

NETWORKING

TRINH THI DIEU HUYEN
GDD18606

ASSIGNMENT FRONT SHEET

Qualification	BTEC Level 5 HND Diploma in Computing		
Unit number and title	Unit 2: Networking		
Submission date	23/12/2019	Date Received 1st submission	23/12/2019
Re-submission Date	27/12/2019	Date Received 2nd submission	27/12/2019
Student Name	Trinh Thi Dieu Huyen	Student ID	GDD18606
Class	1619 GCS0801B.2	Assessor name	Ho Hai Van
Student declaration <p>I certify that the assignment submission is entirely my own work and I fully understand the consequences of plagiarism. I understand that making a false declaration is a form of malpractice.</p>			
		Student's signature	

Grading grid

P1	P2	P3	P4	P5	P6	P7	P8	M1	M2	M3	M4	D1	D2	D3

☐ **Summative Feedback:**

☐ **Resubmission Feedback:**

Grade:

Assessor Signature:

Date:

Signature & Date:

Table of Contents

LO1 Examine networking principles and their protocols.	7
P1. Discuss the benefits and constraints of different network types and standards.	7
I. Computer network systems include many types.	7
1. LAN network.	7
2. WAN network.	8
3. INTRANET network.	9
4. SAN networks.	10
5. MAN network.	11
II. Benefits of different network types.	12
1. LAN.	12
2. WAN.	13
3. INTRANET.	14
4. MAN.	14
5. SAN.	14
III. Standards.	15
1. Standards.	15
2. IEEE standard.	17
P2. Explain the impact of network topology, communication and bandwidth requirements.	18
I. Introduction about a network topology.	18
II. BACKBONE network (BUS).	19
III. STAR network.	20

IV. RING network.....	21
V. TREE TOPOLOGY.....	22
VI. BANDWIDTH network.....	23
VII. Network BANDWIDTH CAPACITY.....	23
VIII. IMPACT OF COMMUNICATION.....	23
M1. Compare common networking principles and how protocols enable the effectiveness of networked systems.	26
I. Compare common networking principles.	26
1. The same.....	26
2. The difference.....	27
II. How protocols enable the effectiveness of networked systems?	30
LO2 Explain networking devices and operations.	31
P3. Discuss the operating principles of networking devices and server types.....	31
I. Router.....	31
II. Switch.	32
III. HUB.....	34
IV. The operating principles of server types.	35
1. How does the server work?	35
2. What can the server do?	35
3. So, rent or buy server?.....	36
P4. Discuss the inter-dependence of workstation hardware with relevant networking software.....	36
I. Workstation and network software.	36
1. Workstation.....	36
2. Network software.....	36

II. The Inter-Dependence.....	37
M2. Explore a range of server types and justify the selection of a server, considering a given scenario regarding cost and performance optimization.	37
D1. Considering a given scenario, identify the topology protocol selected for the efficient utilization of a networking system.	40
LO3 Design efficient networked systems.	42
P5. Design a networked system to meet a given specification.	42
I. Setting up a network rack for a 3-storey building.....	42
1. Note.....	42
2. Objective.....	42
3. Operation.....	43
4. IP address.....	44
P6. Test and evaluate the design to meet the requirements and analyze user feedback.....	45
M3. Install and configure network services and applications on your choice.	48
D2. Design a maintenance schedule to support the networked system.....	51
I. The maintenance schedule to support the networked system.	51
LO4 Implement and diagnose networked systems.....	52
P7. Implement a networked system based on a prepared design.	53
P8. Document and analyze test results against expected results.....	65
1. Check IP Address of PCs, router, prints and servers.....	68
2. Check RIP.....	69
3. Check Telnet.....	71
4. Check FTP.....	72
5. Check Mail, Web.....	74
M4. Recommend potential enhancements for the networked systems.	76

D3. Use critical reflection to evaluate own work and justify valid conclusions	76
REFERENCE.....	77

LO1 Examine networking principles and their protocols.

P1. Discuss the benefits and constraints of different network types and standards.

I. Computer network systems include many types.

1. LAN network.

LAN is often used in an enterprise to provide Internet connection to all people in the same space with a single Internet connection. All Internet devices are capable of being configured as nodes in a LAN and can be connected to the Internet through a separate computer. Computers in the LAN are also used to connect office workstations to grant access to the printer.

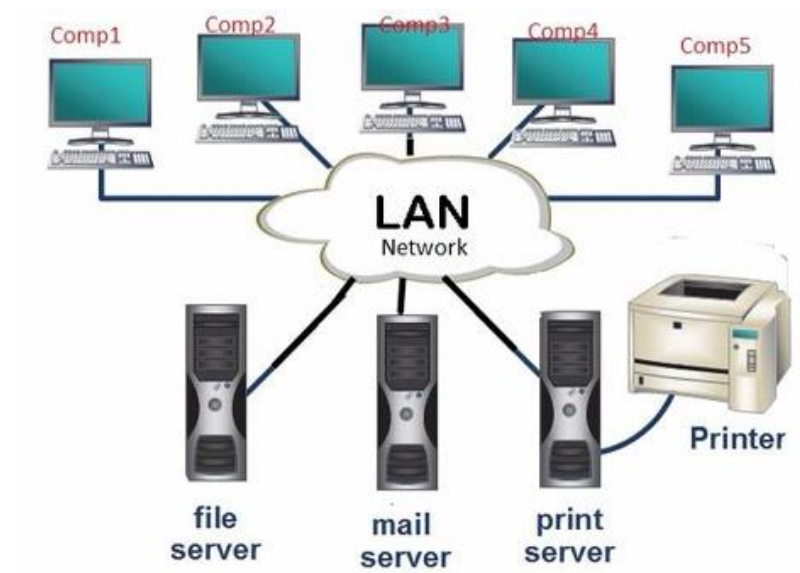


Image: Model connect LAN network.

2. WAN network.

When the LAN has a very small coverage in only one building, the WAN can cover a large geographical area, cross national or international borders. A WAN is done using the subscriber line provided by a service provider or by using switched network packets for data transfer.

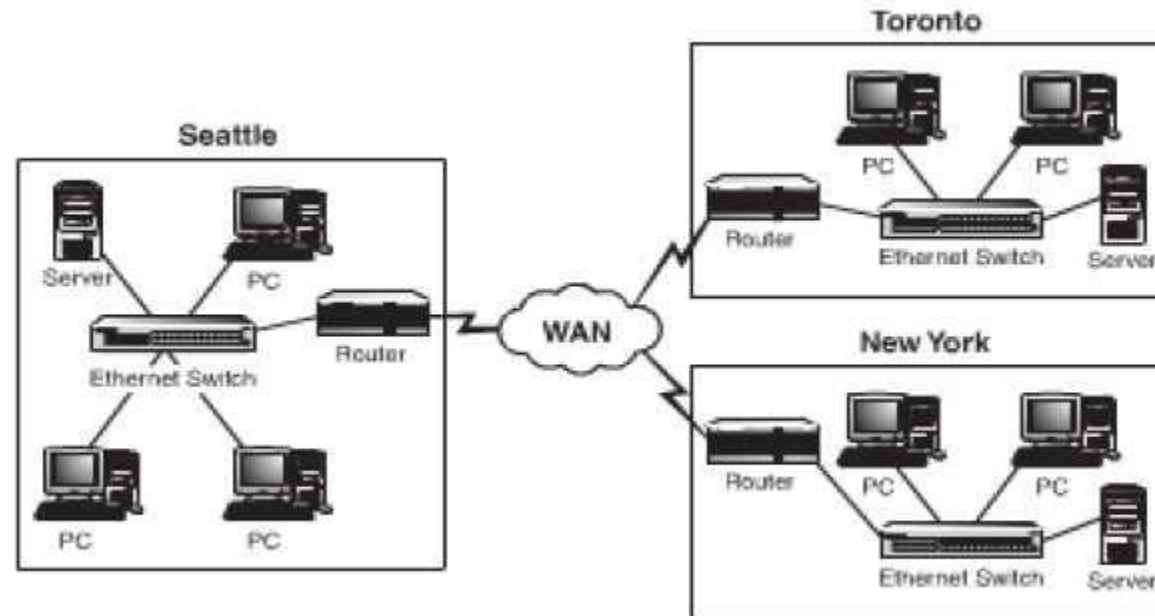


Image: Model connect WAN network.

3. INTRANET network.

An extended intranet that is basically a computer network where users from within the company can find all their resources without having to go outside another company, the INTRANET network may include LAN, WAN and MAN.

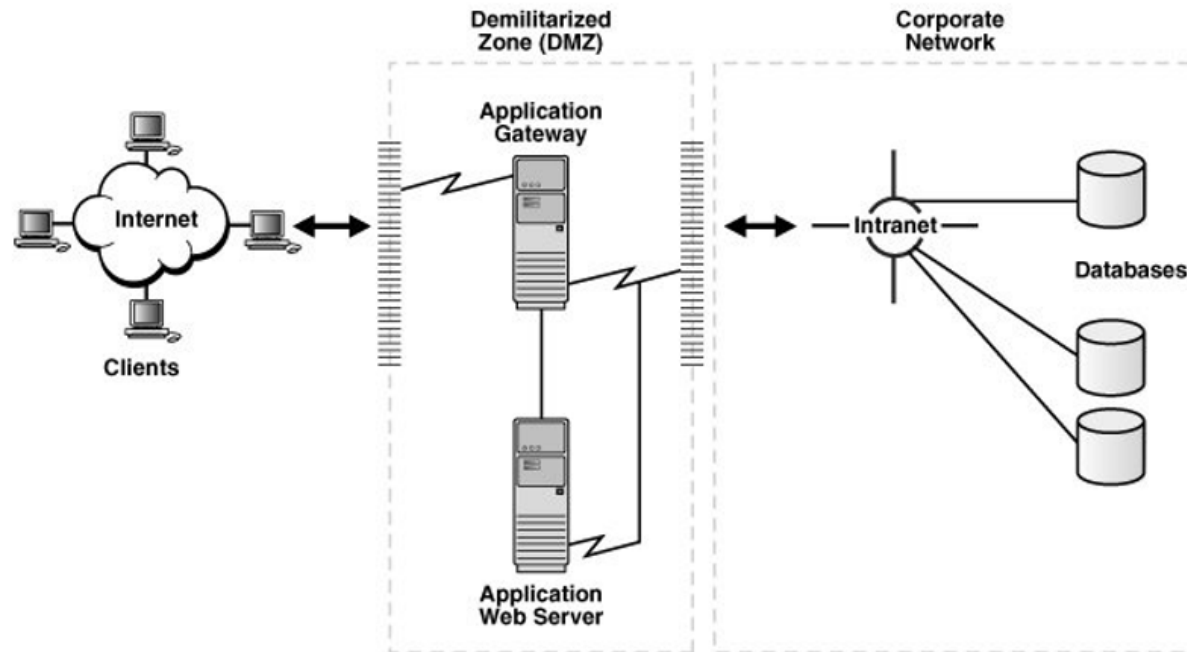


Image: Model connect INTRANET network.

4. SAN networks.

SAN networks, also known as storage networks, provide a high-speed infrastructure to move data between storage devices and file servers. SAN network performance is very fast, redundant features are available, the distance between machines in the SAN network can be up to 10 km and own a low cost, administrators can use the SAN network. same effect.

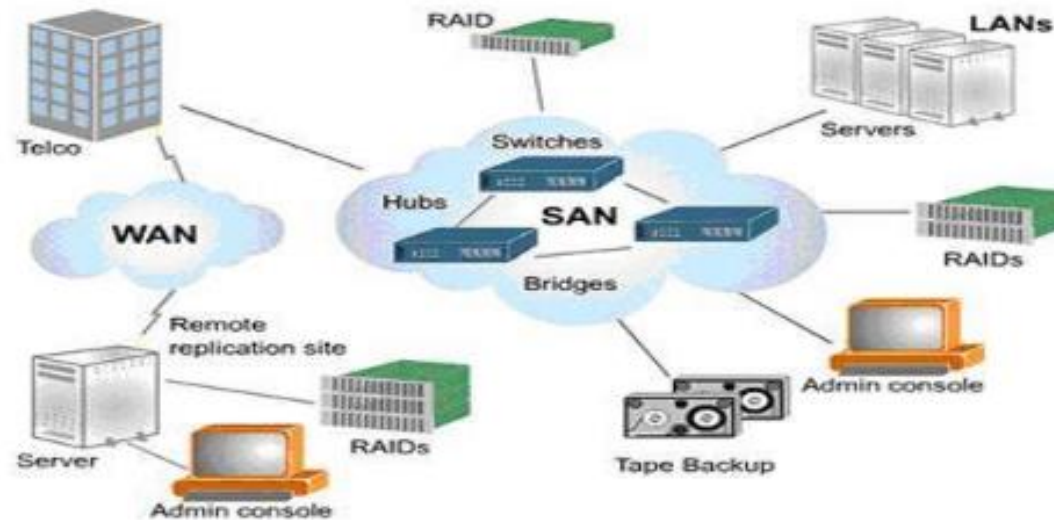


Image: Model connect SAN networks.

5. MAN network.

- + The MAN network has the same connection as the LAN model. It is connected to the LAN together through transmission media, cables, communication devices connected to each other in a certain area like in a city.
- + The MAN network provides the ability to use three types of services simultaneously: VOICE -DATA -VIDEO.
- + Data transmission. / Video conferencing / Watch movies on demand / Cable TV / Distance education / Remote diagnosis / Phone / High-speed Internet access...
- + Customers: are organizations and enterprises with many branches and parts connected to each other and can connect to inter-province, international, industrial parks, large commercial areas, software parks, hi-tech park, new urban area, office building...

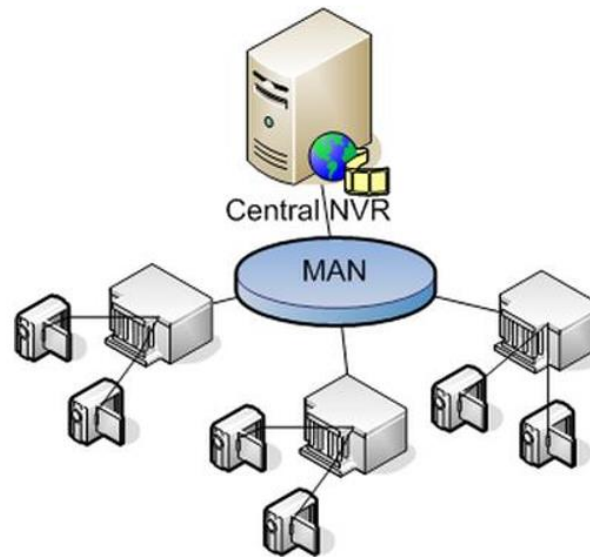


Image: Model connect MAN network.

II. Benefits of different network types.

1. LAN.

- + Ability to share resources: With peripheral network storage space such as computers, printers are shared with workstations without requiring hardware. This helps businesses reduce costs and at the same time improve productivity at work.
- + Standard computer hardware is used for workstations as well as network servers. From there bring you flexible design, easy to maintain effectively.

