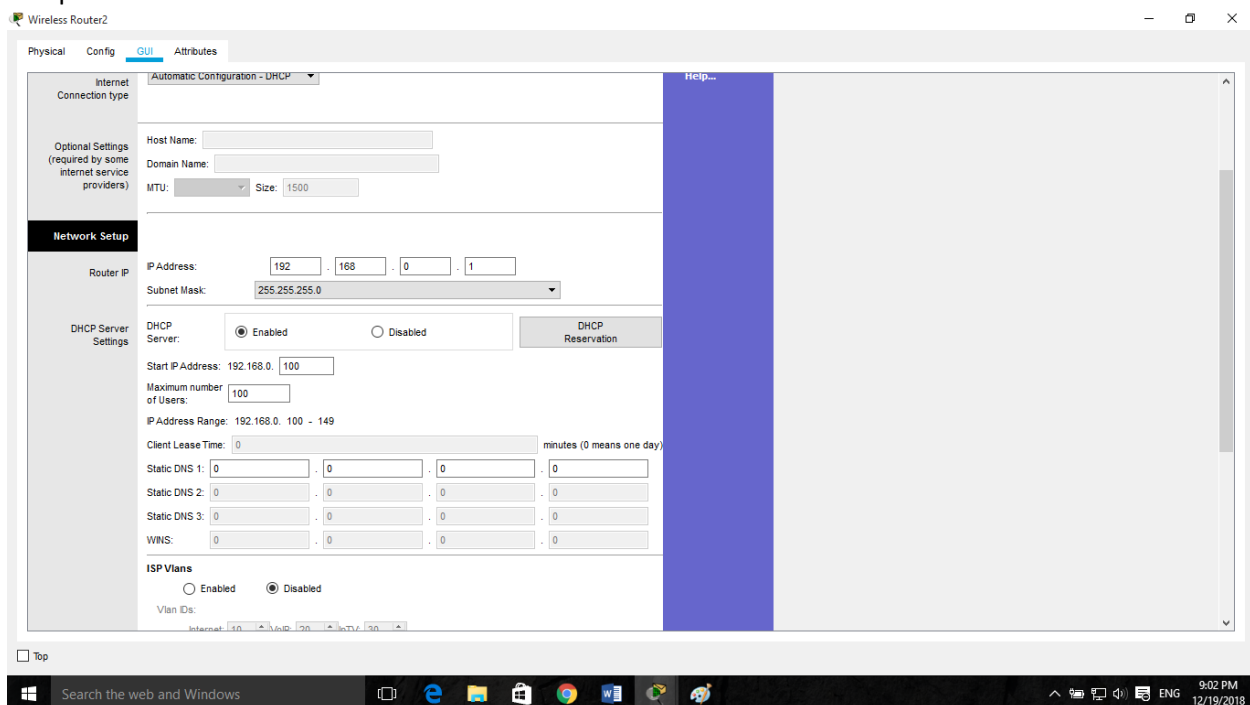
1st floor I used 2 switch to connect the computers together into a router LAN and wifi for those who need it. And the 1st floor is where I put the server for the entire building 3 floors



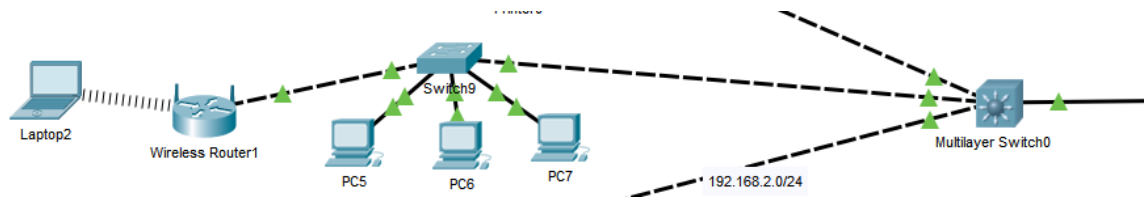
Ip of all the computer I put in the DHCP mode.



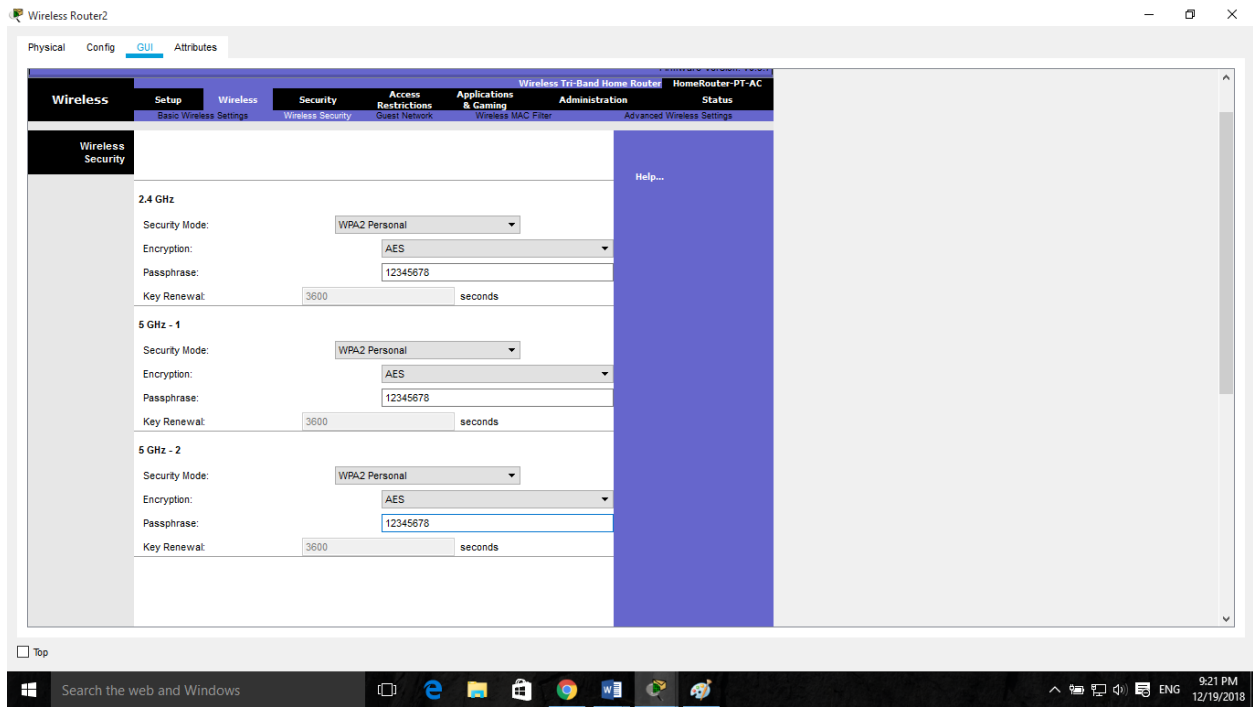
This is the ip wifi router 1st floor and I set the maximum number of users is 100 to install additional computers as needed. And the IP address is 192.168.0.1



