

# Computer Network Report.docx

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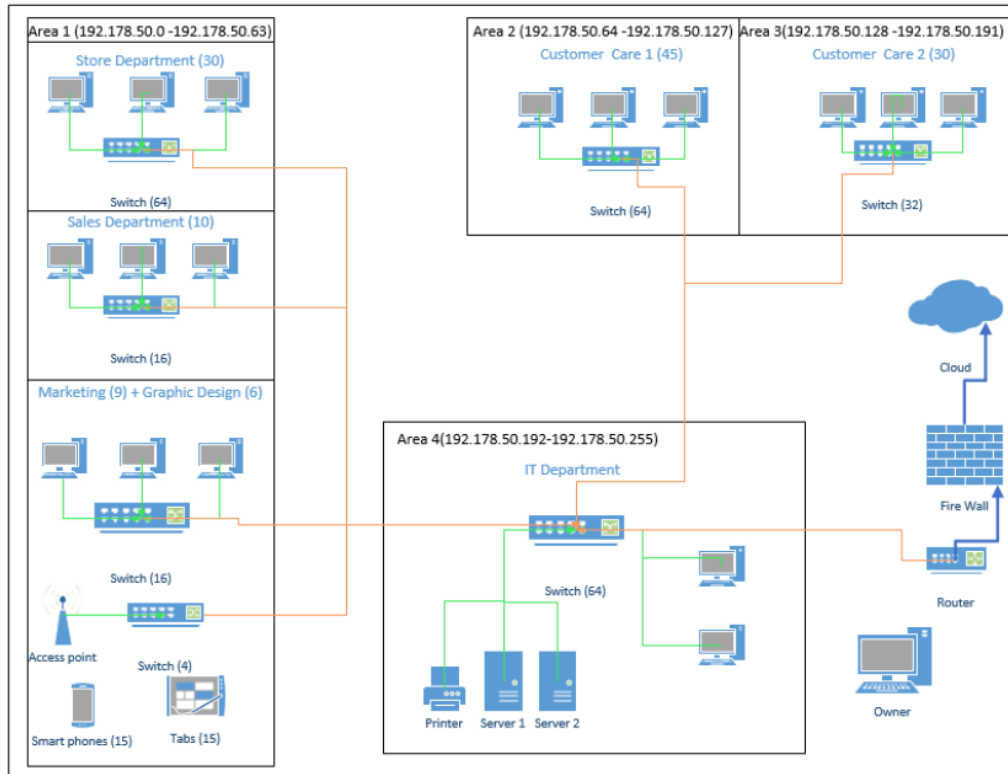
## **Introduction**

A computer network is a collection of computers that pool resources obtained over a network. Computers transmit connections using common communication protocols across digital links. The entire island is serviced by a firm named Cyber Service for computer support. In Sri Lanka, they provide a range of IT-related services, such as network installation, cloud services, computer repair, and many more.

This scenario indicates that the IT department is essentially a diversified section. Therefore, I created the network for the Cyber Service Company using a current structure. Additionally, by selecting a star topology, distribution into 4 subnet areas for each area is eventually connected to a mediated network. Additionally, the network's supporting hardware has been presented. Network protocols and the OSI model are also introduced.

## Task 1

### Network Diagram

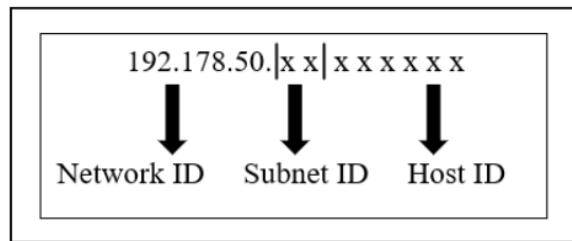


### Description

The network diagram for the cyber service company is displayed in this diagram. There are 6 locations (departments) in the diagram and they are divided into 4 network areas. Those areas are called subnet areas. Every area has a switch to connect to the router. The customer care area is divided into 2 areas because there are 75 PCs, switch 64 is the switch with the highest number of ports, so we cannot connect PCs with 1 switch. There are 2 switches only for the marketing and graphic designing area, one switch is used for PCs and the other switch is used for the access point. Since there are smartphones and tabs in the marketing department, the access point has been used to get internet facilities for them. Network servers are easily accessible in the IT department. The IT department has 2 local servers and a printer. Additionally, this network diagram demonstrates how this network is linked to a router and, via a firewall, to a cloud server. The owner's computer is kept apart and is not networked.