- + The common application is during the transition for users to many different environments. The benefit of this is reduced costs than the ability to license independently.
- + The detail of LAN system is FTTH fiber optic cable service. Through file sharing, users can convert files easily. At the same time increase the security of the data you send. Also allows users to access internal applications of the system.
- + LAN systems allow centralized data storage, providing the ability to share data from a single server system. Like the Tape Offsite Storage service, it not only helps businesses reduce costs but also makes the backup process easier and does not cause data loss when an incident occurs.
- + LAN also helps us to support some fault tolerant features. This has improved the reliability of users with LAN. At the same time, reducing the downtime for businesses.
- + The LAN system also provides users with a centralized security, allowing access control to their network and resources. Depending on the requirements of the user, there are separate data protection policies.
- + The ability to communicate with other users is also easier by the messaging system. Therefore, LAN makes management more effective.

2. WAN.

- + User access control.
- + Modern networks almost always have one or more servers that allow centralized management for users and network resources they have access to. Personal and user-based user credentials may be as simple as usernames and passwords, but increasing attention needs to be paid to security issues of computers and devices. This owner is important to make sure that sensitive information is only available to users themselves.

- + Store and share information.
- + Computers allow users to create and manipulate information.
- + The network provides both an information store and a mechanism to share that information with other network users.
- + Connections are kept employees and guests can be connected using the same network together.

3. INTRANET.

- + Provide service to the globe.
- + Free internet for everyone.

4. MAN.

- + Low cost, stable speed, meet the requirements of information security, simple to manage and easy to convert. Providing businesses with many types of value-added services at the same time on a connection line about voice-data-video. The service helps manage the two-point information technology system infrastructure in a simple, effective and easy way to deploy professional applications.

5. SAN.

- + Combining block and file-level data into 1 data block simplifies storage.
- + Easy integration provides file, fastest storage.
- + Ensuring data security for businesses, reducing overall storage costs.
- + Flexibility in allowing connections, improving performance.
- + Scalable and reliable provide high availability solution.

III. Standards.

1. Standards.

+ In order for the network to reach its maximum capacity, the standards selected must allow network expansion to be able to serve future unforeseen applications at system installation, and that will also allow the network to work with the devices are manufactured from many different brands.

+ The International Standards Council is ISO (International Standards Organization), which is established by member countries. Jobs in North America are governed by ANSI (American National Standards Institute) in the United States. ANSI commissioned IEEE (Institute of Electrical and Electronics Engineers) to develop and set technical standards for LAN.

+ ISO has launched a 7-level model (layers, also called layers or layers) for the network, called the type of open connection system or OSI model (Open System Interconnection).

+ The function of the lower level includes the preparation for the higher level to fulfill its function. A complete network that operates with all its functions must ensure there are 7 levels of structure from low to high.

+ Level 1: Physical layer

The essence of this level is to connect the network elements into a system by physical methods, at which level there will be procedures to ensure the switching requirements work to create paths. Real transmission for the information bit sequence.

+ Level 2: Data Link Layer

The task of this level is to convert information in the form of network bits into bits of information called frames. Then ensure successive transmissions of the frames to the physical level, and handle the messages from the sending and receiving station.

In short, the primary task of this level 2 is to create and organize the frame as well as process the information related to it.

+ Level 3: Network layer

The network level aims to ensure the exchange of information between subnets in a large network, this level is also known as the information level between subnets. Within the network, data packets can travel in different directions to their destination. Therefore, at this level it must be pointed out which data path can go and which path is banned at that time. Usually the network is used in cases where the network has many subnets or large networks and allocates over a large space with many different information nodes.

+ Level 4: Transport Layer

The task of this level is to process information to transition functions from above (contact level) to below (network level) and vice versa. In essence, the level of transmission is to ensure information between servers. This level receives information from the exposure level, divides it into smaller data units, and delivers them to the network level.

+ Level 5: Exposure level (Session Layer)

This level allows users to interact with each other over the network. Thanks to the level of exposure the users can establish with each other, when a conversation is established, it is possible to manage that conversation at the request of the user. A link between users is called a contact. The contact allows the user to be registered to a remote time-sharing system or to transfer a file between two machines.

+ Level 6: Reception level (Presentation Layer)

This level addresses procedures for receiving data in a regular way into the network, the task of this level is to choose how to receive data, convert characters and digits of ASCII code or other codes and symbols. self-control into a unified binary code so that different types of machines can penetrate the network.

+ Level 7: Application Layer

This level is responsible for serving the user directly, providing all necessary coordination requirements for the user, general service requirements such as transferring files, using system terminals, etc. The level of use ensures the automation of the information process, helping users to exploit the best network.

The open interconnect system (OSI) is a system that allows communication with other systems, in which different networks, using different protocols, can notify each other through the Pastern program to transfer from one Protocol to another protocol.

2. IEEE standard.

+ The IEEE LAN standard was developed based on the IEEE 802.11 committee. The IEEE 802.3 standard relates to the CSMA / CD network, which includes both basic and extended band versions. The IEEE 802.4 standard relates to token alignment and IEEE 802.5 includes token transmission rings.

+ According to 802 standards, the data link is divided into 2 sub-levels: the logical control sub-level LLC (Logical Link Control Sublayer) and the subnet level control intrusion network MAC (Media Access Control Sublayer). The sub-level LLC plays the role of data organization, information organization to transmit and receive. The MAC sub-level only serves to control the network intrusion. The sub-level LLC procedure is not affected by the use of different transmission paths, thus making it more flexible to exploit.

+ The 802.2 standard at sub-level LLC is equivalent to the HDLC standard of ISO or X.25 of CCITT.

- + The 802.3 standard defines an instant network penetration method that can detect CSMA/CD information overlap errors. The CSMA/CD method, introduced in 1993, is aimed at improving network efficiency. According to this standard the levels are paired together through couplers.
- + The 802.4 standard is essentially a network penetration method in the form of transmitting token probes through stations and bus links.
- + The 802.5 standard is for a rotary network and is based on a token exploration signal. Each station receives a token probe signal and receives the token and begins the process of transmitting information in the form of frames. The frame has the same structure as that of the 802.4 standard. This method of network intrusion sets many different priorities for the whole network and for each station, the rules are both designed by the user and user defined.

P2. Explain the impact of network topology, communication and bandwidth requirements.

I. Introduction about a network topology.

A network topology is the arrangement of various elements (links, nodes, etc.) of a computer network. Mostly, it is the topological structure of a computer network, and can be described in terms of physical and logical. The physical topology (physical topology) is the arrangement of various network components, including the equipment storage and installation of the connecting cables, while the logical topology (logical topology) indicates How data flows in a network. The distances between the network nodes, physical junctions, transfer rates, and / or signal types may differ between the two networks even though their topology may be identical.

II. BACKBONE network (BUS).

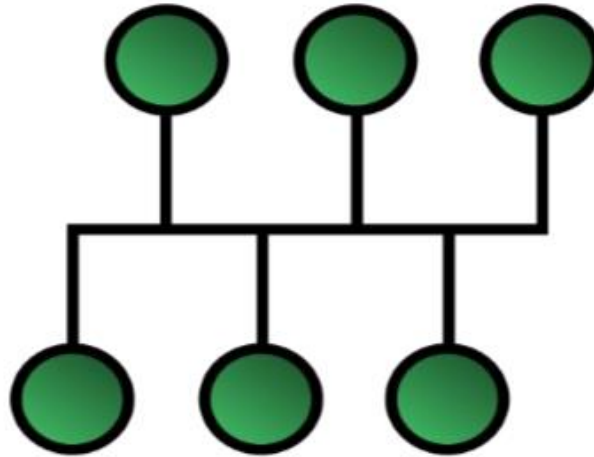


Image: Model connect BACKBONE network (BUS).

All stations divide a common bus route. The main current is limited at the two ends by two special connectors called end points. Each station is connected to the main shaft via T connector or transceiver. The bus network model operates on Point to Multipoint or Broadcast links. The backbone network is easy to design and has a low cost, but it has poor stability, when it is difficult to detect, only one broken node will go down the entire network.

III. STAR network.

The star network has all stations connected to a central device that receives signals from the stations and transfers them to the destination station. Depending on network communication requirements, the central equipment may be a switch, router, hub or central server. The role of the central equipment is to establish Point to Point links.

The network setup is simple, it is easy to reconfigure the network (add, remove stations) and can control and troubleshoot quickly, and maximize the speed of the physical transmission line. However, the line length connecting a station to the central equipment is limited (within 100m, with current technology).

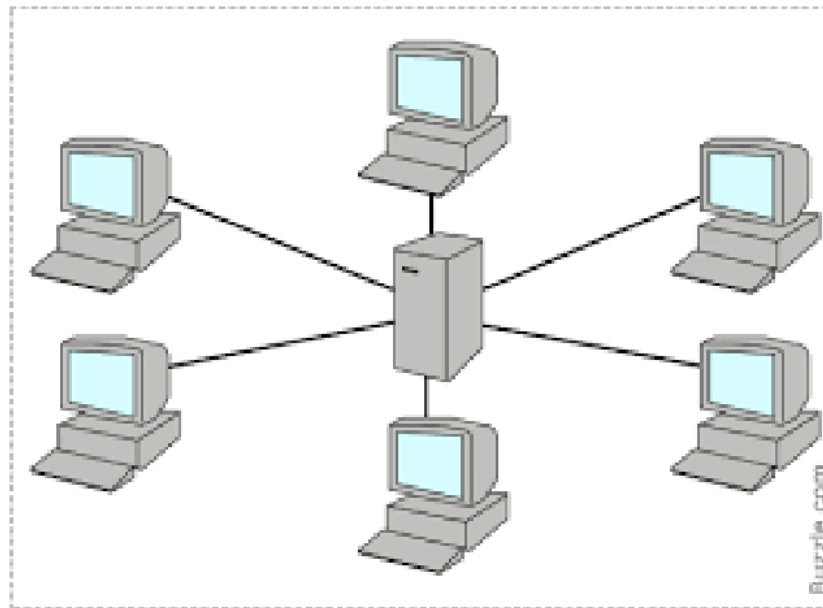


Image: Model connect STAR network.

IV. RING network.

On the network, the ring is transmitted in a single direction. Each station of the network is connected to each other by a relay that receives the signal and then forwards to the next station on the ring. Thus, the signal is circulated on a loop in a successive sequence of Point to Point links between transmitters. The ring network has advantages and disadvantages similar to the star network, but the ring network requires a more complex network access protocol than the star network. There are also mixed connections between such network architectures as the Star Bus or Star Ring.

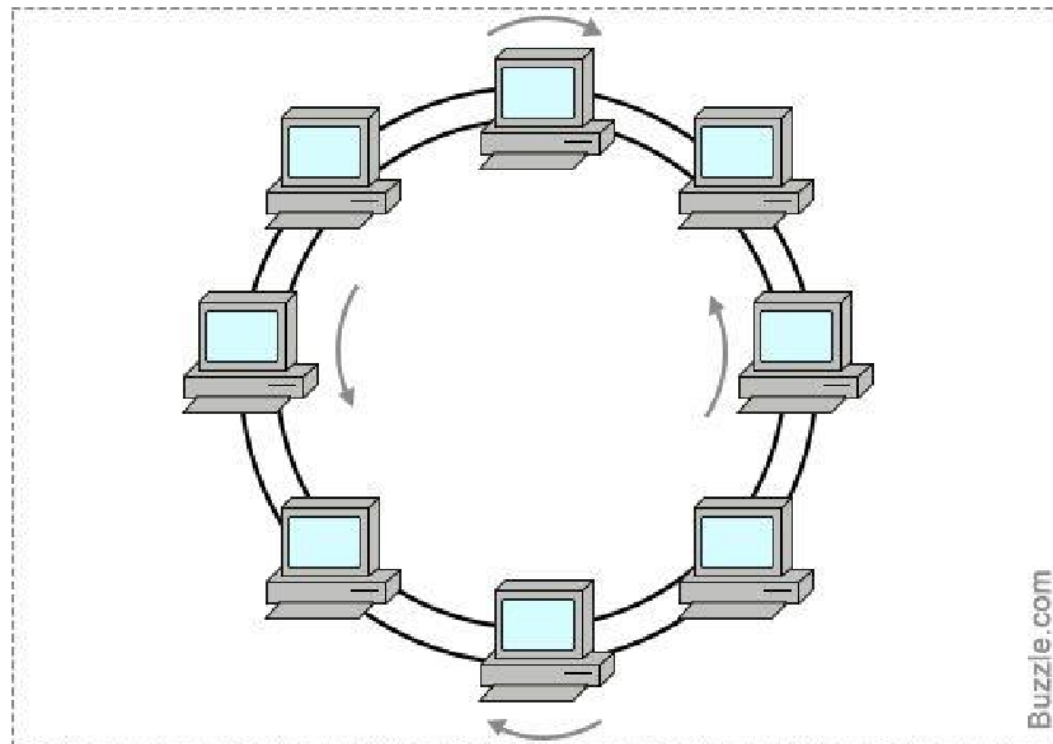


Image: Model connect RING network.

V. TREE TOPOLOGY.

Tree topology is a development of the star model and involves multiple star networks linked together by a central bus. The tree network is often considered the most scalable topology, as it is easy to expand through the addition of additional star networks.

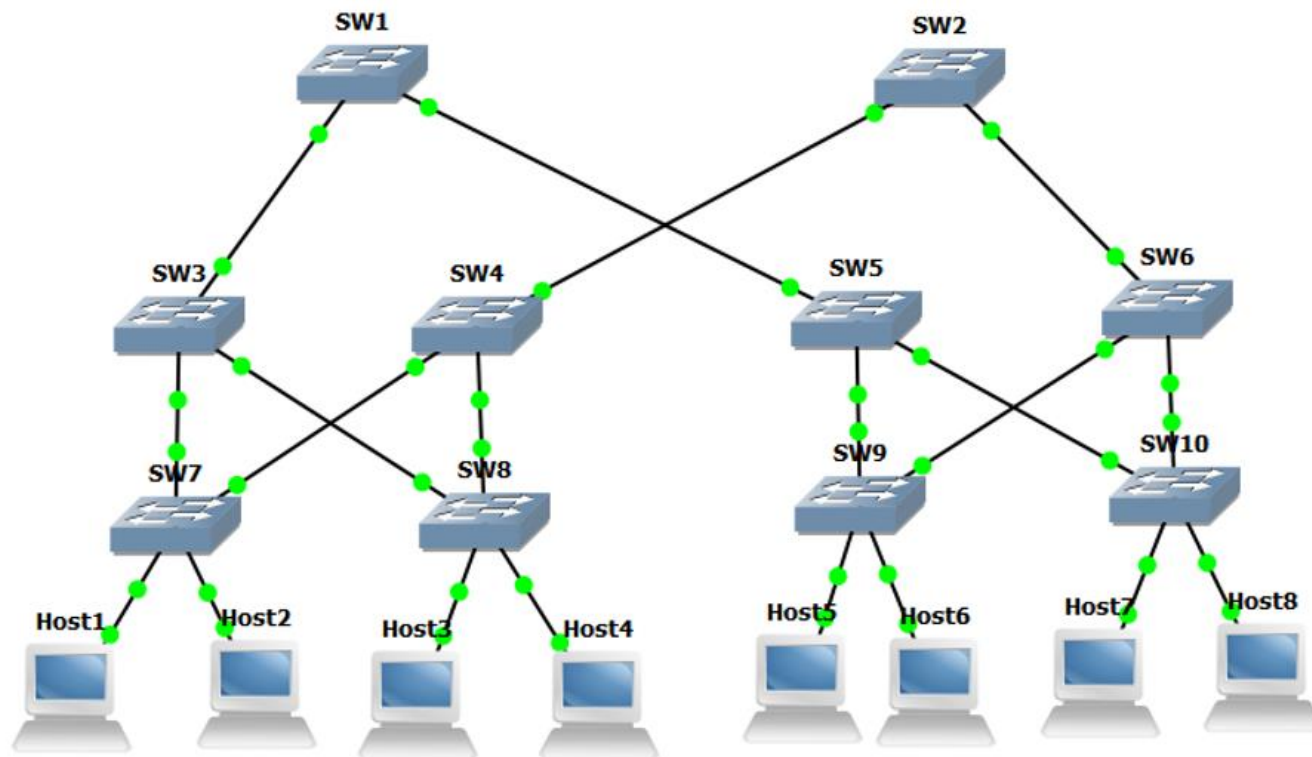


Image: Model connect TREE TOPOLOGY.