to the 2nd floor I used a switch to wifi connection from the laptop to the wifi routers with people using laptops or smartphones

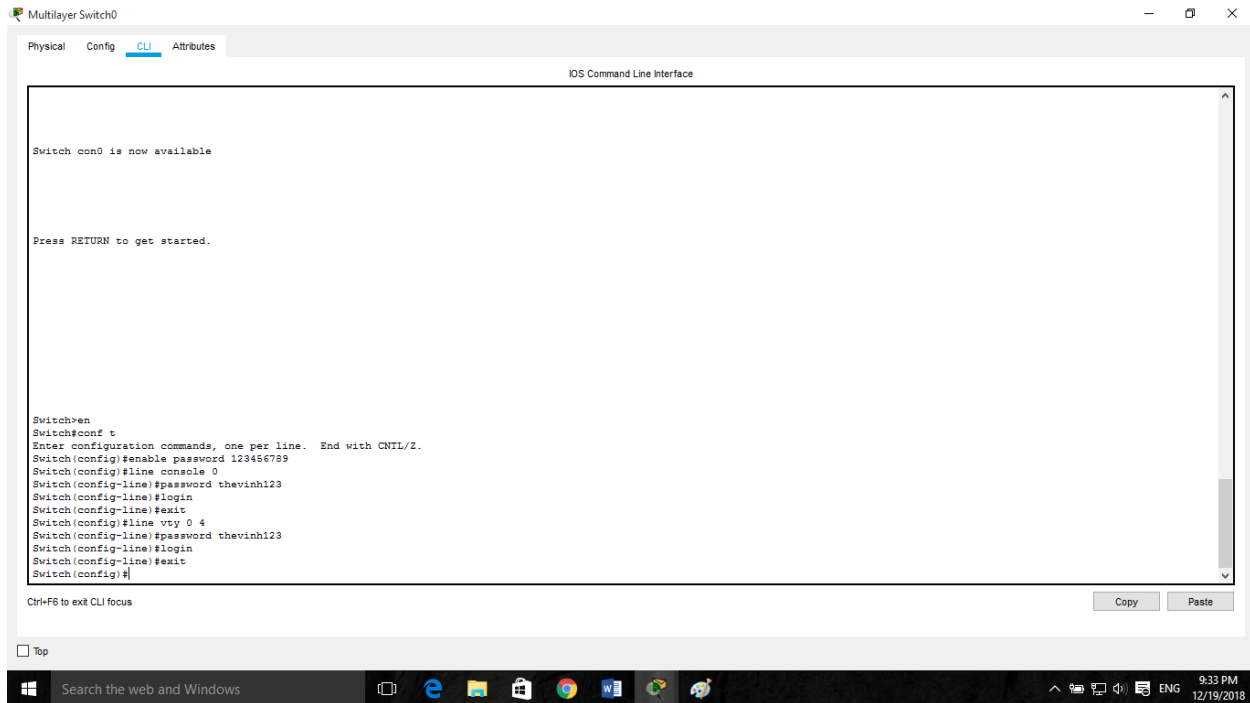


2nd floor wifi router I have set a password to prevent students and strangers from accessing the network and save setting



