

Higher Nationals

Internal verification of assessment decisions – BTEC (RQF)

INTERNAL VERIFICATION – ASSESSMENT DECISIONS			
Programme title	BTEC Higher National Diploma in Computing		
Assessor	Mr. Isura Kulathilaka	Internal Verifier	Mr .Lakindu Premachandra
Unit(s)	Unit 02: Networking		
Assignment title	LAN Design & Implementation for SYNTAX SOLUTIONS		
Student's name	Ranudi Gayathmie Kariyapperuma		
List which assessment criteria the Assessor has awarded.	Pass	Merit	Distinction
INTERNAL VERIFIER CHECKLIST			
Do the assessment criteria awarded match those shown in the assignment brief?	Y/N		
Is the Pass/Merit/Distinction grade awarded justified by the assessor's comments on the student work?	Y/N		
Has the work been assessed accurately?	Y/N		
Is the feedback to the student: Give details: <ul style="list-style-type: none">• Constructive?• Linked to relevant assessment criteria?• Identifying opportunities for improved performance?• Agreeing actions?	Y/N Y/N Y/N Y/N		
Does the assessment decision need amending?	Y/N		
Assessor signature			Date
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Confirm action completed			
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Higher Nationals - Summative Assignment Feedback Form

Student Name/ID	Ranudi Gayathmie Kariyapperuma - KIR/X-00104243		
Unit Title	Unit 02: Networking		
Assignment Number	1	Assessor	
Submission Date	20/12/2022	Date Received 1st submission	20/12/2022
Re-submission Date		Date Received 2nd submission	

Assessor Feedback:

LO1 Examine networking principles and their protocols.

Pass, Merit & Distinction P1 P2 M1
 Descripts

LO2 Explain networking devices and operations.

Pass, Merit & Distinction P3 P4 M2 D1
 Descripts

LO3 Design efficient networked systems.

Pass, Merit & Distinction P5 P6 M3 D2
 Descripts

LO4 Implement and diagnose networked systems.

Pass, Merit & Distinction P7 P8 M4 D3
 Descripts

Grade:	Assessor Signature:	Date:
Resubmission Feedback:		
Grade:	Assessor Signature:	Date:
Internal Verifier's Comments:		
Signature & Date:		

* Please note that grade decisions are provisional. They are only confirmed once internal and external moderation has taken place and grades decisions have been agreed at the assessment board.

Assignment Feedback

Formative Feedback: Assessor to Student

Action Plan

Summative feedback

Feedback: Student to Assessor

Assessor signature		Date	
Student signature	ranudigk@gmail.com	Date	20.12.2022

Pearson Higher Nationals in Computing

Unit 02: Networking
Assignment 01

General Guidelines

1. A Cover page or title page – You should always attach a title page to your assignment. Use previous page as your cover sheet and make sure all the details are accurately filled.
2. Attach this brief as the first section of your assignment.
3. All the assignments should be prepared using a word processing software.
4. All the assignments should be printed on A4 sized papers. Use single side printing.
5. Allow 1" for top, bottom , right margins and 1.25" for the left margin of each page.

Word Processing Rules

1. The font size should be **12** point and should be in the style of **Time New Roman**.
2. **Use 1.5 line spacing.** Left justify all paragraphs.
3. Ensure that all the headings are consistent in terms of the font size and font style.
4. Use **footer function in the word processor to insert Your Name, Subject, Assignment No, and Page Number on each page.** This is useful if individual sheets become detached for any reason.
5. Use word processing application spell check and grammar check function to help editing your assignment.

Important Points:

1. **It is strictly prohibited to use textboxes to add texts in the assignments, except for the compulsory information. eg: Figures, tables of comparison etc. Adding text boxes in the body except for the before mentioned compulsory information will result in rejection of your work.**
2. Avoid using page borders in your assignment body.
3. Carefully check the hand in date and the instructions given in the assignment. Late submissions will not be accepted.
4. Ensure that you give yourself enough time to complete the assignment by the due date.
5. Excuses of any nature will not be accepted for failure to hand in the work on time.
6. You must take responsibility for managing your own time effectively.
7. If you are unable to hand in your assignment on time and have valid reasons such as illness, you may apply (in writing) for an extension.
8. Failure to achieve at least PASS criteria will result in a REFERRAL grade .
9. Non-submission of work without valid reasons will lead to an automatic RE FERRAL. You will then be asked to complete an alternative assignment.
10. If you use other people's work or ideas in your assignment, reference them properly using HARVARD referencing system to avoid plagiarism. You have to provide both in-text citation and a reference list.
11. If you are proven to be guilty of plagiarism or any academic misconduct, your grade could be reduced to A REFERRAL or at worst you could be expelled from the course

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ranudigk@gmail.com

Student's Signature:
(Provide E-mail ID)

Date: 20.12.2022
(Provide Submission Date)

Higher National Diploma in Computing

Assignment Brief

Student Name /ID Number	Ranudi Gayathmie Kariyapperuma KIR/X - 00104243
Unit Number and Title	Unit 2: Networking
Academic Year	2021/22
Unit Tutor	Mr. Isura Kulathilake
Assignment Title	LAN Design & Implementation for SYNTAX SOLUTIONS
Issue Date	30.10.2022
Submission Date	20.12.2022
IV Name & Date	

Submission format

The submission should be in the form of an individual report written in a concise, formal business style using single spacing and font size 12. You are required to make use of headings, paragraphs and subsections as appropriate, and all work must be supported with research and referenced using Harvard referencing system. Please also provide an end list of references using the Harvard referencing system.