VI. BANDWIDTH network.

- + In computing, bandwidth is the maximum data rate on a given path. Bandwidth can be characterized as network bandwidth, data bandwidth, or digital bandwidth.
- + This definition of bandwidth is in contrast to the fields of signal processing, wireless communications, modem data transmission, digital and electronic communications [citation needed], where bandwidth is used to denote tape. The analog signal is measured in hertz, which means the frequency range between the lowest and highest frequencies can be reached while the specified attenuation of the signal power level is met.
- + However, the actual bit rate that can be achieved depends not only on the signal bandwidth but also on the channel noise.

VII. Network BANDWIDTH CAPACITY.

The term bandwidth sometimes determines the net bit rate “*highest bit rate*”, “*information rate*” or physical layer “*useful bit rate*”, channel capacity or maximum throughput of the communication line. logic or physics in digital communication systems. For example, the bandwidth test measures the maximum throughput of a computer network. The maximum speed that can be maintained on a link is limited by the Shannon-Hartley channel capacity for these communication systems, which depends on the bandwidth in hertz and noise on the channel.

VIII. IMPACT OF COMMUNICATION.

Communication has a great influence on all issues of society. Communication affects public awareness, from awareness affects public actions and behavior. When a public behavior is repeated in order, the custom eventually becomes the norm of society. Thanks to the media, these issues are socially accepted and spread quickly among the public.

 **Communication has a great impact on the following major groups of subjects:**

For the state government:

- Help state agencies to inform people about economic, cultural and social policies and laws to the public, persuade the public to change their perceptions and behave lawfully. In addition, the government has also asked the media to explore public opinion before issuing legal documents. Thanks to the media, the government regulates its management policies and creates high consensus among the people.
- The media makes the government, the executors of the law cleaner and more transparent, through the critical information of the people in the society.

For the public:

- Help people update socio-economic information, laws at home and abroad. Help people entertain and learn about the lifestyle of those around them. Media advocates beauty and eliminates evil. Communication plays a role in creating trends in lifestyle, culture, fashion ...
- In addition, the media also helps people to respond, speak up and protect their legitimate rights and interests.

For the economy:

- Thanks to the media, businesses can promote products and services, helping buyers identify and use products and services. Communication also creates demand for products and services, helps companies create jobs for many people, and helps the economy develop. More than 90% of a company's marketing budget is spent using media to advertise products and services to attract consumers to recognize and use their products and services.
- Communication itself is an important economic sector of a country, creating jobs and creating value for the economy.
- Communication is also a tool to help consumers reflect on the quality of products and services of manufacturers.

Calculating 2 sides of communication:

- Communication also has its two sides if the information and images transmitted are negative, the impact of the communication also creates negative effects for the public objects in society. Especially for young people, those with low levels of awareness, unable to filter information, if the information from negative media is easily enticed and has negative impacts on self and for social community.
- In the economy, communication affects people's consumption to help people consume more, to help the economy develop. However, communication also impacts on people consuming more and more than necessary. People are increasingly working to cater to consumer needs. Material values are increasingly appreciated by the society over the spiritual values. High production and consumption will destroy the environment and adversely affect people's lives.

+ Bandwidth requirements.

The channel bandwidths needed to transmit various types of signals, using various processing schemes. Every signal observed in practice can be expressed as a sum (discrete or over a frequency continuum) of sinusoidal components of various frequencies. The plot of the amplitude versus frequency constitutes one feature of the frequency spectrum (the other being the phase versus frequency). The difference between the highest and the lowest frequencies of the frequency components of significant amplitudes in the spectrum is called the bandwidth of the signal, expressed in the unit of frequency, hertz. Every communication medium (also called channel) is capable of transmitting a frequency band (spectrum of frequencies) with reasonable fidelity. Qualitatively speaking, the difference between the highest and the lowest frequencies of components in the band over which the channel gain remains reasonably constant (or within a specified variation) is called the channel bandwidth.

Clearly, to transmit a signal with reasonable fidelity over a communication channel, the channel bandwidth must match and be at least equal to the signal bandwidth. Proper conditioning of a signal, such as modulation or coding, however, can increase or decrease the

bandwidth of the processed signal. Thus, it is possible to transmit the information of a signal over a channel of bandwidth larger or smaller than that of the original signal.

Amplitude modulation (AM) with double sidebands (DSB), for example, doubles the signal bandwidth. If the audio signal to be transmitted has a bandwidth of 5 kHz, the resulting AM signal bandwidth using DSB is 10 kHz. Amplitude modulation with a single sideband (SSB), on the other hand, requires exactly the same bandwidth as that of the original signal. In broadcast frequency modulation (FM), on the other hand.

M1. Compare common networking principles and how protocols enable the effectiveness of networked systems.

In establishing an Internet connection there are many network protocols. Each protocol has different setup and usage. Usually these protocols define the characteristics of the connection and are also very diverse.

I. Compare common networking principles.

1. The same.

Simply put, the protocol is rules and the network protocol are a set of rules that the network must follow. It's formal standards and policies made up of rules, procedures and formats that defines communication between two or more devices over a network. These network protocols are created to conducts the action, policies and affairs of the end-to-end process of timely, secured and managed data or network communication. It defines communication rules and conventions, incorporates all process requests and has constraints including the connection between computers, routers, servers, and supported devices. other networks when they want to communicate with each other. Network protocols must be confirmed and installed by the sender and receiver to *ensure network \ data communication*. It also applies software and hardware nodes that communicate on a network.

2. The difference.

Internet Protocol Suite:

+ Internet protocol suite is the set of communication protocols that implement the protocol stack on which the internet runs. The Internet protocol suite is sometimes called the TCP/IP protocol suite, after TCP/IP, which refers to the important protocols in it, the Transmission Control Protocol (TCP) and the Internet Protocol (IP). The Internet protocol suite can be described by the analogy with the OSI model, but there are some differences. Also, not all of the layers correspond well.

Protocol Stack:

+ A protocol stack is the complete set of protocol layers that work together to provide networking capabilities.

Transmission Control Protocol (TCP):

+ The Transmission Control Protocol is the core protocol of the internet protocol suite. It originated in the network implementation in which it complemented the Internet Protocol. Therefore, the entire suite is commonly referred to as TCP/IP. TCP provides reliable delivery of a stream of octets over an IP network. Ordering and error-checking are main characteristics of the TCP. All major Internet applications such as World Wide Web, email and file transfer rely on TCP.

Internet Protocol (IP):

+ The Internet Protocol is the principal protocol in the Internet protocol suite for relaying data across networks. Its routing function essentially establishes the internet. Historically it was the connectionless datagram service in the original Transmission Control Program. The other being the connection-oriented protocol (TCP). Therefore, the Internet protocol suite is referred as TCP/IP.

Common Protocols Used and Their Ports:

Hypertext Transfer Protocol (HTTP):

- + The HTTP is the foundation of data communication for the World Wide Web. The hypertext is structured text that uses hyperlinks between nodes containing texts. The HTTP is the application protocol for distributed and collaborative hypermedia information system.
- + The default port of HTTP is 80 and 443 is the secured port.

File Transfer Protocol (FTP):

- + The FTP is the most common protocol used in the file transferring in the Internet and within private networks.
- + The default port of FTP is 20/21.

Secured Shell (SSH):

- + SSH is the primary method used to manage the network devices securely at the command level. It usually used as the alternative of the Telnet which does not support secure connections.
- + The default port of SSH is 22.

Telnet:

- + Telnet is the primary method used to manage network devices at the command level. Unlike SSH, Telnet does not provide a secure connection, but it provides a basic unsecured connection.
- + The default port of Telnet is 23.

Simple Mail Transfer Protocol (SMTP):

+ SMTP is used for two primary functions. It is used to transfer email from source to destination between mail servers and it is used to transfer email from end users to a mail system.

+ The default port of SMTP is 25 and secured (SMTPS) is 465 (Not standard).

Domain Name System (DNS):

+ Domain name system is used to convert the domain name to IP address. There are root servers, TLDs and authoritative servers in the DNS hierarchy.

+ The default port of DNS is 53.

Post Office Protocol version 3 (POP 3):

+ The Post Office Protocol version 3 is one of the two main protocols used to retrieve mail from the internet. It is very simple as it allows the client to retrieve complete content from the server mail box and deletes contents from the server.

+ The default port of POP3 is 110 and secured is 995.

Internet Message Access Protocol (IMAP):

+ IMAP version 3 is another main protocol that used to retrieve mail from a server. IMAP does not delete the content from the mail box of the server.

+ The default port of IMAP is 143 and secured is 993.

Simple Network Management Protocol (SNMP):

- + The Simple Network Management Protocol is used to manage networks. It has abilities to monitor, configure and control network devices. SNMP traps can also be configured on network devices to notify a central server when specific action is occurring.
- + The default port of SNMP is 161/162.

Hypertext Transfer Protocol over SSL/TLS (HTTPS):

- + HTTPS is used with HTTP to provide same services, but with a secured connection which is provided by SSL or TLS.
- + The default port of HTTPS is 443.

II. How protocols enable the effectiveness of networked systems?

- + The defined and standardized protocols will help the system operate, meaning that we will use open protocols to communicate and this is a factor supporting the efficient use of network systems.
- + Also, because protocols are a set of rules governing communication between computers on the network. The network protocol rules include rules governing the following network characteristics: access methods, permitted physical topologies, cables and data transmission rates. Therefore, for the system to work effectively, it forces the system to do exactly all of the above, i.e. to provide the right access method, correct connection address and physical topologies. The device or transmitter must be correct and of good quality. Not only that, installation, connection or communication requirements require the participation of both parties (send / receive). In short, all order and principles need to be complied with in order for the system to function and function properly when using the protocol i.e. the system has permission to operate from the protocol and can be applied. Use all the features and good functionality of the protocol to ensure the connection speed and signal transmission line are always in good condition.

LO2 Explain networking devices and operations.

P3. Discuss the operating principles of networking devices and server types.

Different networking devices and hardware types - hub, switch, router, modem, bridge, repeater. Short bytes: different network devices have different roles in the computer network. These network devices also operate in different segments of the computer network performing various tasks.

I. Router.



+ A router is a computer network device that transfers data packets over an inter-network and to endpoints, through a process called "routing". It operates on the 3rd floor (transport layer) following the OSI model.

- + Routers have the role of connecting 2 or more networks together (usually 2 LANS or wans or connecting 1 LANS with its IPS network). The router has the function of sending network data packets between two or more networks, from one to many final destinations from the router. Therefore, its position in an internet is where two or more networks are connected.
- + In terms of structure, routers usually include one or more LAN ports and may include antenna that emits WIFI signals. Normally, we will use the router to connect our computer to the internet (using the network cable from the LAN port) or use our devices to catch the WIFI signal generated by the router.
- + The router uses the headers in the packets to determine the fastest path for packets (the network layer) from one host to the other.

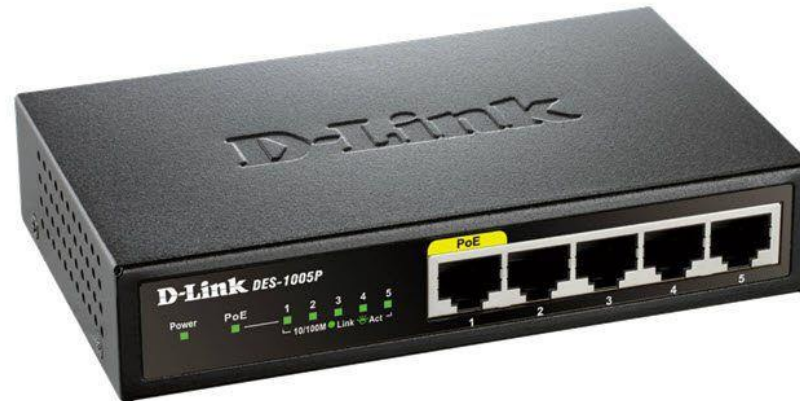
II. Switch.



- + A switch is a device used to connect networks together in a star-shaped network. According to this model, the switch acts as the central device, all computers are connected here. In the OSI reference model, switches operate at the data link layer, in addition there are some advanced switches that operate at the network layer.

- + Let's talk a little about network design in the form of stars. Nowadays, this is a commonly used network design. Lan application range is often used to connect computers in the home, in a game room, in a net room, in a building of work, school. Because the radius is about 100 meters, computers are located farther than normal people use the internet to exchange information. The network has such advantages as high speed, a broken machine does not affect the network connection of the remaining devices.
- + The switch decides to transfer the frame based on the mac address, so it is classified as class 2 device. Because the switch has the ability to choose the path to decide the frame transfer, the LAN can operate more efficiently.
- + The switch knows which machine is connected to its port by learning the source mac address in the frame it receives. When two machines make contact with each other. The switch only establishes a virtual circuit between the two corresponding ports without affecting traffic on the other ports. Therefore, high performance LANS often use full switching.
- + Switches focus on connections and decide which path to use for efficient data transfer. The frame is switched from the receiving port to the emitting port. Each port is a connection providing host bandwidth selection.
- + In ethernet hub, all ports connected to a main network, in other words, all devices connected to the hub will share the network bandwidth. If two clients have established a connection session, they will use a significant amount of bandwidth and the activity of the remaining devices connected to the hub will be reduced.
- + To solve this problem, the switch handles each port as a separate segment. When machines at different ports need to communicate with each other, the switch will switch frames from one port to the other and ensure the bandwidth selection for each connection session.

III. HUB.



- + The hub is a central connection point for all other devices in the network that connect to (like a switch). Hub connects segments of a LAN.
- + A hub connects multiple computers (or other network devices) together to form a single segment network in the system center.
- + On this network segment, all computers can communicate directly with each other. Ethernet hubs are the most common types, hubs with many other types of networks coexist.
- + A hub consists of a series of ports that accept each network cable. Small hub networks usually contain four connection ports. They contain 4 or sometimes 5 ports, and one is reserved for "uplink" connecting to a hub or similar device. Larger centers contain 8, 12, 16, and even 24 ports.
- + Hubs classify as a device layer in the OSI model. At the physical layer, the hub can support very little in the network. Hubs do not read any data passing through them and are not aware of their source or destination. Basically, a hub simply receives and sends packets, can amplify the electrical signals and broadcast these packets to all other devices on the network.