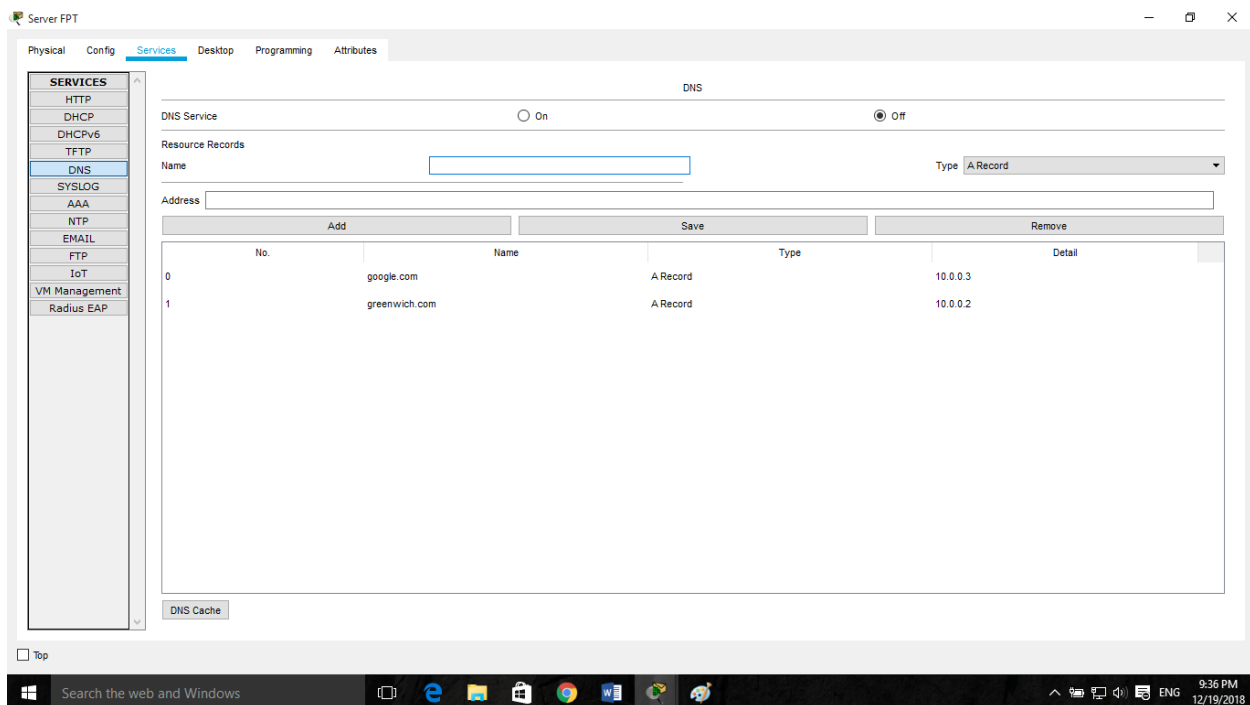
This is a laptop that can access the wifi router.





- DNS settings.

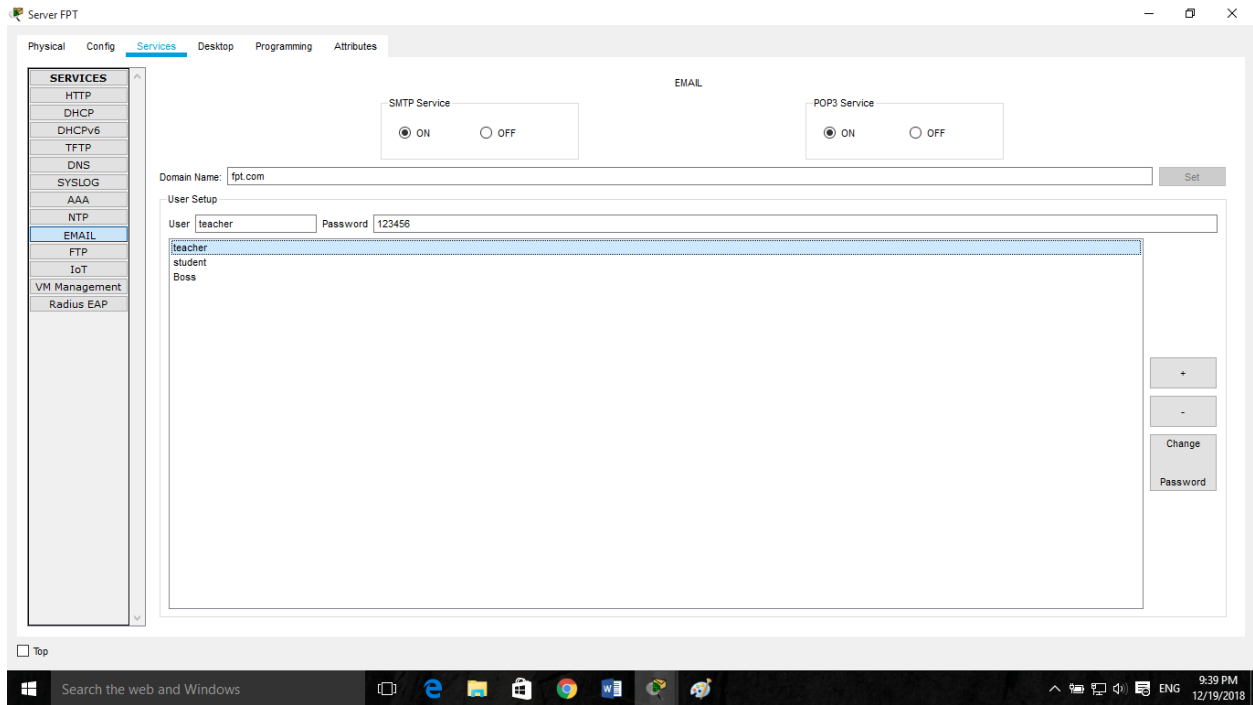
And with the server of the FPT network I installed the ip address is 10.0.0.1 and DNS settings.