We must create different networks for each location while allocating IP addresses to the network. And we may connect each network to a centralized device by using the CLASS C IP address. There are about 200 PCs on this network, which is why a class C IP address was chosen.

IP address range – 192.178.50.0 – 192.178.50.255



There may be a maximum of 62 PCs per subnet due to the 6 host bits and 64 addresses being accessible per subnet.

Host bits = 6

Number of hosts per network =  $2^6 - 2$

PCs =  $64 - 2 = 62$

(Since the broadcast address is at the end and the network address is at the beginning. They aren't accessible through PCs.)

## Task 2

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### Network topology

The logical and physical configuration of a network's nodes and links is known as its topology.

Routers, switches, and software having switch and router functions are frequently found in nodes.

A graph is a common way to depict network topologies.

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### Star topology

One of the most typical network configurations is the star topology, sometimes known as a star

network. In this design, each node is linked to a switch, hub, or computer that serves as the hub for the whole network. The main network device serves as a server, and the other network nodes function as clients.

### Reason for proposing a star topology

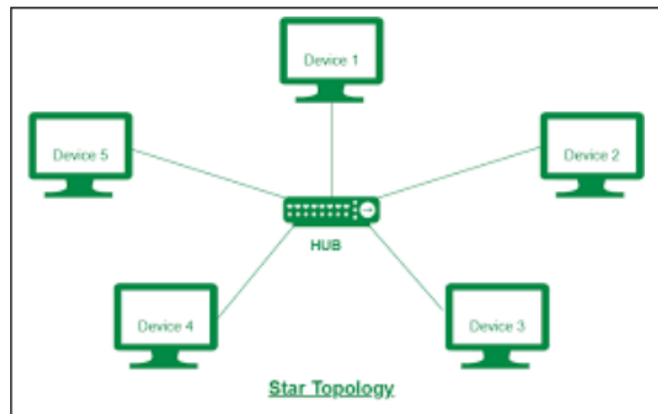
This network topology was chosen for a variety of reasons. The link here is quite simple.

Additionally, it is incredibly simple to maintain and needs no additional training. Another unique

factor is that other PCs are unaffected when one PC fails. Direct data, on the other side, may be

sent to distant PCs. This network is not complicated, making it simple to manage and inexpensive.

For all of these reasons, I believe that the star topology is the best option for this network.



## Types of servers

1. Web server
2. Proxy server
3. Mail server
4. Application server
5. Domain name server (DNS server)
6. Dynamic Host Configuration Protocol Server (DHCP server)

### 1. Web server

A web server is a piece of computer software and hardware resources that process HTTP or HTTPS requests. When an HTTP request is made for a website page or other resource, communication between both the web server and client PC begins, and the request's content and any error messages, whether any, are also shown as a response. Thus, a web host is any computer that provides web hosting for websites on the internet. The web server's software also regulates how a user can access the host's files. For this network, a web server is more crucial for addressing these demands.

### 2. Proxy server

A proxy server is a server program used in computer networking that stands between a client and the server supplying the resource that the client is seeking. As a result, it aids in preventing online intruders from accessing a private network. Also, it helps to safeguard the data on client Computers and shields your computer from harmful software (viruses). The client has control over both the websites that may be visited while surfing the internet and the information that is sent through it. Individual users can share access to the internet. Additionally, since the proxy server's reserve RAM is accessible to all users, frequently visited websites are saved there so that users may get pertinent information fast.

### 3. Mail server

The electronic counterpart of your friendly local mailman is a mail server. A mail server stores email messages sent by users, as well as emails that users receive and send to mail servers. As a result, whether sending or receiving emails, multiple protocols are utilized, such as SMTP, POP3, and IMAP. Every email that is sent passes through a series of mail servers along its way to its intended recipient.