IV. The operating principles of server types.

- + A server is a computer system that provides services to other computers in the enterprise (and its users) in the same system. These servers often have a strong configuration and are installed with the windows server operating system, maintained continuously, to ensure other computers in the same system can work.
- + The server is used to operate for many requests, data storage, for online services such as: website, app programming, online games, etc., thus requiring the server to have a high configuration to carry goods. Dozens of jobs, so the servers often use the Xeon central processor family, which is the best line of central processors to run multi-tasking today.

1. How does the server work?

Server works on the internet, or intranet. But now, server users are using the internet, to handle a number of services such as website, game, app, software ... On the server system will store a lot of data of applications that users, so that when users log in through the server to check and respond to users, users can log in and use the service at their computers.

2. What can the server do?

A powerful server can help the whole company work more smoothly, compared to a normal workstation, for example, when you want to download a file from the server, if in case there is a lot of people want to download the file, it will result in overload and can lead to interruption of your work. Servers are often purchased and rented by users located in data centers, which provide adequate electricity, internet, cold room ... To ensure the server operates continuously without the least errors, or they can rent server according to your desire to use.

3. So, rent or buy server?

This is based on user requirements, the benefit of buying a server is that you can put it in your company, have the peace of mind about your data, many users have the psychological will be losing data when renting a server, that mentality is completely misleading, the server hire, the provider only provides the server and the administration is managed by the technical staff of the organization hosting the server logical, so there is no basis for the psychology of losing data. On the other hand, buying a server will take a lot of cost for a server with a strong configuration to ensure the work of the business. So, the effective solution now, is to hire server from reputable providers. By renting a server, businesses will save a large amount of cost and will not have to take a lot of risk when the server has hardware problems, because when the company hired the server, the provider will bear complete risk of server failure.

P4. Discuss the inter-dependence of workstation hardware with relevant networking software.

I. Workstation and network software.

1. Workstation.

The workstation is a computer specifically designed for scientific or engineering applications. Intended primarily to be used by one person at a time, they are usually connected to a local area network and run multi-user operating systems. The term workstation is also loosely used to refer to everything from the mainframe terminal to the pc connected to the network.

2. Network software.

Network software is a basic 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, and network software packages into the solution. Software-defined networks (SDNs) separate software from hardware, making it easy to innovate and adapt networks to quickly respond to

changing network needs. Separating functions from hardware, such as firewalls or load balancers, is called network function virtualization (NFV).

II. The Inter-Dependence.

A network is formed, when more than one computer is connected to each other, for the purpose of communication between them. There are servers also present in a network, providing lots of data storage. Servers to manage multiple computers need an operating system. When a request is received from a computer, over the internet to the server, there are several scheduling algorithms that determine what requests or resources will be provided for which requests. In this way, a piece of software interacts with workstation hardware.

M2. Explore a range of server types and justify the selection of a server, considering a given scenario regarding cost and performance optimization.

Different servers do different jobs, from serving email and video to protecting internal networks and hosting Web sites. Servers are often dedicated, meaning that they perform no other tasks besides their server tasks. Different servers do different jobs, from serving email and video to protecting internal networks and hosting Web sites.

Server Types:

- + Proxy Server: sits between a client program (typically a Web browser) and an external server (typically another server on the Web) to filter requests, improve performance, and share connections.
- + Mail Server: Almost as ubiquitous and crucial as Web servers, mail servers move and store mail over corporate networks (via LANs and WANs) and across the Internet.

- + **Server Platforms:** A term often used synonymously with operating system, a platform is the underlying hardware or software for a system and is thus the engine that drives the server.
- + **Web Server:** At its core, a Web server serves static content to a Web browser by loading a file from a disk and serving it across the network to a user's Web browser. This entire exchange is mediated by the browser and server talking to each other using HTTP.
- + **Application Server:** Sometimes referred to as a type of middleware, application servers occupy a large chunk of computing territory between database servers and the end user, and they often connect the two.
- + **Real-Time Communication Server:** formerly known as chat servers or IRC Servers, and still sometimes referred to as instant messaging (IM) servers, enable large numbers users to exchange information near instantaneously.
- + **FTP Server:** One of the oldest of the Internet services, File Transfer Protocol makes it possible to move one or more files securely between computers while providing file security and organization as well as transfer control.
- + **Collaboration Server:** In many ways, collaboration software, once called 'groupware,' demonstrates the original power of the Web. Collaboration software designed to enable users to collaborate, regardless of location, via the Internet or a corporate intranet and to work together in a virtual atmosphere.
- + **List Server:** List servers offer a way to better manage mailing lists, whether they be interactive discussions open to the public or one-way lists that deliver announcements, newsletters or advertising.
- + **Telnet Server:** A Telnet server enables users to log on to a host computer and perform tasks as if they're working on the remote computer itself.
- + **Open Source Server:** From your underlying open source server operating system to the server software that help you get your job done, open source software is a critical part of many IT infrastructures.

+ Virtual Server: In 2009, the number of virtual servers deployed exceeded the number of physical servers. Today, server virtualization has become near ubiquitous in the data center.

⇒ My choice is virtual server: A server, usually a Web server, that shares computer resources with other virtual servers. In this context, the virtual part simply means that it is not a dedicated server-- that is, the entire computer is not dedicated to running the server software. Virtual Web servers are a very popular way of providing low-cost web hosting services. Instead of requiring a separate computer for each server, dozens of virtual servers can co-reside on the same computer. In most cases, performance is not affected and each web site behaves as if it is being served by a dedicated server. However, if too many virtual servers reside on the same computer, or if one virtual server starts hogging resources, Web pages will be delivered more slowly.

⇒ Benefits When using a virtual server are:


- **More stable and reliable:** Shared web hosting may no longer be trusted by users. Due to the rapid growth in this segment, has overloaded the servers of web hosting companies. Which leads to a situation where there are thousands of customers present on the same web server. The reliability of such service providers must be checked very closely before registering. Host shared hosting in this way can affect timing. And performance of the site.

- **Better control:** When you use VPS hosting, you get full root access to the server. If you want to install a custom software package. You can do it easily in a virtual environment without the support of a hosting provider. When you have a virtual environment, it will be very helpful.

- **Inexpensive:** With the use of VPS hosting, the entire dedicated server is divided into many complete computing environments. Used by different customers. In this way, the same physical server is used by many people. Each VPS has completely separate RAM parameters. And you can use the entire allocated resource. For example: VPS you have 2GB of RAM, 2 CPUs. You will completely use up these resources. Without being shared by other websites. Because each VPS is an independent virtual server system based on a physical server.

- **Scalability is not a problem:** Sites that have achieved stability do not have too many customer traffic issues. Scalability does not seem to be their problem. But for the site has only recently started. And will develop quickly in a short time. For all such sites. The ability and size of storage resources without any time constraints or technical issues is critical. In VPS hosting. Your website is hosted on a virtual server that has allocated some computer resources. The great thing about VPS is being able to allocate more resources faster without any problems. For example, if you want to increase capacity when a spike is expected. You can do it with the click of a button. In case of dedicated storage, the RAM upgrade. Or hosting related to physical installation will result in large down time and traffic loss.
- **Good support for SEO to the top websites on search engines Google, Bing, COCCOC, Yahoo:** Using Cloud VPS helps you to have a stable website access speed, the installation of configuration of all modules or plugin is relatively easy easily do not worry about being blocked or incompatible, because I can configure the settings on VPS regardless of using shared hosting.

D1. Considering a given scenario, identify the topology protocol selected for the efficient utilization of a networking system.

 *In the project, I used tree topology to use for network. It is a combination of star topology and BUS topology. In which the star networks are connected to each other by the BUS network. In a tree topology, nodes are connected to each other in a hierarchical manner.*

+ In the star topology, every node in the network is connected to the central computer or node, taking care of the network. Every device in the network has a direct connection to the central node and every node is indirectly connected to other nodes by the central node. upon destination. The center manages and controls all data transfers and connections within the star topology. The center also acts as a repeater to ensure no or minimal data loss during transmission.

⇒ The star network topology has the advantage that a node's failure will not affect the entire network, devices can be added, deleted, reconfigured or modified without disturbing the network, with fewer cables, Easy to install, modify and troubleshoot.

+ Bus topology refers to a network setup where nodes or devices are interconnected using a single cable. It is because of this setup why bus topology is often referred to as line topology or backbone. Depending on the nodes or devices that need to be connected, a coaxial cable or an RJ45 cable is typically used to connect the devices. Bus topology usually consists of two ends and signals travel from one end to another. Bus topology is unidirectional and data is transferred from one end to another in a single direction.

⇒ Its advantages are cost-effective, less cable required to connect the nodes, very easy to understand, provides an easy feasibility to extend or to reduce a network, ideal for small network setups.

+ *On the other hand, the combination of star topology and bus topology creates a tree topology that brings the advantages of the topology for this project is that it is flexible, scalable, easy. to add or remove nodes, suitable for large networks and easy to manage. These things are very relevant to the network model in schools.*

⇒ *When combining many network topologies together, they can compensate for each other, supplementing the advantages, which will make the whole system reduce disadvantages and become more optimized, better bandwidth.*

LO3 Design efficient networked systems.

P5. Design a networked system to meet a given specification.

I. Setting up a network rack for a 3-storey building.

1. Note.

-In general, there are 85 PCs, 3 printers, 1 router, 4 switches and 4 servers.

+50 PCs for students

+32 PCs for staffs

+3 PCs for admins

2. Objective.

- All employees, managers, teachers, students can use the network and access the network with optimal speed easily.
- All computers can communicate with each other
- Increasing bandwidth for floors 1 and 2 to ensure optimal network access requirements.
- Ensuring aesthetics, neat, clean.
- Increasing the security of the network by creating web servers for people in the building to access the wrong network quality assurance.

3. Operation.

+ **1st floor**: 3 rooms, 1 switch in room 1, 1 witch in room 2, 3.

- Room 1 (Room Server): 2 Server.

- Room 2 (Staff): 32 computers, 3 prints.

- Room 4 (Admin): 3 computers.

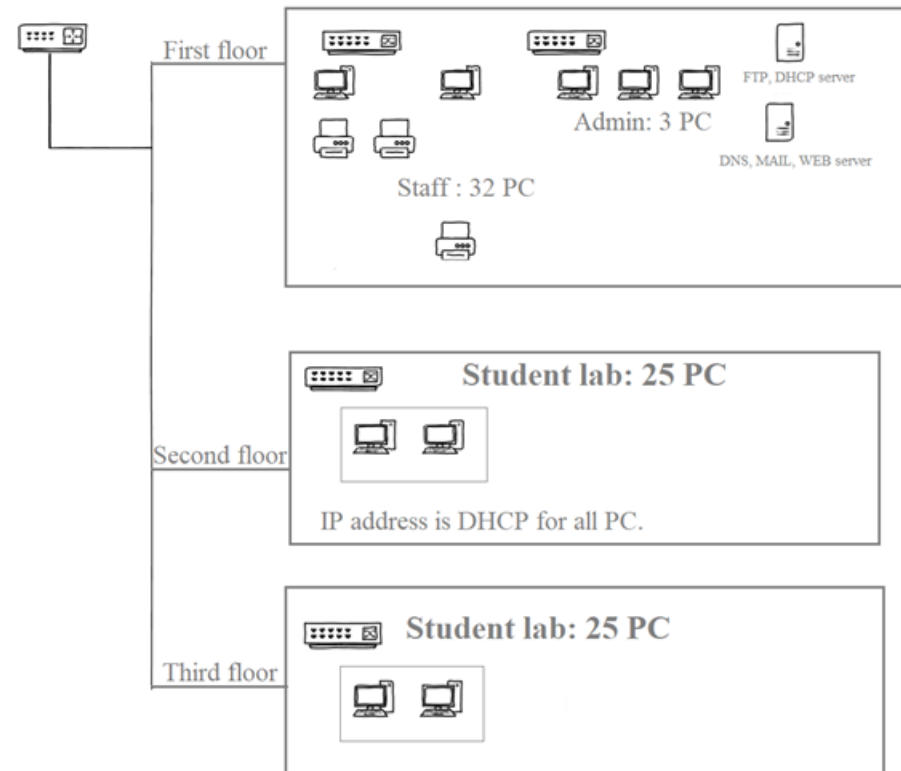
+ **2nd floor**: 1 room, 1 switch.

- Room 1 (the laboratory is also a student's room): 25 computers.

+ **3rd floor**: 1 room, 1 switch.

- Room 1 (the laboratory is also a student's room) 25 computers.

This is how I'm going to manage these devices in the building:



4. IP address.

IP address for PCs (Dynamic IP addresses and static addresses)

-There are two ways to make IP addresses which are DHCP (dynamic IP address) or static address. Each type of IP address has its own advantages and disadvantages.

-For my network, all PC will be static address because when using a static address, you will be able to access shared items or servers on your network easily.

-An IP address has two part: Network ID and Host ID. My network ID is 192 so it is in class C, so the subnet mask will be 255.255.255.0

-About default-router, I will type the IP address of the Router in that Ethernet depends on the gateway of the router to which network. For example, the first-floor network is connected to the router that has the IP address 192.168.2.3 in the FastEthernet7/0, so the default-router is 192.168.2.3

However, I still configured additional DHCP on the server to support those who do not want to be use IP static.

P6. Test and evaluate the design to meet the requirements and analyze user feedback.

- First, check the IP addresses of all PCs.

When placing the mouse cursor on a PC, a notice board appears. If the link shows "UP" and the IP address of the newly installed address is correct. Similarly, check all other remaining PCs to make sure that the static IP address has been set successfully.

- Secondly, check the IP of all remaining devices such as routers, switches, ... the same test results as when checking a PC or using the command: "*show ip route*".

- Next, check the connection between devices using the "PING" command. If successful, it will show "0% lose". Continue testing on all devices in the network model. All devices must be connected to each other. It means having to "PING" successfully.

- After that, I will continue to test workstations, servers, switches, routers, network cables and network cable connectors. All devices must be stable and successfully configured.

- Finally, check other services like: Telnet, FTP, ... All services must be stable, optimized and successfully configured.