- Email settings

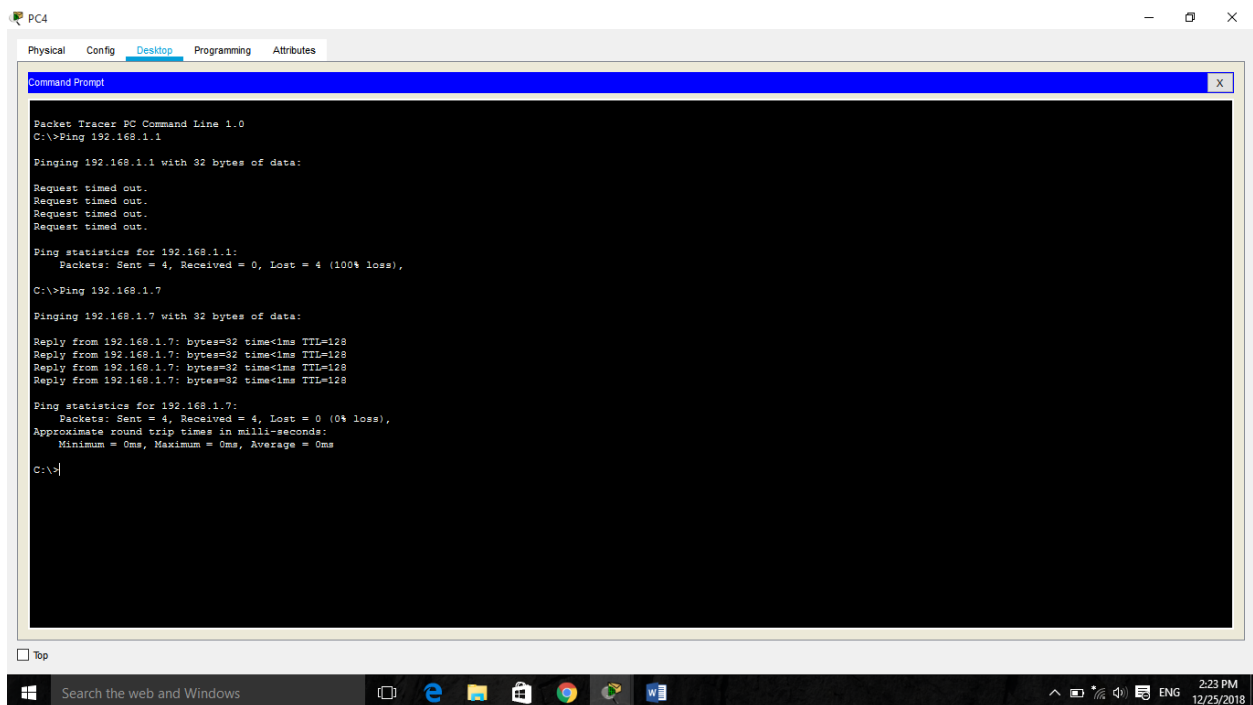
Set up email to be able to send messages internally