### 4. Application server

Together with the web server, this server operates. An application server offers dynamic web pages or software content that enables challenging user interfaces. In software systems, data files are saved on the web server, and the stored data may be managed via this application server.

### 5. Domain name server (DNS server)

On computer networks, a domain server is a particular kind of server that answers access requests and validates users. When using the internet, it is challenging for the user to recall the IP address of the server machines that house the websites. As a result, the Domain Name Server (DNS) may be utilized as a specific server computer that changes the user-entered web addresses into the domain names' IP addresses.

### 6. Dynamic Host Configuration Protocol Server (DHCP server)

Assigning IP addresses, default gateways, and some other network parameters to user devices automatically are done by a network server known as a DHCP server. It uses the Dynamic Host Configuration Protocol, or DHCP, as a standard protocol to reply to broadcast requests from clients. The host can interact online after the setup process is finished.

## Task 3

### OSI Reference Model

A conceptual framework called the OSI Model (Open Systems Interconnection Model) is employed to describe the operations of a networking system. It demonstrates how the 7 levels that make up the network communication process may be used to categorize the information that is sent between computers.

1. Application Layer
2. Presentation Layer
3. Session Layer
4. Transport Layer
5. Network Layer
6. Data Link Layer
7. Physical Layer

#### 1. Application Layer

The OSI model's top-level demonstrates how application software communicates with the network. <sup>1</sup> The shared communications protocols and interface techniques used by hosts in a communications network are specified at the application layer, which is an abstraction layer. Both the OSI model as well as the Internet Protocol Suite defines an application layer abstraction. Additionally, this application layer is special in that it takes into account the user's identity, privacy, and how the data should be used. You can add software processes for file transfers, email browsing, and other network-related tasks. The application layer is where protocols like FTP, NFS, HTTP, SMTP, DHCP, SNMP, and TELNET operate.

#### 2. Presentation Layer

Compared to other layers, it is less active and used. This layer transforms alphanumeric data into ASCII format. This layer is where data encryption, decryption, and compression happen. This presentation layer is connected to protocols like MIME and XDR.



### 3. Session Layer

The session layer's responsibility is to establish a connection between two communication endpoints and keep it going for the necessary amount of time. The session layer, for instance, begins when we access a website. Here, RTP and SIP are the protocols in use.

### 4. Transport Layer

The transport layer's primary responsibility is to directly offer communication services to application programs running on various hosts. The protocols of this layer offer applications end-to-end communication services. We use UDP and TCP protocols.

### 5. Network Layer

A component of online communications called the network layer enables the connection and transmission of data packets between various devices or networks. This section includes descriptions of routing, data forwarding, addressing, block management, and data packet sequencing. Here, several of the protocols in use are RIP, IP, and ICMP.

### 6. Data Link Layer

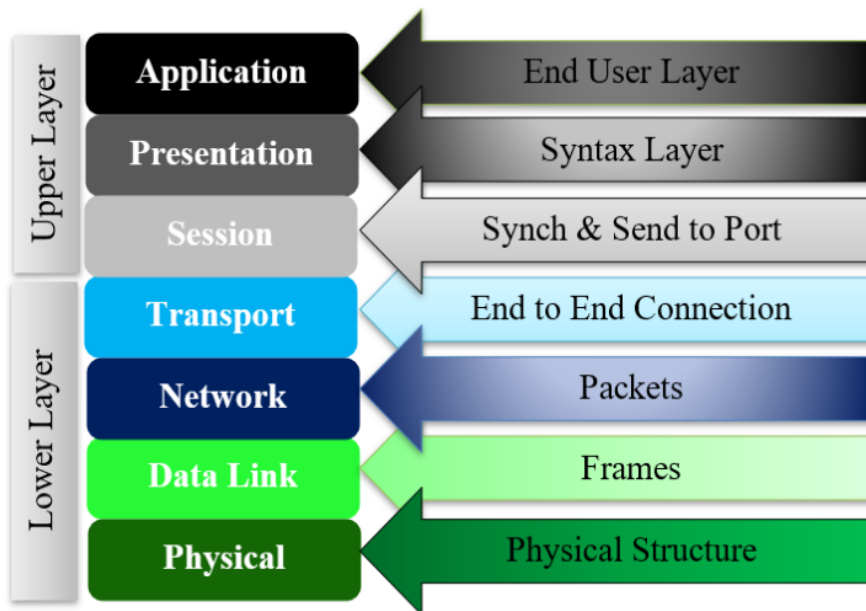
This layer functions between two hosts that are rather directly linked. This layer is in charge of bit-by-bit signal conversion and transmission to the underlying hardware of the data stream. There are 2 sub-layers in this layer.