- Network requirements:

+ Fast access

+ High speed

+ Centralized network management and control

+ If a computer error occurs, the system will not be affected

+ When a network error occurs, it must be easily overcome

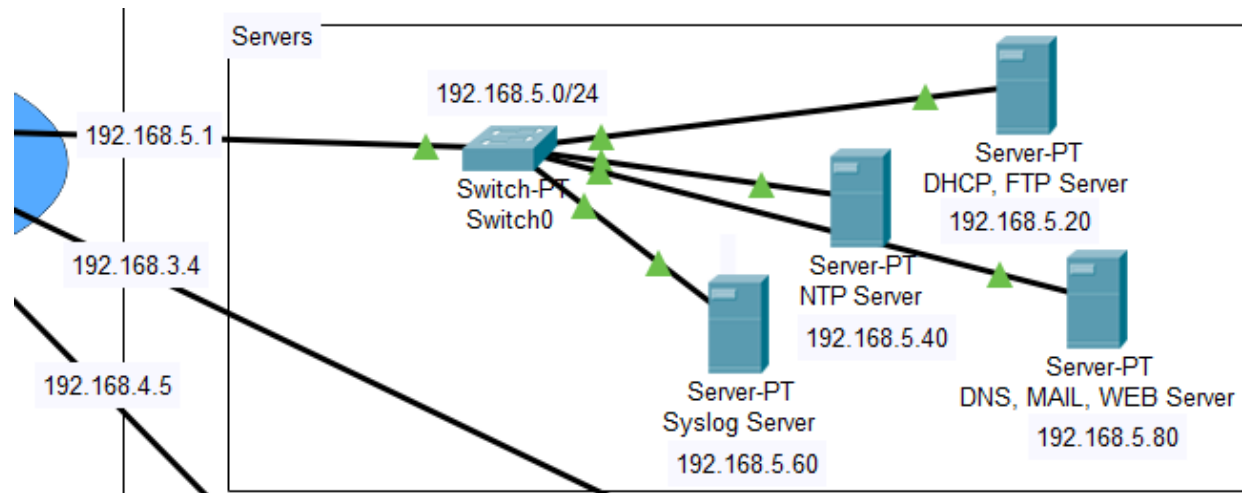
+ Cost:

Product Number	Name	Brand	Description	Unit price	Quantity	Price (VND)
1	Router Cisco 2821-SEC K9	CISCO	Compliant standard: IEEE 802.3 Connects to 5 ports	12.000.000	1	12.000.000
2	48-Port Gigabit PoE with 4-Port 10-Gigabit Smart Switch CISCO SG250X- 48PK9-EU	CISCO	48 ports Connects to 32 PCs for staffs	40.560.000	1	40.560.000

3	26-Port 10/100/1000Mb PS Gigabit Ethernet Switch Cisco SG200-26	CISCO	26 ports to connect 25 PCs of each floor	7.560.000	2	15.120.000
4	Switch 5 Port 10/100M Tenda SG105	TENDA	Connects to 3 PCs for admins and 4 servers	268.000	2	536.000
5	Server Robo ST E5- 2620V4	CISCO		31.000.000	4	124.000.000
6	Photocopy Ricoh MP 2352	RICOH		13.300.000	2	26.600.000
7	Cable CommScope AMP cat.6 UTP	COMMSCOPE	300m	3.195.000	1 box	3.195.000
8	HP Deskjet Ink Advantage 5525 e All in One	HP		2.950.000	1	2.950.000
9	PC Dell Optiplex Core i5 3470, Ram 8gb, SSD 120GB and computer screen Dell 21.5 inch	DELL		5.560.000	85	472.600.000
10	Headphone Sony MDR- ZX110AP	SONY		442.000	85	37.570.000
TOTAL	735.136.000					

M3. Install and configure network services and applications on your choice.

I use 4 Server (NTP help for FTP).



+ **FTP:** Staff and administrators will manage and notify students so only they have the right to create and edit ie read, list, delete, write and rename while students can only read and list. This will be confidential and safe to avoid inaccurate notifications and fake news.

+ **NTP and Syslog:** Using syslog and NTP makes time more accurate. In addition, you can check the time easily.

NTP Server

Physical Config **Services** Desktop Programming Attributes

SERVICES

- HTTP
- DHCP
- DHCPv6
- TFTP
- DNS
- SYSLOG
- AAA
- NTP**
- EMAIL
- FTP
- IoT
- VM Management
- Radius EAP

NTP

Service ☒ On ☐ Off

Authentication

☐ Enable ☒ Disable

Key: Password:

December 2019 12:39:47PM

Sun	Mon	Tue	Wed	Thu	Fri	Sat
24	25	26	27	28	29	30
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31	1	2	3	4

☐ Top

Can edit the time
directly to this
table

```
Router>en
Password: huyen
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#ntp server 192.168.5.20
Router(config)#ntp update-calendar
Router(config)#service timestamps log datetime msec
Router(config)#logging host 192.168.5.40
Router(config)#exit
Router#
*Mar 01, 01:55:27.5555: SYS-5-CONFIG_I: Configured from console
by console
*Mar 01, 01:55:27.5555: %SYS-6-LOGGINGHOST_STARTSTOP: Logging to
host 192.168.5.40 port 514 started - CLI initiated
Router#
```

SERVICES
HTTP
DHCP
DHCPv6
TFTP
DNS
SYSLOG
AAA
NTP
EMAIL

Syslog

Service

☒ On
☐ Off

	Time	HostName	Message
1	Dec 23 13:34:55.736	192.168.5.60	*Dec 23, 13:34:55.3434: %SYS-5-CON...

D2. Design a maintenance schedule to support the networked system.

I. The maintenance schedule to support the networked system.

 *Need periodic maintenance 1 time per month.*

First, server maintenance need:

- + Control access to the network or server
- + Check and configure network security services (Microsoft ISA, Firewall, Checkpoints).
- + Check, configure and update the latest versions of anti-virus software, trojan software, and spyware adware for the entire computer system at the customer company.
- + Store business data such as accounting, office operations, customer text files to different storage devices.
- + Optimize the garbage collection and optimize software applications, office software, and security software on the customer's computer system.
- + Ensure the operation of the Email, File, Document, Internet, Print systems regularly, stably and safely for customers' work.
- + Backup the server configuration (CD, DVD or tape) to ensure the server always operates properly.
- + Record system monitoring (maintenance book).

Second, workstation maintenance need:

- + Check and configure the connection of anti-virus software between the workstation and the server.

- + Backup, archive documents, email content, address book for all company's computers to storage devices: CD, Magnetic Tape, Hard Drive, ... (Depending on the requirements and needs of guests), ensuring the security of important customer data and can effectively prevent data loss.
- + Optimize checking for garbage removal and optimization of application software, office software, and security software on the customer's computer system.
- + Ensure the operation of the systems Email, File, Document, Internet, Print regularly, stably and safely for customers' work.

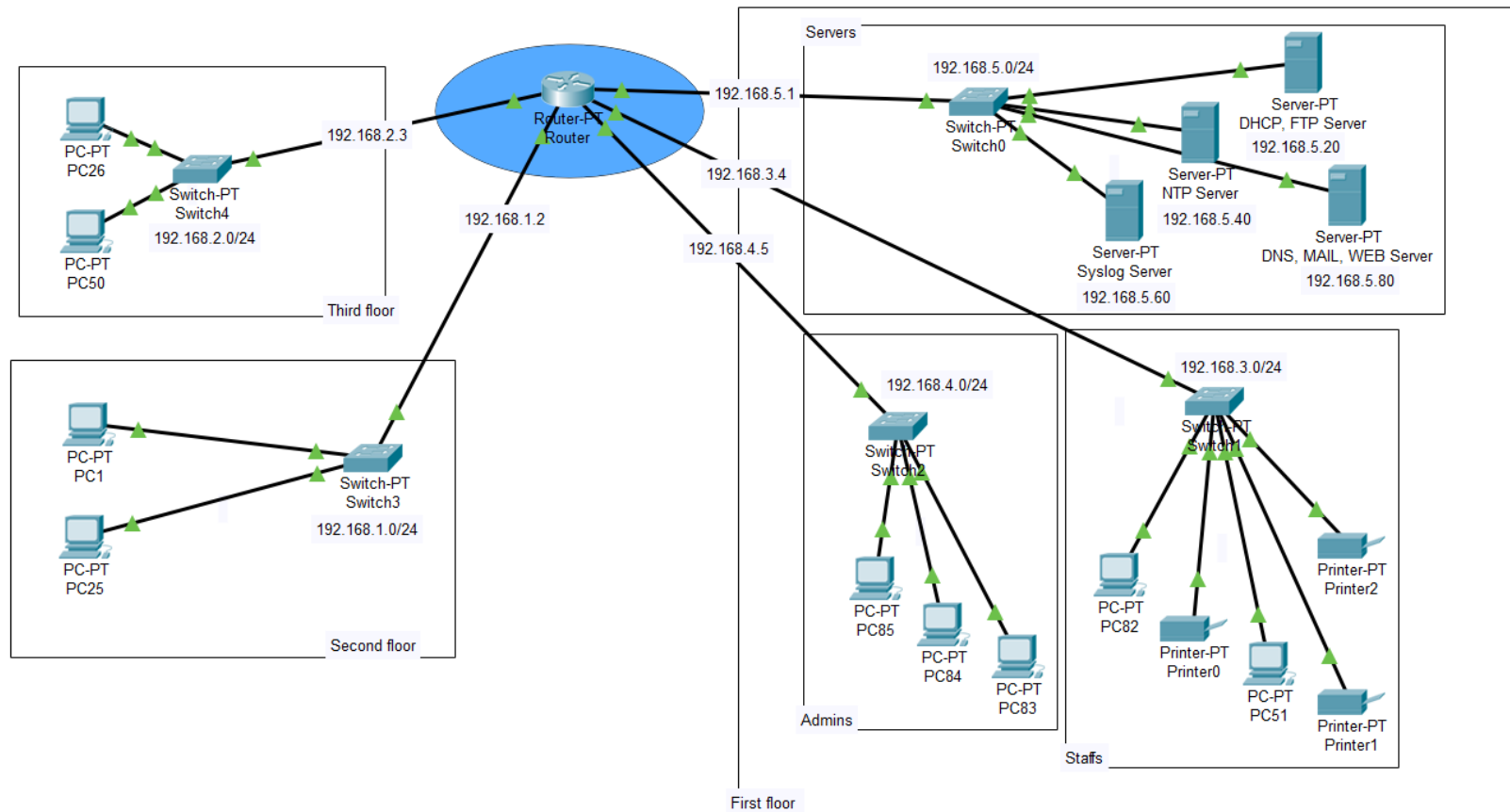
Finally, network maintenance need:

- + Configure the network for access by machines
 - + Review the entire network cabling system, make sure the cabling system is designed and placed in an environment in accordance with technical standards.
 - + Draw a server, workstation, peripherals and network cable layout.
 - + Check and test all cables and connectors to ensure satisfactory signal transmission.
 - + Record system monitoring (maintenance book).
- ⇒ In addition, can install new functions for network system.

LO4 Implement and diagnose networked systems.

P7. Implement a networked system based on a prepared design.

-This is the complete networking of the building:



- On the First floor will have the 4 Servers and 2 networks for staffs and admins.
- On the Second floor just have only 1 network for students use. On the Third floor too.

+ IP address of PC Third floor (student labs).

PC26

Physical Config **Desktop** Programming Attributes

IP Configuration X

Interface FastEthernet0

IP Configuration

☐ DHCP ☒ Static

IP Address 192.168.2.26

Subnet Mask 255.255.255.0

Default Gateway 192.168.2.3

DNS Server 192.168.5.80

PC50

Physical Config **Desktop** Programming Attributes

IP Configuration X

Interface FastEthernet0

IP Configuration

☐ DHCP ☒ Static

IP Address 192.168.2.50

Subnet Mask 255.255.255.0

Default Gateway 192.168.2.3

DNS Server 192.168.5.80

+ IP address of PC Second floor (students labs).

PC1

Physical Config **Desktop** Programming Attributes

IP Configuration X

Interface FastEthernet0

IP Configuration

☐ DHCP ☒ Static

IP Address 192.168.1.1

Subnet Mask 255.255.255.0

Default Gateway 192.168.1.2

DNS Server 192.168.5.80

PC25

Physical Config **Desktop** Programming Attributes

IP Configuration X

Interface FastEthernet0

IP Configuration

☐ DHCP ☒ Static

IP Address 192.168.1.25

Subnet Mask 255.255.255.0

Default Gateway 192.168.1.2

DNS Server 192.168.5.80

+ IP address for PC of Staff and Admin at First floor.

Admin Room

PC85

Physical Config **Desktop** Programming Attributes

IP Configuration X

Interface FastEthernet0

IP Configuration

☐ DHCP ☒ Static

IP Address 192.168.4.85

Subnet Mask 255.255.255.0

Default Gateway 192.168.4.5

DNS Server 192.168.5.80

PC84

Physical Config **Desktop** Programming Attributes

IP Configuration X

Interface FastEthernet0

IP Configuration

☐ DHCP ☒ Static

IP Address 192.168.4.84

Subnet Mask 255.255.255.0

Default Gateway 192.168.4.5

DNS Server 192.168.5.80

PC83

Physical Config **Desktop** Programming Attributes

IP Configuration X

Interface FastEthernet0

IP Configuration

☐ DHCP ☒ Static

IP Address 192.168.4.83

Subnet Mask 255.255.255.0

Default Gateway 192.168.4.5

DNS Server 192.168.5.80

Staff Room

PC82

— □ >

Physical Config **Desktop** Programming Attributes

IP Configuration X

Interface FastEthernet0

IP Configuration

☐ DHCP ☒ Static

IP Address 192.168.3.82

Subnet Mask 255.255.255.0

Default Gateway 192.168.3.4

DNS Server 192.168.5.80

PC51

— □

Physical Config **Desktop** Programming Attributes

IP Configuration X

Interface FastEthernet0

IP Configuration

☐ DHCP ☒ Static

IP Address 192.168.3.51

Subnet Mask 255.255.255.0

Default Gateway 192.168.3.4

DNS Server 192.168.5.80

+ IP address of router.