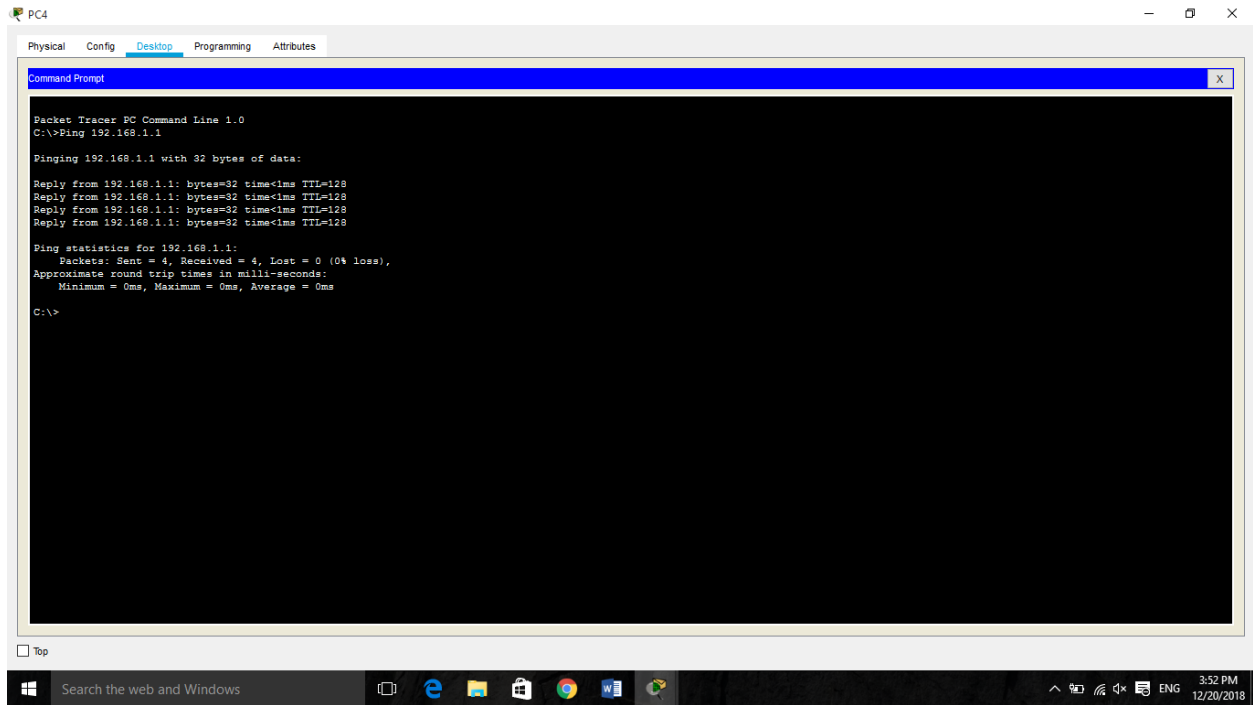
## 2.1.2. Test

- Now I will test by ping the different machines

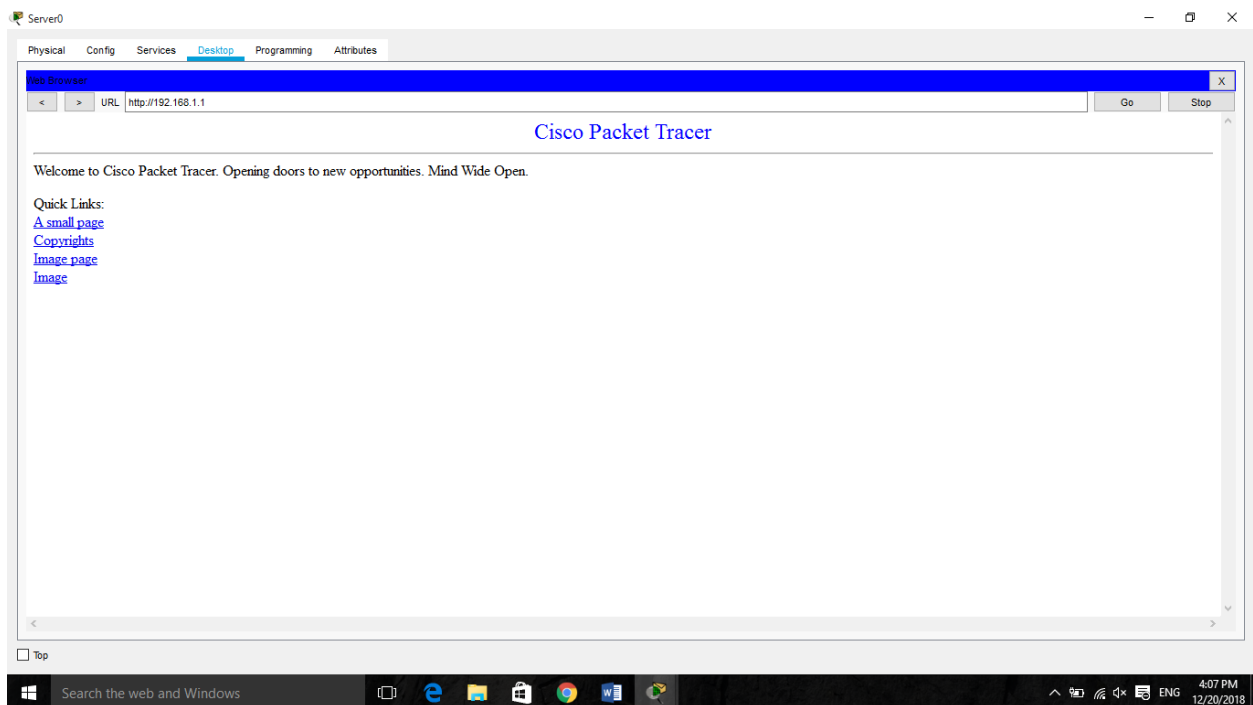


In here I used the pc4 of the first floor to ping on pc1 of the 1nd floor and success.

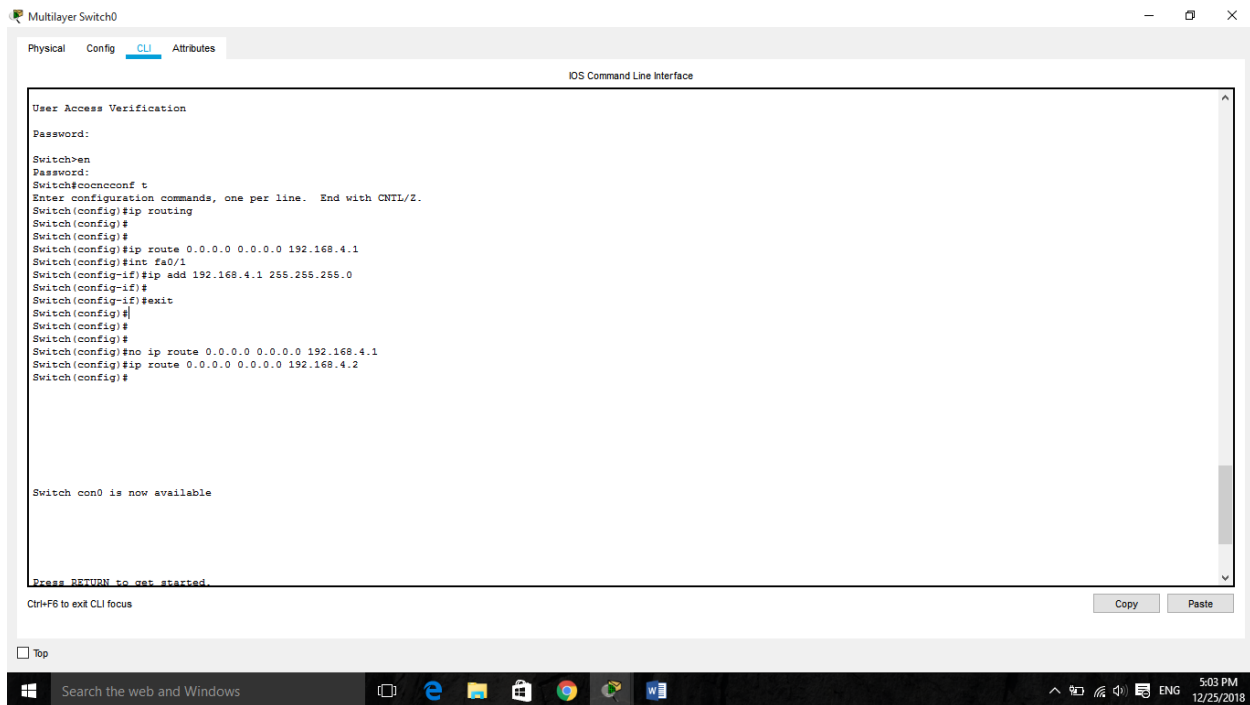
- Now test the 3rd floor ping computer and web access to the building server