- Logical link control layer
- Media access control layer

The media access layer, as well as error detection, flow control, frame synchronization, and logical control layer, are characterized in terms of gaining access to networked computer data and receiving authorization to transfer it. In this case, PPTP and PPP are utilized as protocols.

## 7. Physical Layer

The OSI model's bottom layer is this one. This layer defines the specifications for the actual hardware, including repeaters, cables, and networking cards. In this case, data is sent over a transmission medium. An electrical, mechanical, and procedural interface to the transmission medium is provided by the physical layer. The transmission type, interface, media rate, and modalities of transmission are all defined.



### Network Devices

Area	Devices and features
Customer care	CPU = 11th-gen Intel Core i5 CPU GPU = Integrated octa core GPU Memory = 8 GB RAM Storage = 512GB SSD Display = 13.5-inch PixelSense touch
Store department	CPU = 10 <sup>th</sup> Gen Intel core i3 GPU = Integrated Octa-Core GPU Memory = 16 GB RAM Storage = 512 GB SSD Display = 27" Full HD
Sales department	CPU = 10 <sup>th</sup> Gen Intel Core i3 GPU = Integrated octa-core GPU Memory = 16 GB RAM Storage = 256 GB SSD Display = 15.6 Inches
Marketing department & graphics designers	CPU = intel 7 core i7 processor GPU = 2GB NVIDIA GeForce MX350 Memory = 16 GB RAM Storage = 1 TB SSD Display = 13 inches Smart Phone – Samsung Galaxy S22, 8 <sup>th</sup> gen 1 chip (4GB RAM 64GB ) 7inch Tabs – Samsung Galaxy Tab S7 FE Wi-Fi (4GB RAM 64GB)

IT department	CPU = i7 11 <sup>th</sup> gen processor GPU = Integrated Intel Iris Plus Memory = 16 GB RAM Storage = 1 TB HDD. Display = 19 inches monitor Printer = HP Ink Tank 415
Owner Room	CPU = 3.2 GHz Apple M1chip GPU = Integrated octa-core GPU Memory = 32GB RAM Storage = 1TB hard drive Display = 13.3 inch Battery = 15 hours

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**Network Protocols**

An established set of guidelines that govern how data is sent between various devices connected to the same network is known as a network protocol. No matter how different their underlying infrastructures, architectures, or standards may be, servers, routers, and endpoints all need to be able to interact with one another. This indicates the format and transmission order of the message. There are many different kinds of protocols that support the transport of data.

<b>Application</b>	<b>HTTP, DNS, DHCP, FTP</b>	<b>Application</b>
<b>Presentation</b>		
<b>Session</b>		
<b>Transport</b>	<b>TCP, UDP</b>	<b>Transport</b>
<b>Network</b>	<b>IPv4, IPv4, ICMPv4, IPMPv6</b>	<b>Internet</b>
<b>Data Link</b>	<b>PPP, Frame relay, Ethernet</b>	<b>Network Access</b>
<b>Physical</b>		

- **HTTP (Hyper Text Transfer Protocol)**

For distributed, collaborative, hypermedia information systems, the HTTP is an application layer protocol in the Internet protocol suite model. The structure and delivery of messages as well as the answers that web browsers and servers must give to certain instructions are all specified by HTTP. In addition to basic and digest access authentications, HTTP offers a number of other authentication protocols.