Router Staff room

Physical Config CLI Attributes

Algorithm Settings

ROUTING

Static

RIP

INTERFACE

FastEthernet0/0

FastEthernet1/0

Serial2/0

Serial3/0

FastEthernet4/0

FastEthernet5/0

FastEthernet6/0

FastEthernet7/0

FastEthernet8/0

FastEthernet9/0

FastEthernet8/0

Port Status ☒ On

Bandwidth ☒ 100 Mbps ☐ 10 Mbps ☒ Auto

Duplex ☐ Half Duplex ☒ Full Duplex ☒ Auto

MAC Address 000C.CF91.64EA

IP Configuration

IP Address 192.168.3.4

Subnet Mask 255.255.255.0

Tx Ring Limit 10

Router Admin room

Physical Config CLI Attributes

GLOBAL

Settings

Algorithm Settings

ROUTING

Static

RIP

INTERFACE

FastEthernet0/0

FastEthernet1/0

Serial2/0

FastEthernet1/0

Port Status ☒ On

Bandwidth ☒ 100 Mbps ☐ 10 Mbps ☒ Auto

Duplex ☐ Half Duplex ☒ Full Duplex ☒ Auto

MAC Address 0060.5CB0.3B83

IP Configuration

IP Address 192.168.4.5

Subnet Mask 255.255.255.0

Tx Ring Limit 10

Router Server room

Physical Config CLI Attributes

GLOBAL

Settings

Algorithm Settings

ROUTING

Static

RIP

INTERFACE

FastEthernet0/0

FastEthernet0/0

Port Status ☒ On

Bandwidth ☒ 100 Mbps ☐ 10 Mbps ☒ Auto

Duplex ☐ Half Duplex ☒ Full Duplex ☒ Auto

MAC Address 000C.8573.C4DD

IP Configuration

IP Address 192.168.5.1

Subnet Mask 255.255.255.0

First floor

Router **Second floor**

Physical **Config** CLI Attributes

Algorithm Settings ^

ROUTING

Static

RIP

INTERFACE

FastEthernet0/0

FastEthernet1/0

Serial2/0

Serial3/0

FastEthernet4/0

FastEthernet5/0

FastEthernet6/0

FastEthernet7/0

FastEthernet8/0

FastEthernet9/0 v

FastEthernet6/0

Port Status ☒ On

Bandwidth ☐ 100 Mbps ☐ 10 Mbps ☒ Auto

Duplex ☐ Half Duplex ☒ Full Duplex ☒ Auto

MAC Address 0006.2A73.D35A

IP Configuration

IP Address 192.168.1.2

Subnet Mask 255.255.255.0

Tx Ring Limit 10

Router **Third floor**

Physical **Config** CLI Attributes

Algorithm Settings ^

ROUTING

Static

RIP

INTERFACE

FastEthernet0/0

FastEthernet1/0

Serial2/0

Serial3/0

FastEthernet4/0

FastEthernet5/0

FastEthernet7/0

FastEthernet8/0

FastEthernet9/0 v

FastEthernet7/0

Port Status ☒ On

Bandwidth ☐ 100 Mbps ☐ 10 Mbps ☒ Auto

Duplex ☐ Half Duplex ☒ Full Duplex ☒ Auto

MAC Address 0004.9ACB.C63C

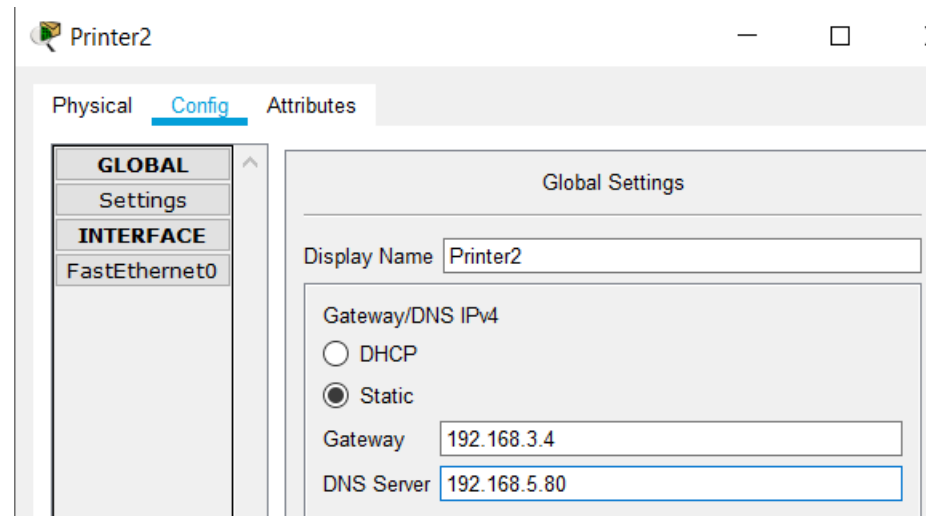
IP Configuration

IP Address 192.168.2.3

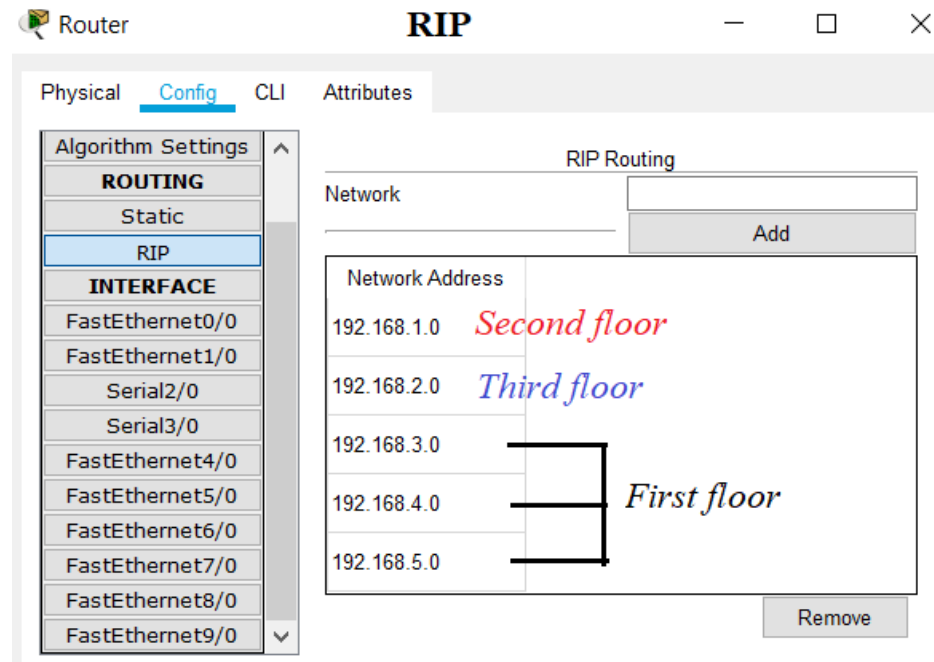
Subnet Mask 255.255.255.0

Tx Ring Limit 10

+ Configuration for Prints: have 3 prints on Staff room at First floor and they are configured with the same.



+ RIP (Routing Information Protocol): find the best path between the source and the destination network.



+ Telnet: when you are using the PC in the ground floor, but you want to access and control the router, you have to do the Telnet protocol.

```
Router>en
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#line vty 0 4
Router(config-line)#pass 2589
Router(config-line)#login
Router(config-line)#exit
Router(config)#enable sec huyen
Router(config)#exit
Router#
```

+ Extended access-list: only specific PCs like Admin and Staff are allowed to control the entire network and this also requires a password when telnet to the router to ensure network security.

The image shows two side-by-side screenshots of a Cisco Router's IOS Command Line Interface (CLI) in configuration mode. The left screenshot shows the configuration of an extended access-list 130. The right screenshot shows the application of this access-list to various interfaces.

Left Screenshot (CLI Configuration):

```
Router(config)#access-list 130 permit tcp 192.168.4.83 0.0.0.255
host 192.168.4.5 eq 23
Router(config)#access-list 130 permit tcp 192.168.4.83 0.0.0.255
host 192.168.1.2 eq 23
Router(config)#access-list 130 permit tcp 192.168.4.83 0.0.0.255
host 192.168.2.3 eq 23
Router(config)#access-list 130 permit tcp 192.168.4.83 0.0.0.255
host 192.168.3.4 eq 23
Router(config)#access-list 130 deny tcp any any eq 23
Router(config)#access-list 130 permit ip any any
Router(config)#
Router(config)#interface FastEthernet0/0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface FastEthernet0/0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface FastEthernet1/0
Router(config-if)#ip access-group 130 in
Router(config-if)#
Router(config-if)#exit
Router(config)#interface FastEthernet1/0
Router(config-if)#
Router(config-if)#exit
```

Right Screenshot (CLI Configuration):

```
Router(config)#interface FastEthernet1/0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface FastEthernet6/0
Router(config-if)#ip access-group 130 in
Router(config-if)#exit
Router(config)#interface FastEthernet6/0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface FastEthernet7/0
Router(config-if)#ip access-group 130 in
Router(config-if)#
Router(config-if)#exit
Router(config)#interface FastEthernet7/0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface FastEthernet8/0
Router(config-if)#ip access-group 130 in
```

Callouts:

- Top Callout:** Admin will to access all of the ip addresses of the router, eq 23 is the telnet port number. (Points to the line: `Router(config-if)#ip access-group 130 in` in the right screenshot)
- Middle Callout:** This line will make the others PC cannot telnet to every ip addresses of the router. (Points to the line: `Router(config)#access-list 130 deny tcp any any eq 23` in the left screenshot)
- Bottom Callout:** Block telnet but they can still ping to the router, ftp to the server and do other ip protocols. (Points to the line: `Router(config)#access-list 130 permit ip any any` in the left screenshot)

+ DHCP:

DHCP, FTP Server

Physical Config **Services** Desktop Programming Attributes

SERVICES

- HTTP
- DHCP**
- DHCPv6
- TFTP
- DNS
- SYSLOG
- AAA
- NTP
- EMAIL
- FTP
- IoT
- VM Management
- Radius EAP

DHCP

Interface: FastEthernet0 Service: ☒ On ☐ Off

Pool Name: serverPool

Default Gateway: 0.0.0.0

DNS Server: 0.0.0.0

Start IP Address: 192 168 5 0

Subnet Mask: 255 255 255 0

Maximum Number of Users: 255

TFTP Server: 0.0.0.0

WLC Address: 0.0.0.0

Add Save Remove

Pool Name	Default Gateway	DNS Server	Start IP Address	Subnet Mask	Max User	TFTP Server	WLC Address
Admins	192.168.4.5	192.168.5...	192.168.4...	255.255.2...	171	0.0.0.0	0.0.0.0
Staffs	192.168.3.4	192.168.5...	192.168.3...	255.255.2...	205	0.0.0.0	0.0.0.0
SecondFloor	192.168.1.2	192.168.5...	192.168.1...	255.255.2...	206	0.0.0.0	0.0.0.0
ThirdFloor	192.168.2.3	192.168.5...	192.168.2...	255.255.2...	206	0.0.0.0	0.0.0.0
serverPool	0.0.0.0	0.0.0.0	192.168.5.0	255.255.2...	255	0.0.0.0	0.0.0.0

Top

Click "On" if you want use DHCP

Already preconfigured

+ FTP: only staff and administrators are given all full rights, students can only read and list files.

DHCP, FTP Server

Physical Config **Services** Desktop Programming Attributes

SERVICES

- HTTP
- DHCP
- DHCPv6
- TFTP
- DNS
- SYSLOG
- AAA
- NTP
- EMAIL
- FTP**
- IoT
- VM Management
- Radius EAP

FTP

Service ☒ On ☐ Off

User Setup

Username Password

☐ Write ☐ Read ☐ Delete ☐ Rename ☐ List

	Username	Password	Permission
1	Staffs	staffs	RWDNL
2	Students	Students	RL
3	admin	admin	RWDNL

Add

Save

Remove

+ DNS, Mail and Web:

DNS, MAIL, WEB Server

Physical Config **Services** Desktop Programming Attributes

SERVICES

- HTTP
- DHCP
- DHCPv6
- TFTP
- DNS**
- SYSLOG
- AAA
- NTP
- EMAIL
- FTP
- IoT

DNS

DNS Service ☒ On ☐ Off

Resource Records

Name Type A Record

Address

Add Save Remove

No.	Name	Type	Detail
0	student.com	A Record	192.168.5.80

DNS, MAIL, WEB Server

Physical Config **Services** Desktop Programming Attributes

SERVICES

- HTTP
- DHCP
- DHCPv6
- TFTP
- DNS
- SYSLOG
- AAA
- NTP
- EMAIL**
- FTP
- IoT
- VM Management

EMAIL

SMTP Service ☒ ON ☐ OFF

POP3 Service ☒ ON ☐ OFF

Domain Name: Set

User Setup

User Password

user1
user2

password same user

The image displays two side-by-side screenshots of a network configuration interface, labeled PC1 and PC25. Both windows show the 'Desktop' tab selected, with a 'Configure Mail' section highlighted in blue. The interface includes fields for User Information, Server Information, and Logon Information, each followed by a 'Save' button.

PC1 Configuration:

- User Information:** Your Name: user1, Email Address: user1@student.com
- Server Information:** Incoming Mail Server: 192.168.5.80, Outgoing Mail Server: 192.168.5.80
- Logon Information:** User Name: user1, Password: [masked]

PC25 Configuration:

- User Information:** Your Name: user2, Email Address: user2@student.com
- Server Information:** Incoming Mail Server: 192.168.5.80, Outgoing Mail Server: 192.168.5.80
- Logon Information:** User Name: user2, Password: [masked]

- Similarly, create additional accounts to use for the school.

P8. Document and analyze test results against expected results.

The result is right compared with the plan:

- Check the equipment in the building is connected to the internet
- Arrange computers in the right position in the plan

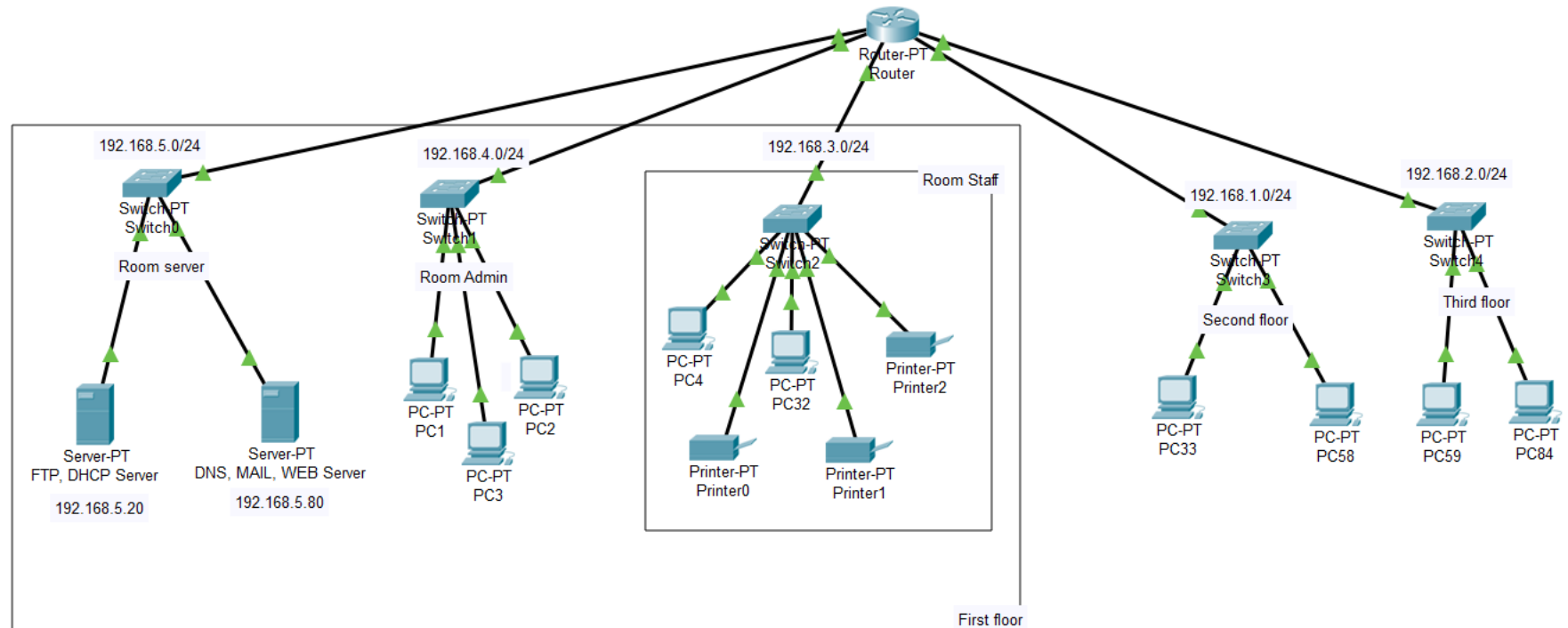
- The computers have contacted each other
- All computers have dynamic IP
- Stable network and all devices connected to the network.