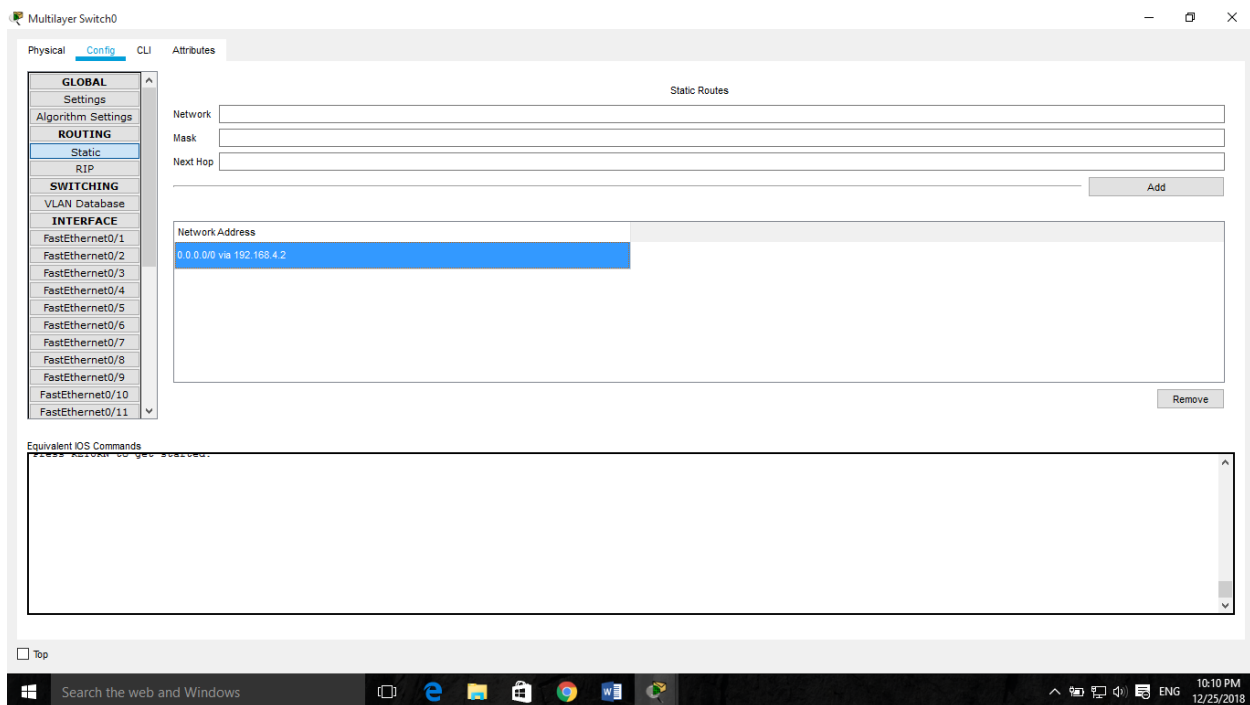
Here I use pc4 on the 1rd floor to ping and access the web server of the building



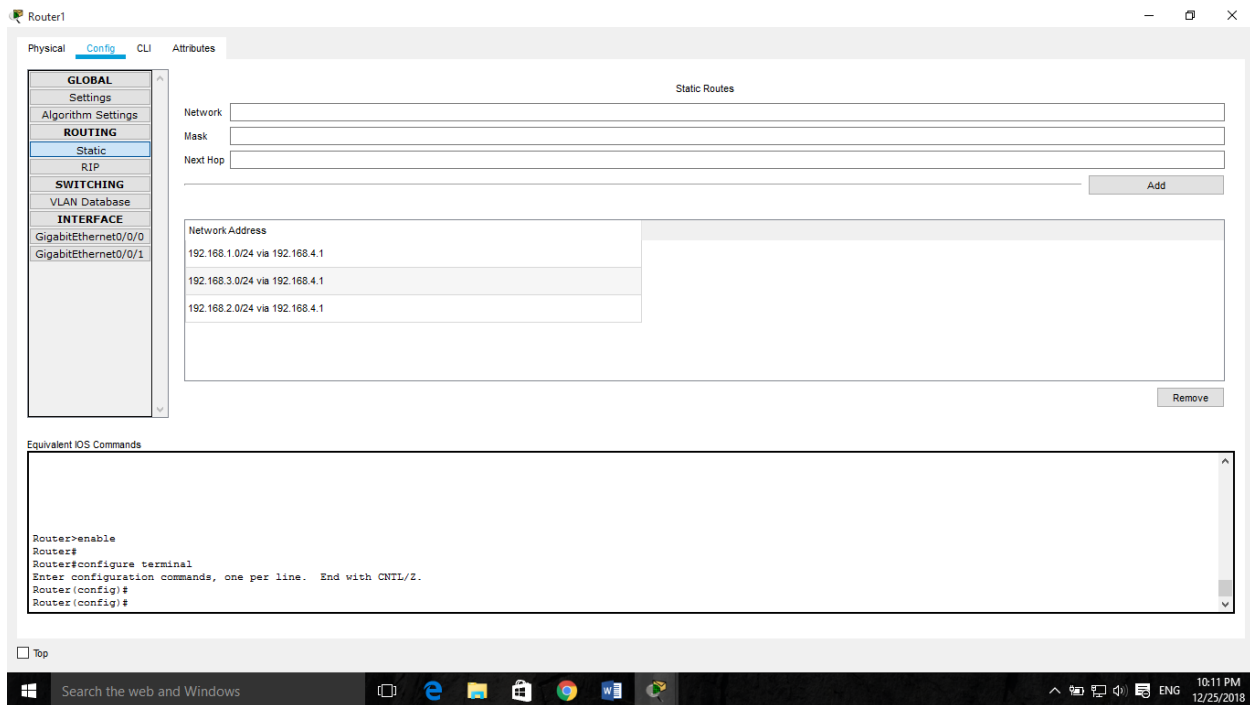
- I use The command ip routing to turn lever 3 switches into routers.