Pros	Cons
<ul style="list-style-type: none"> <li>❖ Better security for the customers</li> <li>❖ Better authentication process for visitors</li> <li>❖ Automatically generates trust for the customers</li> <li>❖ Significantly reduces latency in the connection.</li> </ul>	<ul style="list-style-type: none"> <li>❖ Website speed might decrease with HTTP</li> <li>❖ More updating required</li> <li>❖ It might require changes to your mobile platforms</li> <li>❖ No encryption methods are used in HTTP</li> </ul>

- **TCP/ IP (Transmission Control Protocol) / (Internet Protocol)**

This is a communications standard that enables computer hardware and software to exchange messages over a network. it can be used to provide remote access over the network for interactive file sharing, deliver email, distribute web pages over the network and provide remote access to client file systems.

Pros	Cons
<ul style="list-style-type: none"> <li>❖ Has autonomous operation</li> <li>❖ Facilitates the connecting of different computer kinds</li> <li>❖ Operates independently of the OS</li> <li>❖ Recognize various routing techniques</li> </ul>	<ul style="list-style-type: none"> <li>❖ It is difficult to replace protocols in TCP/IP</li> <li>❖ The transport layer does not ensure packet delivery</li> <li>❖ Hard to set up and use</li> </ul>

- **FTP (File Transfer Protocol)**

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On a computer network, files can be sent from a server to a client via the File Transfer Protocol, a common communication protocol. FTP frequently employs a secure design with SSL/TLS services. FTP encourages file sharing over a distant computer in an effective and dependable data transmission.

Pros	Cons
<ul style="list-style-type: none"> <li>❖ The ability to upload or download files while adding files to the police</li> <li>❖ Ability to change and restart the offline instance</li> <li>❖ enables the transfer of numerous files and folders</li> <li>❖ Faster transfer than HTTP</li> <li>❖ No size limitation on a single transfer</li> </ul>	<ul style="list-style-type: none"> <li>❖ Files, usernames, and passwords are sent in clear text</li> <li>❖ Server can be spoofed to send data to a random port on a united computer</li> <li>❖ Easy for inexperienced users to wipe our work</li> <li>❖ Unable to keep track of what is uploaded on the distant system</li> </ul>

- **SMTP (Simple Mail Transfer Protocol)**

It facilitates email transmission and is a form of application layer protocol.

- **UDP (User Datagram Protocol)**

There is an unconnected exchange of information. Information is not reliably sent here.

- **POP (Post Office Protocol)**

From the mail server, it is utilized to choose the desired email. Another form of application layer protocol is this one.

## **Task 4**

### **Recommended Enhancements**

To quickly do the routing and other capabilities done by the router for this network, I believe it would be ideal to utilize a gateway node rather than a router. Thus, network devices with various organizational structures can be linked by connecting a gateway node rather than a router. It is a contemporary machine with prior knowledge. The gateway node has control over either broadcast domain dispute. Full-duplex communication is used. A backup server can also be set up to get crucial backups of this business for development. The use of fiber optic connections is another suggestion for enhancing this network's performance. Using wireless connections or such as Bluetooth for printers, fax machines, and scanners can also enhance this network.

### **Strength and Weaknesses**

#### **Strengths**

- The implementation of this diagram is a star topology. Therefore, any malfunction of one thing won't affect any other objects.
- A firewall checks the network's characteristics while also providing improved security against hackers and other remote access to the system.
- The department's smartphones and tablets may readily access the internet thanks to the usage of an access point.
- The failure of one segment does not affect the other sections since there are independent switches for each section, which also lowers network traffic.

#### **Weaknesses**

- Because there isn't a gateway node, it is challenging to manage routing for many networks.
- There isn't a backup server to obtain significant enterprise backups.
- Using just a star topology increases the quantity of cable needed for this configuration, and the entire network is affected if the centralized equipment fails.



## **Conclusion**

First, I used the correct symbols to create the network diagram in this paper. I next explained my network diagram and allocated IP addresses to each department's subnetwork. I suggested the star topology as a good network topology for that and provided a thorough justification for my recommendation. I've previously listed and discussed the various server kinds. The OSI model and network device mapping that I utilized to create my network was then discussed. In addition, I discussed network protocols. Finally, I gave an honest evaluation of the network's strengths and weaknesses while suggesting improvements I might do to prevent network vandalism.

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