Has achieved the set goals of the plan:

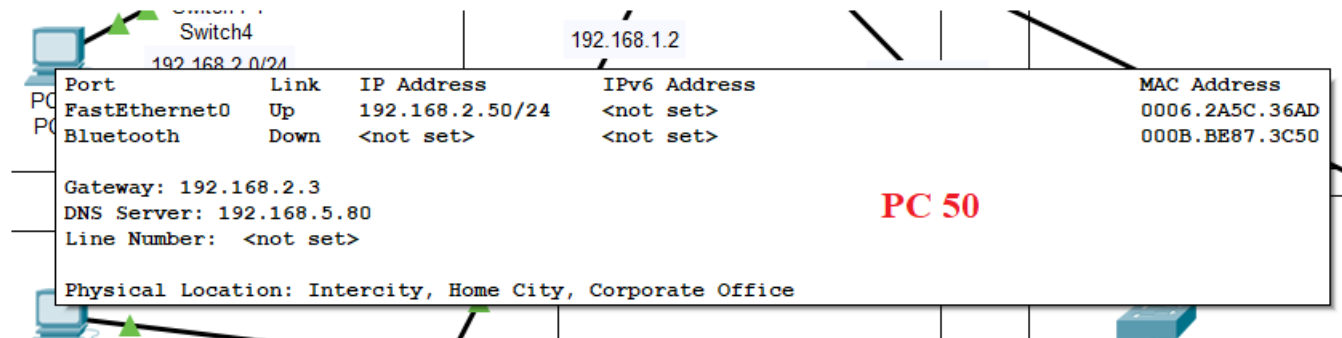
- Nice neat aesthetic
- All computers can communicate with each other
- Reasonable construction cost but still quality assurance
- Reasonable transmission line ensures network quality

Note:

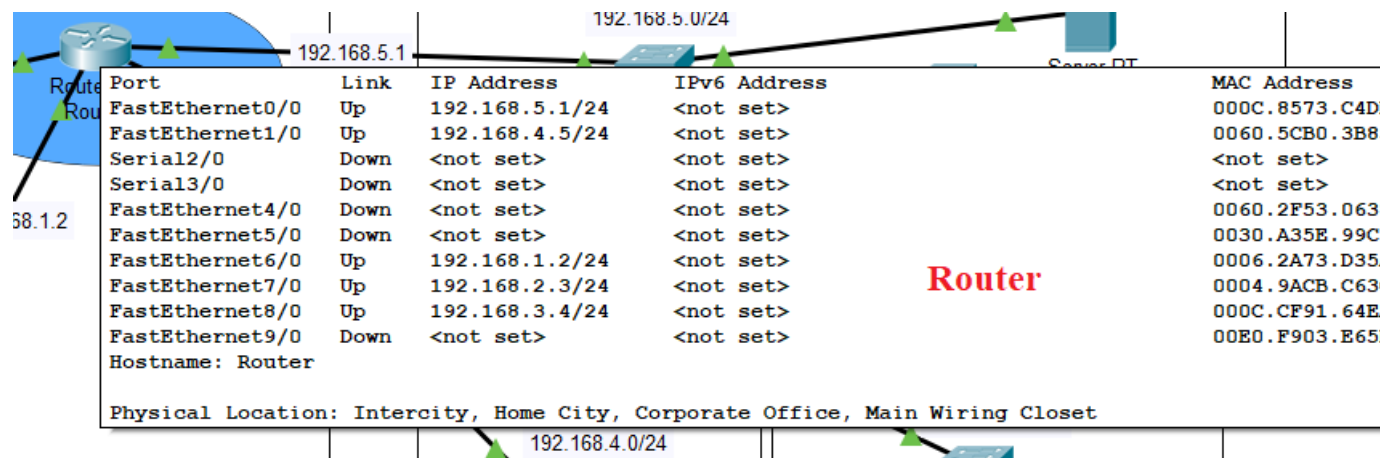
- In this assignment, I will create a network that will be used by 232 people in a school including students, staffs and admins.
- There are 50 PCs for students, so PC1 to PC25 are located in the first floor, and the rest 25 PCs are in the second floor. Also, there are 32 PCs for marketing staffs and three important PCs for the IT lab which are the admin of the building.
- This is my network in general:

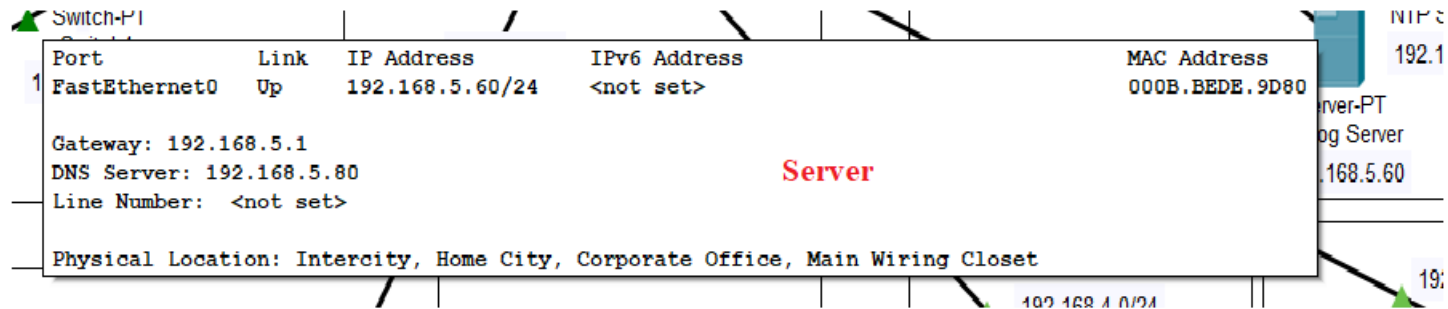


1. Check IP Address of PCs, router, prints and servers.

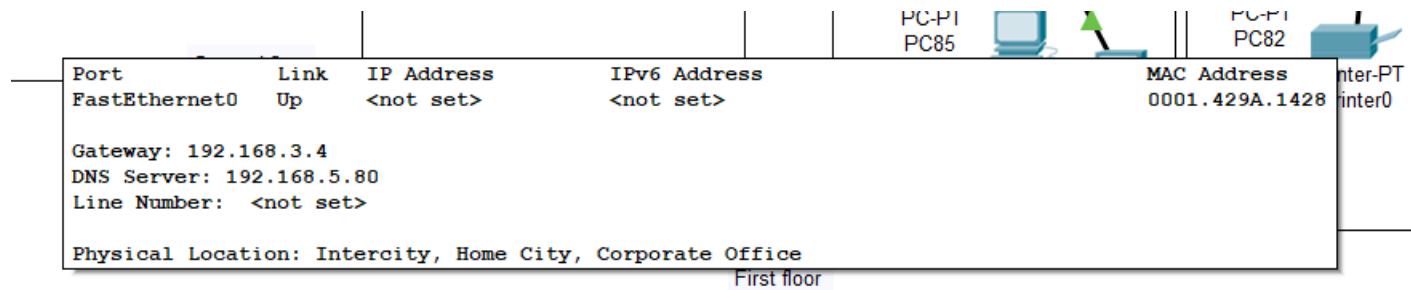


- The remaining PCs have successfully installed their IP addresses.





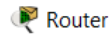
- The remaining servers have successfully installed their IP addresses.



- All 3 printers have been successfully configured.

2. Check RIP.

+ The router now can ping to five networks and five networks can ping back to the router, can ping from the PC to the router or any device to any other of them.



Router

Physical Config **CLI** Attributes

IOS Command Line Interface

```
Router>en
Password:
Router#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile,
B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter
area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external
type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E -
EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia -
IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

C    192.168.1.0/24 is directly connected, FastEthernet6/0
C    192.168.2.0/24 is directly connected, FastEthernet7/0
C    192.168.3.0/24 is directly connected, FastEthernet8/0
C    192.168.4.0/24 is directly connected, FastEthernet1/0
C    192.168.5.0/24 is directly connected, FastEthernet0/0

Router#
```

Ctrl+F6 to exit CLI focus

☐ Top



PC82

Physical Config **Desktop** Programming Attributes

Command Prompt

```
Packet Tracer PC Command Line 1.0
C:\>ping 192.168.5.1

Pinging 192.168.5.1 with 32 bytes of data:

Reply from 192.168.5.1: bytes=32 time=1ms TTL=255
Reply from 192.168.5.1: bytes=32 time<1ms TTL=255
Reply from 192.168.5.1: bytes=32 time<1ms TTL=255
Reply from 192.168.5.1: bytes=32 time<1ms TTL=255

Ping statistics for 192.168.5.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 1ms, Average = 0ms
```



Router

Physical Config **CLI** Attributes

IOS Command Line Interface

```
Router#show ip protocol
Routing Protocol is "rip"
Sending updates every 30 seconds, next due in 22 seconds
Invalid after 180 seconds, hold down 180, flushed after 240
Outgoing update filter list for all interfaces is not set
Incoming update filter list for all interfaces is not set
Redistributing: rip
Default version control: send version 1, receive any version

Interface          Send Recv  Triggered RIP  Key-chain
FastEthernet0/0      1       2  1
FastEthernet1/0      1       2  1
FastEthernet6/0      1       2  1
FastEthernet8/0      1       2  1
FastEthernet7/0      1       2  1

Automatic network summarization is in effect
Maximum path: 4
Routing for Networks:
    192.168.1.0
    192.168.2.0
    192.168.3.0
    192.168.4.0
    192.168.5.0
Passive Interface(s):
--More--
```

Copy Paste

3. Check Telnet.

+ Can telnet from PC to the router:

```
Packet Tracer PC Command Line 1.0
C:\>telnet 192.168.2.3
Trying 192.168.2.3 ...Open

User Access Verification
Password:
Router>en
Password:
Router#show running-config
Building configuration...

Current configuration : 1341 bytes
!
version 12.2
no service timestamps log datetime msec
no service timestamps debug datetime msec
no service password-encryption
!
hostname Router
!
!
!
enable secret 5 $1$mERr$Z1Fa7hNvzaN1arTrvOPfV1
!
!
!
ip dhcp pool IP10
 network 192.168.2.0 255.255.255.0
!
!
!
--More-- |
```

The first password: 2589
The secret password: huyen

☐ Top

Router

Physical Config **CLI** Attributes

IOS Command Line Interface

Router>en
Password:
Password:
Router#show line

Tty	Line	Type	Tx/Rx	A	Roty	AccO	AccI	Uses	Noise
0	0	CTYP		-	-	-	-	0	0
1	1	AUX	9600/9600	-	-	-	-	0	0
* 132	132	VTYP		-	-	-	-	1	0
133	133	VTYP		-	-	-	-	0	0
134	134	VTYP		-	-	-	-	0	0
135	135	VTYP		-	-	-	-	0	0
136	136	VTYP		-	-	-	-	0	0

Line(s) not in async mode -or- with no hardware support:
2-131
Router#

Ctrl+F6 to exit CLI focus

Copy Paste

Top

The “*” shows that I am doing telnet to router in devices which are in port 132 and this means that 1 PC is doing this controlling the router by using Telnet protocol.

4. Check FTP.


```
C:\>dir

Volume in drive C has no label.
Volume Serial Number is 5E12-4AF3
Directory of C:\

1/1/1970   7:0 PM           16      lan.txt
1/1/1970   7:0 PM           79      pass.txt
1/1/1970   7:0 PM          26      sampleFile.txt
               121 bytes          3 File(s)

C:\>ftp 192.168.5.20
Trying to connect...192.168.5.20
Connected to 192.168.5.20
220- Welcome to FT Ftp server
Username:admin
331- Username ok, need password
Password:
230- Logged in
(passive mode On)
ftp>dir

Listing /ftp directory from 192.168.5.20:
 0 : asa842-k8.bin                    5571584
 1 : asa923-k8.bin                    30468096
 2 : c1841-advipservicesk9-mz.124-15.T1.bin 33591768
 3 : c1841-ipbase-mz.123-14.T7.bin    13832032
 4 : c1841-ipbasek9-mz.124-12.bin     16599160
 5 : c1900-universalk9-mz.SPA.155-3.M4a.bin 33591768
 6 : c2600-advipservicesk9-mz.124-15.T1.bin 33591768
 7 : c2600-i-mz.122-28.bin            5571584
 8 : c2600-ipbasek9-mz.124-8.bin      13169700
 9 : c2800nm-advipservicesk9-mz.124-15.T1.bin 50938004
10 : c2800nm-advipservicesk9-mz.151-4.M4.bin 33591768
11 : c2800nm-ipbase-mz.123-14.T7.bin  5571584
```

```
12 : c2800nm-ipbasek9-mz.124-8.bin    15522644
13 : c2900-universalk9-mz.SPA.155-3.M4a.bin 33591768
14 : c2950-i6q412-mz.121-22.EA4.bin  3058048
15 : c2950-i6q412-mz.121-22.EA8.bin  3117390
16 : c2960-lanbase-mz.122-25.FX.bin   4414921
17 : c2960-lanbase-mz.122-25.SEE1.bin 4670455
18 : c2960-lanbasek9-mz.150-2.SE4.bin 4670455
19 : c3560-advipservicesk9-mz.122-37.SE1.bin 8662192
20 : c3560-advipservicesk9-mz.122-46.SE.bin 10713279
21 : c800-universalk9-mz.SPA.152-4.M4.bin 33591768
22 : c800-universalk9-mz.SPA.154-3.M6a.bin 83029236
23 : cat3k_caa-universalk9.16.03.02.SPA.bin 505532849
24 : cgr1000-universalk9-mz.SPA.154-2.CG 159487552
25 : cgr1000-universalk9-mz.SPA.156-3.CG 184530138
26 : ir800-universalk9-bundle.SPA.156-3.M.bin 160968869
27 : ir800-universalk9-mz.SPA.155-3.M 61750062
28 : ir800-universalk9-mz.SPA.156-3.M 63753767
29 : ir800_yocto-1.7.2.tar            2877440
30 : ir800_yocto-1.7.2_python-2.7.3.tar 6912000
31 : lan.txt                           16
32 : pt1000-i-mz.122-28.bin            5571584
33 : pt3000-i6q412-mz.121-22.EA4.bin  3117390

ftp>put pass.txt

Writing file pass.txt to 192.168.5.20:
File transfer in progress...

[Transfer complete - 79 bytes]

79 bytes copied in 0.023 secs (3434 bytes/sec)
ftp>dir

Listing /ftp directory from 192.168.5.20:
 0 : asa842-k8.bin                    5571584
 1 : asa923-k8.bin                    30468096
 2 : c1841-advipservicesk9-mz.124-15.T1.bin 33591768
 3 : c1841-ipbase-mz.123-14.T7.bin    13832032
 4 : c1841-ipbasek9-mz.124-12.bin     16599160
 5 : c1900-universalk9-mz.SPA.155-3.M4a.bin 33591768
 6 : c2600-advipservicesk9-mz.124-15.T1.bin 33591768
 7 : c2600-i-mz.122-28.bin            5571584
 8 : c2600-ipbasek9-mz.124-8.bin      13169700
 9 : c2800nm-advipservicesk9-mz.124-15.T1.bin 50938004
10 : c2800nm-advipservicesk9-mz.151-4.M4.bin 33591768
11 : c2800nm-ipbase-mz.123-14.T7.bin  5571584
12 : c2800nm-ipbasek9-mz.124-8.bin    15522644
13 : c2900-universalk9-mz.SPA.155-3.M4a.bin 33591768
14 : c2950-i6q412-mz.121-22.EA4.bin  3058048
15 : c2950-i6q412-mz.121-22.EA8.bin  3117390
16 : c2960-lanbase-mz.122-25.FX.bin   4414921
17 : c2960-lanbase-mz.122-25.SEE1.bin 4670455
18 : c2960-lanbasek9-mz.150-2.SE4.bin 4670455
19 : c3560-advipservicesk9-mz.122-37.SE1.bin 8662192
20 : c3560-advipservicesk9-mz.122-46.SE.bin 10713279
21 : c800-universalk9-mz.SPA.152-4.M4.bin 33591768
22 : c800-universalk9-mz.SPA.154-3.M6a.bin 83029236
23 : cat3k_caa-universalk9.16.03.02.SPA.bin 505532849
24 : cgr1000-universalk9-mz.SPA.154-2.CG 159487552
25 : cgr1000-universalk9-mz.SPA.156-3.CG 184530138
26 : ir800-universalk9-bundle.SPA.156-3.M.bin 160968869
27 : ir800-universalk9-mz.SPA.155-3.M 61750062
28 : ir800-universalk9-mz.SPA.156-3.M 63753767
29 : ir800_yocto-1.7.2.tar            2877440
30 : ir800_yocto-1.7.2_python-2.7.3.tar 6912000
31 : lan.txt                           16
32 : pass.txt                           79
```

```
2 : c1841-advipservicesk9-mz.124-15.T1.bin 33591768
3 : c1841-ipbase-mz.123-14.T7.bin    13832032
4 : c1841-ipbasek9-mz.124-12.bin     16599160
5 : c1900-universalk9-mz.SPA.155-3.M4a.bin 33591768
6 : c2600-advipservicesk9-mz.124-15.T1.bin 33591768
7 : c2600-i-mz.122-28.bin            5571584
8 : c2600-ipbasek9-mz.124-8.bin      13169700
9 : c2800nm-advipservicesk9-mz.124-15.T1.bin 50938004
10 : c2800nm-advipservicesk9-mz.151-4.M4.bin 33591768
11 : c2800nm-ipbase-mz.123-14.T7.bin  5571584
12 : c2800nm-ipbasek9-mz.124-8.bin    15522644
13 : c2900-universalk9-mz.SPA.155-3.M4a.bin 33591768
14 : c2950-i6q412-mz.121-22.EA4.bin  3058048
15 : c2950-i6q412-mz.121-22.EA8.bin  3117390
16 : c2960-lanbase-mz.122-25.FX.bin   4414921
17 : c2960-lanbase-mz.122-25.SEE1.bin 4670455
18 : c2960-lanbasek9-mz.150-2.SE4.bin 4670455
19 : c3560-advipservicesk9-mz.122-37.SE1.bin 8662192
20 : c3560-advipservicesk9-mz.122-46.SE.bin 10713279
21 : c800-universalk9-mz.SPA.152-4.M4.bin 33591768
22 : c800-universalk9-mz.SPA.154-3.M6a.bin 83029236
23 : cat3k_caa-universalk9.16.03.02.SPA.bin 505532849
24 : cgr1000-universalk9-mz.SPA.154-2.CG 159487552
25 : cgr1000-universalk9-mz.SPA.156-3.CG 184530138
26 : ir800-universalk9-bundle.SPA.156-3.M.bin 160968869
27 : ir800-universalk9-mz.SPA.155-3.M 61750062
28 : ir800-universalk9-mz.SPA.156-3.M 63753767
29 : ir800_yocto-1.7.2.tar            2877440
30 : ir800_yocto-1.7.2_python-2.7.3.tar 6912000
31 : lan.txt                           16
32 : pass.txt                           79
```