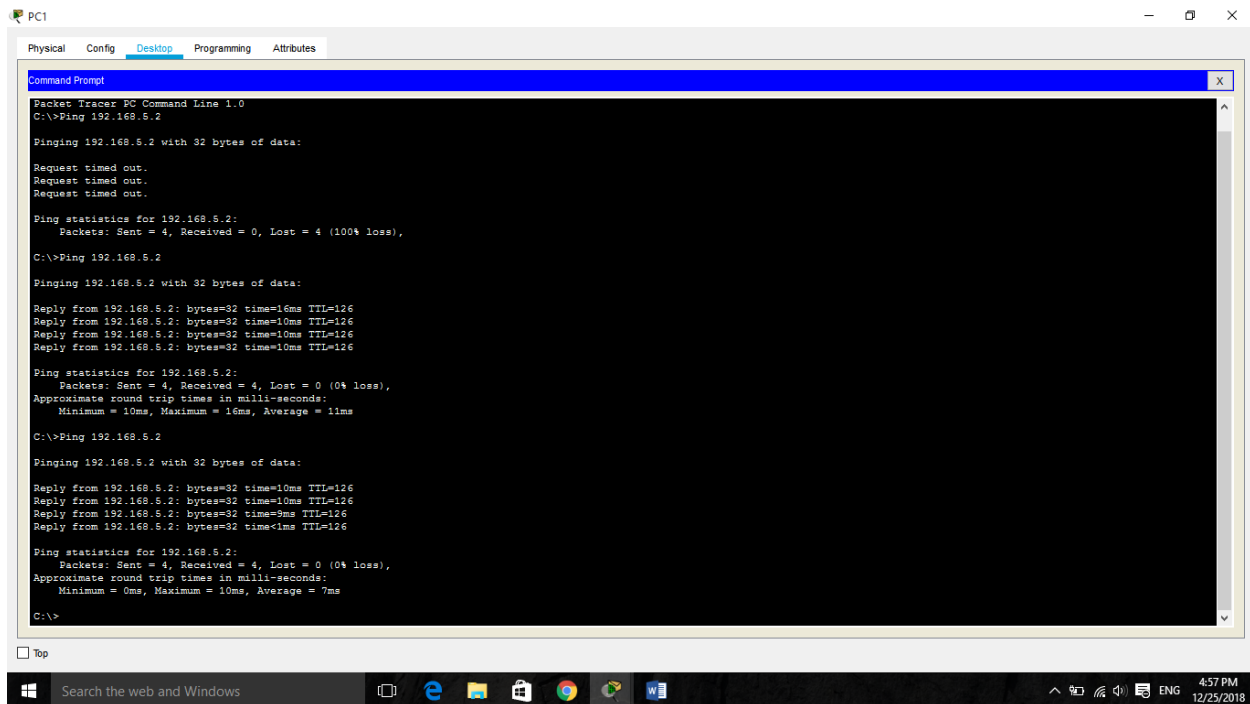
so that Ping succeeds from building to network FPT I use static static routing because such use can be connected. And first I need static routing for Multilayer Switch0 and Router1 of FPT network



and Router1 of FPT network

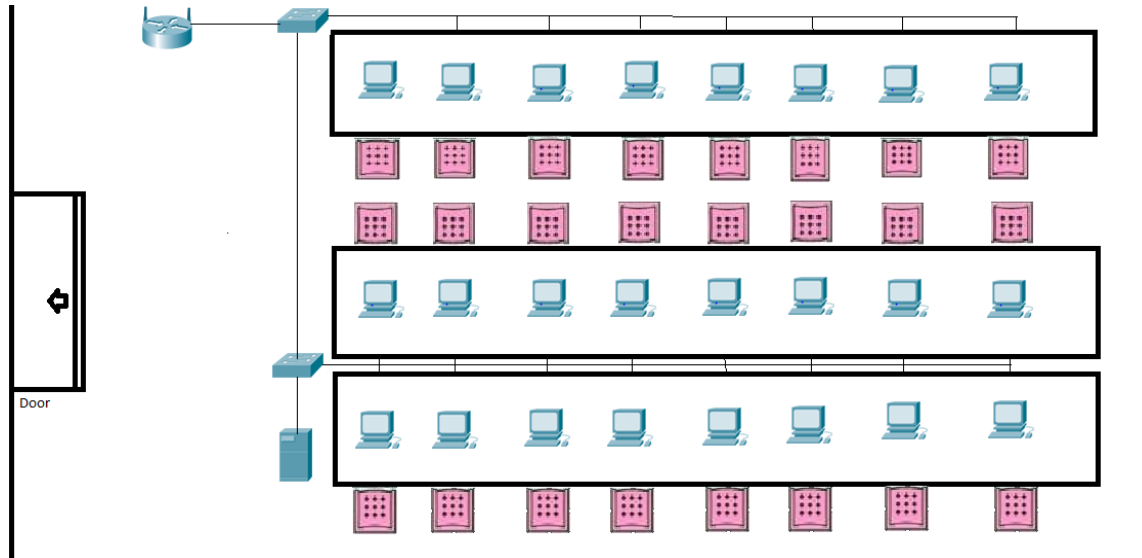


Here I use pc1 on the 1st floor to ping and access FPT server

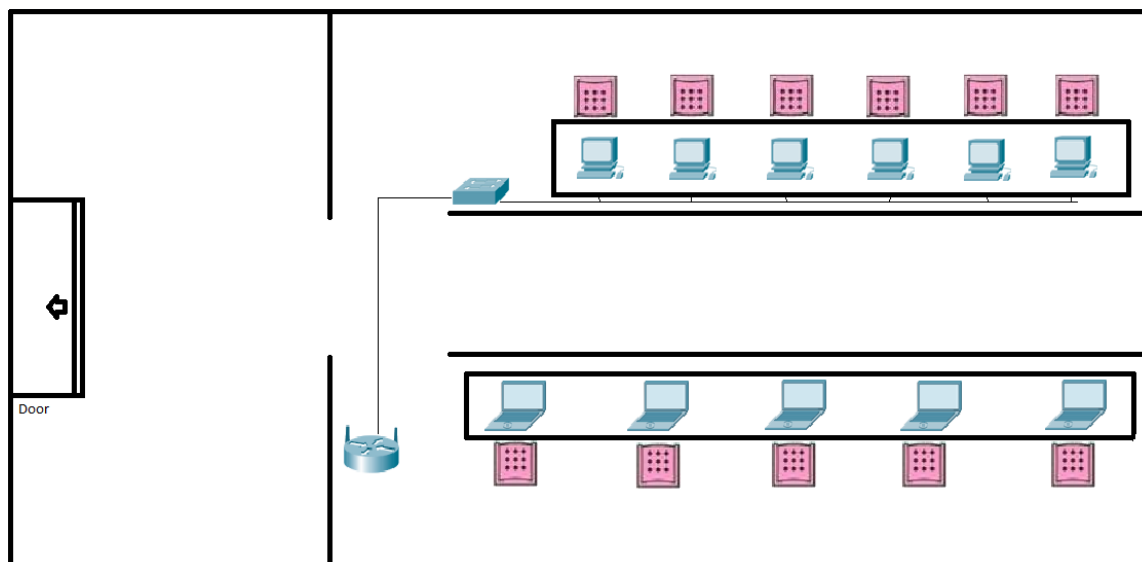


## 2.2 Physical model:

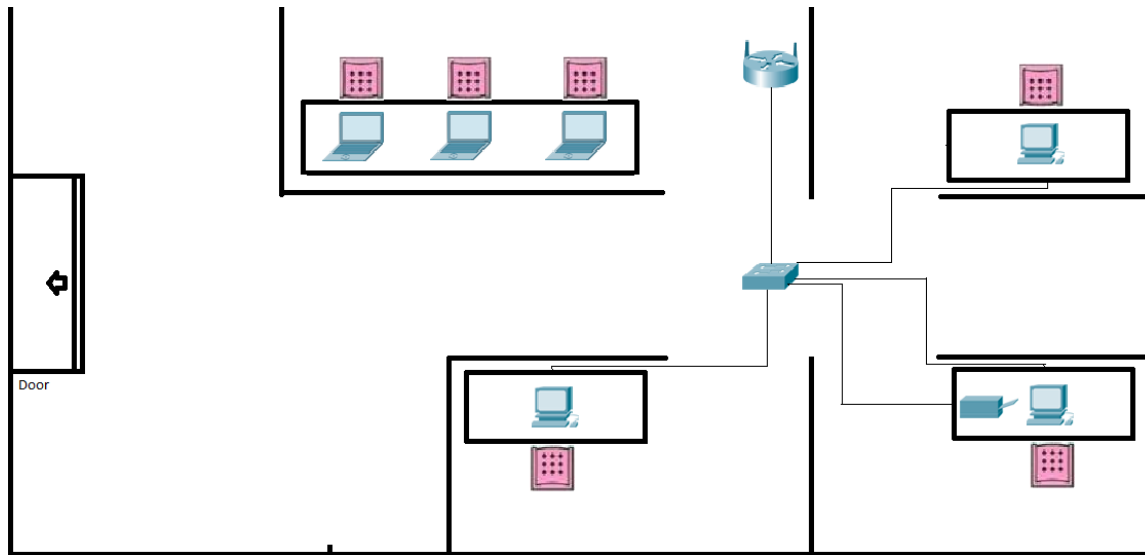
With this model on the first floor I designed two switches to be able to connect the computer and the wifi router and the server. The switch will be mounted on the wall or high position and the wire will be inserted into the wall or ceiling



With this model on the second floor there will be 2 rooms for network administrators and marketing staff, network administrators will need a stable connection so they can use the computer. I designed a switch to be able to connect the computer in the room of the network administrator and the wifi router in the room of the marketing staff because they will use the laptop.



With this model on the third floor, there will be 3 rooms for senior management including the Academic Manager and the Program Manager and a room for Programmer Management. This floor will resemble the 2nd floor with a switch and a wifi router. I design switches and wires in the ceiling and ward in the wall.



#### IV. Evaluate

With my design model and details of the network, I will evaluate according to 4 criteria such as fault tolerance, scalability and transmission quality, and security

- Fault tolerance: when I designed the network in the building, during the process of checking and using, there was an error such as breaking the network and affecting the entire school network system. It may depend on many factors such as mouse bite or natural factors such as thunderstorms or lightning or electric poles, and my solution is to buy more wires suitable for building equipment and connect directly. on the switch, doing so every time the network cable is broken, the backup wire will work. Each device will have a backup line such as wireless, pc, server etc.

- scalability, when I design a network for this 3-storey buildings, have reviewed the scalability so I decided to install an additional 25 computers in the lab. But a problem arises when it is mounted computer 25 will need a switch and switches for installation I buy only 24 gates and I decided to buy 2 switches for the lab to use for the present and future

- Quality of service: The internal network that I use for 3-storey building is fiber optic network with speed of 120mb / s and I use cat6 cable with 1000 'Gigabit' transmission speed enough to meet the demand Building

- Security: because this is an internal network, LAN is used in a 3-story building, I think security is essential and • In LAN system I will use security like wireless: secure VLAN division on each floor I use 2 devices that are a wireless router and Multilayer Switch. I then configured two devices and created a security layer for the building. The security class I designed is intended to prevent strangers from accessing the building's network and having a separate password account for users.

- and this intranet system I use IPV4 because it is enough to help provide the user's needs, it is very suitable for the model of the building. And IPV4 is not old compared to IPV6 and is suitable for the building's machinery system for 5 to 10 years.

References:

(Advantages and disadvantages of local area network (LAN), 2018)  
(Network topologies, 2016)  
(Advantages and disadvantages of wide area network (WAN), 2018)  
(Network topologies, 2016)  
(Network Devices, 2017)  
(What's Networking Software?, 2018)  
(Networking Standards, 2018)