- The similar, check on the remaining PCs.

5. Check Mail, Web.

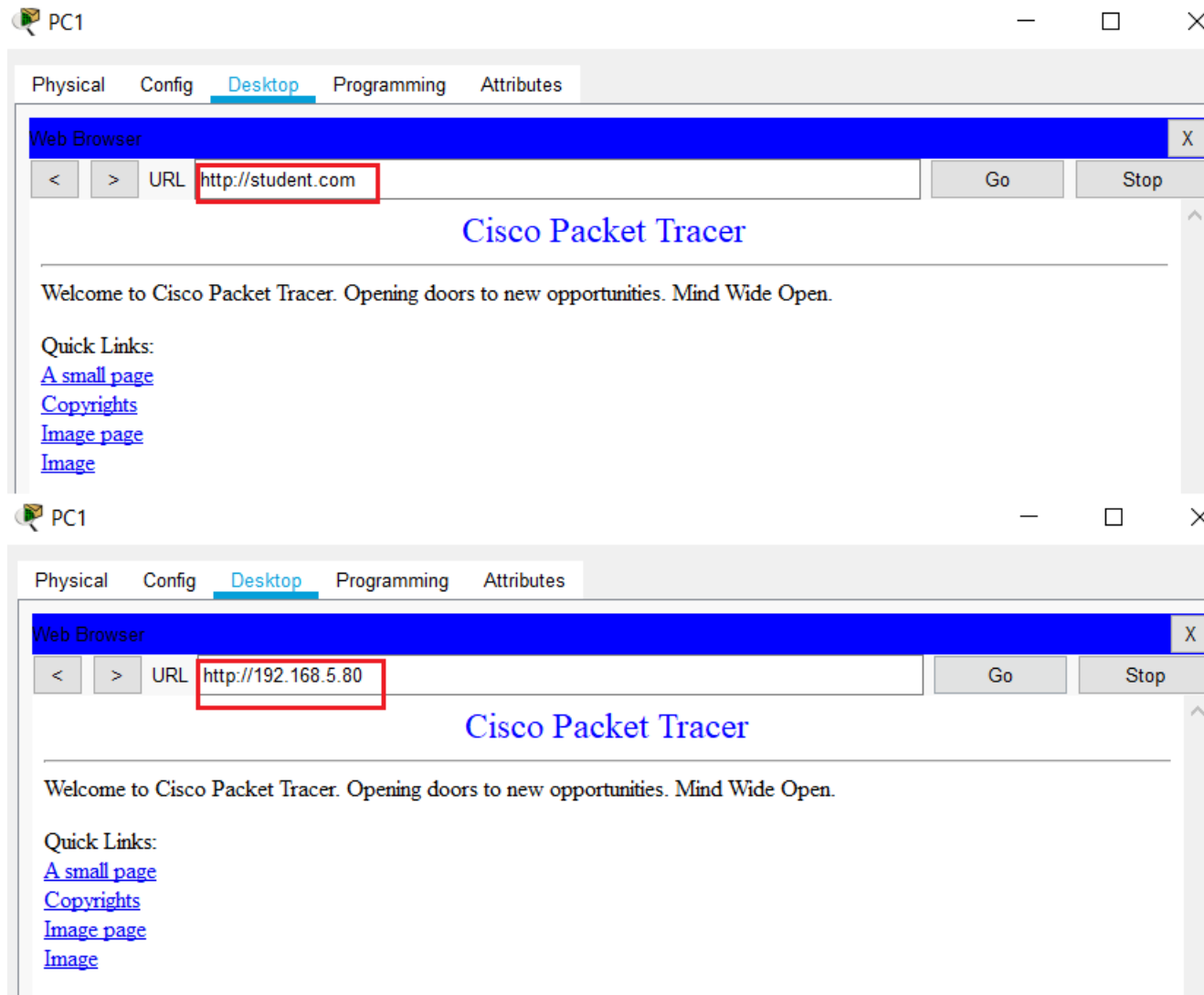
+ Check Mail:

The screenshots illustrate the following steps:

- PC1 Compose Mail:** The 'Compose Mail' window shows the 'To' field as 'user2@student.com' and the 'Subject' as 'text1'. The 'Send' button is highlighted. Below the form, there are four lines of 'pass' text.
- PC25 Mail Browser:** The 'MAIL BROWSER' window shows a list of emails. The first email is from 'user1@student.com' with subject 'text1', received on 'Wed Dec 25 2019 18:24:26'. A red arrow points from the 'Send success' message in the PC1 screenshot to this email entry.
- PC25 Reply Mail:** The 'Reply Mail' window shows the 'To' field as 'user1@student.com' and the 'Subject' as 'RE: text1'. The 'Send' button is highlighted. Below the form, there are four lines of 'hope' text.
- PC1 Mail Browser:** The 'MAIL BROWSER' window shows a list of emails. The first email is from 'user2@student.com' with subject 'RE: text1', received on 'Wed Dec 25 2019 18:45:41'. A red box highlights this email entry.

A large red box at the bottom right contains the text: **Send, Receive and reply success**. Red lines connect this box to the 'Send' button in the first screenshot and the 'Receive' button in the third screenshot.

+ Check Web: Success.



M4. Recommend potential enhancements for the networked systems.

The potential improvement for networked systems can be based on existing platforms or can also create new ones. However, the original purpose has not changed. The request for improvement is the need to create a faster and more efficient deployment roadmap that will help meet the demands of new workloads in network communications. In addition, optimization is needed in terms of performance, reliability and durability, bringing modern infrastructure to meet the needs of digital businesses. On the other hand, it is necessary to improve the equipment of the data center with agile capabilities to provide a more efficient and cost-effective service. Finally, is reduce the time to distribute network infrastructure and reduce incidents by at least 50 percent.

Here are 2 recommend:

- + Using compute solutions focused on low latency and high bandwidth can help communication service providers increase their agility and optimize TCO.
- + Using integrated intellectual property (IP) and superior software tools reduces deployment time, power consumption and costs with a variety of configurable FPGAs.

D3. Use critical reflection to evaluate own work and justify valid conclusions.

Work is well organizing and presented good and has been completed within the allotted time span. Easy use. The validity of the results has been judged conclusions have been arrived at through synthesis of ideas and have been just edit realistic improvements have been proposed against defined characteristics for success. Conclusions were made through a combination of ideas and proven. The validity of the results was assessed using defined criteria. Constantly renew professional development plan. Combination represents an important

reflection of learning towards the original goals. Discuss the processes and activities needed to carry out the development plan. Commit and propose development activities as planned. Critically reflect the goals achieved at the present and the initial goals set in the development plan. Update development plan based on feedback and evaluation. Mean, completed the goal set. However, there is a need for further improvement because the initial goal is very simple. It is necessary to select and use assessments and feedback to improve and develop the plan towards more quality and better optimization. After the project, you can gain more experience for yourself and overcome mistakes.

Besides, it is necessary to set up a more detailed, clear and professional plan. Know how to take advantage of available resources and develop them. Some protocols and functional resources that have not been installed and exploited need to be done in the next maintenance phase.

REFERENCE.

Phân phối máy chủ - Máy chấm công - Máy vi tính - Bộ lưu điện - Laptop. (2019). Mạng máy tính LAN – MAN – WAN – INTERNET.. [online] Available at: <https://hkc.vn/mang-may-tinh-lan-man-wan-internet/> [Accessed 25 Dec. 2019].

Netone.com.vn. (2019). *Lợi ích việc tích hợp công nghệ lưu trữ NAS và SAN*. [online] Available at: <http://netone.com.vn/Trangchu/Hotrokythuat/Kienthuccanban/tabid/366/arid/1077/Default.aspx> [Accessed 25 Dec. 2019].

Ocean. (2019). *Các chuẩn của mạng máy tính*. [online] Available at: <https://donghoqualac.wordpress.com/2006/12/28/cac-chu%E1%BA%A9n-c%E1%BB%A7a-m%E1%BA%A1ng-may-tinh/> [Accessed 25 Dec. 2019].

Qvcorp.com.vn. (2019). *Vai trò của truyền thông - truyền thông quan trọng như thế nào?*. [online] Available at: <http://qvcorp.com.vn/tin-tuc-1/Vai-tro-cua-truyen-thong-truyen-thong-quan-trong-nhu-the-nao-729.html> [Accessed 25 Dec. 2019].

TheFreeDictionary.com. (2019). *Bandwidth requirements*. [online] Available at: <https://encyclopedia2.thefreedictionary.com/Bandwidth+requirements> [Accessed 25 Dec. 2019].

- Viblo. (2019). *Phân biệt Router, Switch và Hub (Mạng máy tính)*. [online] Available at: <https://viblo.asia/p/phan-biet-router-switch-va-hub-mang-may-tinh-bJzKm0j659N> [Accessed 25 Dec. 2019].
- Dichvumaychu.net. (2019). *Server là gì ? Nguyên lý hoạt động của server?*. [online] Available at: <http://dichvumaychu.net/tin-tuc/tin-tuc-tu-vcic/server-la-gi-nguyen-ly-hoat-dong-cua-server.html> [Accessed 25 Dec. 2019].
- Anon, (2019). [online] Available at: <https://brainly.in/question/9614893> [Accessed 25 Dec. 2019].
- SDxCentral. (2019). *What is Networking Software? and How Used in SDN?*. [online] Available at: <https://www.sdxcentral.com/networking/sdn/definitions/networking-software/> [Accessed 25 Dec. 2019].
- TOTOLINK Việt Nam. (2019). *14 giao thức mạng phổ biến mà bạn nên biết - TOTOLINK Việt Nam*. [online] Available at: <https://www.totolink.vn/article/137-14-giao-thuc-mang-pho-bien-ma-ban-nen-biet.html> [Accessed 25 Dec. 2019].
- Quantrimang.com. (2019). *Những giao thức mạng phổ biến hiện nay*. [online] Available at: https://quantrimang.com/nhung-giao-thuc-mang-pho-bien-hien-nay-162843#mcetoc_1d7llu59b1 [Accessed 25 Dec. 2019].
- Interserver Tips. (2019). *Common Network Protocols and Their Ports - Interserver Tips*. [online] Available at: <https://www.interserver.net/tips/kb/common-network-protocols-ports/> [Accessed 25 Dec. 2019].
- Webopedia.com. (2019). *Server Types - Webopedia.com*. [online] Available at: https://www.webopedia.com/quick_ref/servers.asp [Accessed 25 Dec. 2019].
- Webopedia.com. (2019). *What is Virtual Server? Webopedia Definition*. [online] Available at: https://www.webopedia.com/TERM/V/virtual_server.html [Accessed 25 Dec. 2019].
- Hòa, C. (2019). *Lợi ích khi sử dụng VPS là gì có thể bạn không biết?*. [online] Lợi ích khi sử dụng VPS là gì có thể bạn không biết?. Available at: <https://nhanhoa.com/tin-tuc/loi-ich-khi-su-dung-vps-la-gi-co-the-ban-khong-biet.html> [Accessed 25 Dec. 2019].
- Intel. (2019). *Các giải pháp công nghệ đổi mới mạng và truyền thông*. [online] Available at: <https://www.intel.vn/content/www/vn/vi/communications/network-transformation.html> [Accessed 25 Dec. 2019].

pháp, G. (2019). *Mạng Dựa trên Mục đích*. [online] Cisco. Available at: https://www.cisco.com/c/vi_vn/solutions/intent-based-networking.html#~stickynav=1 [Accessed 25 Dec. 2019].

TechGenix. (2019). *Network topology guide: Why it's crucial you build the right structure*. [online] Available at: <http://techgenix.com/network-topology/> [Accessed 25 Dec. 2019].

Bk.com.vn. (2019). *Bảo trì hệ thống mạng cho doanh nghiệp*. [online] Available at: <http://bk.com.vn/san-pham-dich-vu/Bao-tri-he-thong-mang-cho-doanh-nghiep/23.html> [Accessed 25 Dec. 2019].