The recommended word count is 3,000–3,500 words for the report excluding annexures, although you will not be penalised for exceeding the total word limit.

Unit Learning Outcomes:

LO1 Examine networking principles and their protocols.

LO2 Explain networking devices and operations.

LO3 Design efficient networked systems.

LO4 Implement and diagnose networked systems.

Assignment Brief and Guidance:

Scenario

SYNTAX SOLUTIONS is a privately owned, well-known Software company located in Colombo. The Management of **SYNTAX SOLUTIONS** has purchased a 3-story building in the heart of **Matara**. They are planning to make it one of the state-of-the-art companies in Matara with the latest facilities.

It is expected to have nearly **150 employees** in Matara branch.

Department	Number of Users
Customer Care	10
Sales and Marketing	20
Finance	25
Legal	5
HR	10
Developers	55
Network Team	5
Server Room	Servers +ISP connections

Following requirements are given by the Management.

- All the departments **must be separated** with **unique subnet** and should not communicate with each other **unless there is a special requirement**.
- **192.168.10.0/24** is given and should be used for all the departments except the server room. IPs should assign **using DHCP**.
- **ERP and CRM Systems** need to be implemented in Matara branch in local servers.

- **Number of servers required for the Server room** need to be decided by the Network designer and should be assigned with **10.254.1.0/24** subnet. (Uses **static IPs**)
- **High level of redundancy** is expected in network design to eliminate single point of failures and traffic bottle necks.
- **Sales and Marketing Team** need to access Network resources **using WIFI** connectivity.
- **Proper methods for networking monitoring** and **troubleshooting** need to be established.
- All possible **network security** mechanisms should be implemented.

Assume you have been appointed as the new network consultant of **SYNTAX SOLUTIONS**. Prepare a network architectural design and implement it with your suggestions and recommendations to meet the company requirements.

(Note: Clearly state your assumptions. You are allowed to design the network according to your assumptions, but main requirements should not be violated)

Activity 01

- Discuss the benefits and constraints of different network system types that can be implemented in the Matara branch and the main IEEE Ethernet standards that can be used in above LAN and WLAN design.
- Discuss the importance and impact of network topologies and network protocol suites while comparing the main network topologies and network protocol suites that are used in network design using examples. Recommend suitable network topologies and network protocol suites for above scenario and justify your answer with valid points.

Activity 02

- Discuss the operating principles of network devices (Ex: Router, Switch, Etc.) and server types that can be used for above scenario while exploring different servers that are available in today's market with their specifications. Recommend server/servers for the above scenario and justify your selection with valid points.

- Discuss the inter-dependence of workstation hardware with networking software and provide examples for networking software that can be used in above network design.

Activity 03

- Prepare a written network design plan to meet the above mentioned user requirements including a blueprint drawn using a modeling tool. (Ex: Microsoft Visio, EdrawMax).
Support your answer by providing the VLAN and IP subnetting scheme for the above scenario and the list of devices, network components and software used to design the network for above scenario and while justifying your selections.

- Test and evaluate the proposed design to meet the requirements and analyse user feedback by using a User feedback form.

- Install and configure Network services, devices and applications (Ex: VLAN,DHCP, DNS,Proxy, Web, Etc.) according to the proposed design to accomplish the user requirements and design a detailed Maintenance schedule for above Network.

***Note: - Screen shots of Configuration scripts should be presented.**

Activity 04

- Implement a networked system based on your prepared design with valid evidences and recommend potential future enhancements for the networked system with valid

justifications to your recommendations. Use critical reflection to critically evaluate the design, plan, configuration, and testing of your network while justifying with valid conclusions.

- Develop test cases and conduct verification (Ex: Ping, extended ping, trace route, telnet, SSH, etc.) to test the above Network and analyse the test results against the expected results.



ACKNOWLEDGEMENT

At last author would like to share the experience while doing the project. Author learns many new things about the networking topics. The best thing which author can share is that author developed more interest in this subject. This Project gave author a real sight into the Networking world.

A very special thanks to Mr Isuru Kulathilake who teach us this subject and Author thanks for who helped author to do this kind of project. Thank you!

Regards,

The author,

Ranudi Kariyapperuma.

Table of Content

NETWORKING PRINCIPLES AND THEIR PROTOCOLS.....	21
THE BENEFITS OF DIFFERENT NETWORK TYPES AND STANDARDS.	21
2. Benefits of Computer Networking	21
3. Network Architectures	23
3.1. Client – server architecture	23
3.2 Peer -to- peer architecture	25
4. Types of Networks	28
4.1 Advantages and Disadvantages of Network Types.....	36
6. Network Standards.....	40
5.1 Network Standards Organizations.	40
The impact of network topology, communication, and bandwidth Requirements....	43
1. The impact of network topology.....	43
1.1 Physical topology.....	43
1) Point to Point Topology.....	43
1.2 Logical Topology	51
1.3 The importance of Network topologies.	53
2. Communication and Bandwidth Requirements.	53
2.1. Bandwidth	53
2.2. The amount of bandwidth that needs for various types of services.....	53
2.3 Importance of bandwidth	54
2.4 Bandwidth Measurements.....	54
Common networking principles and protocols that enable the effectiveness of networked systems.	55
1. Network Protocols.....	55
1.1. Types of Network Protocols.	55
NETWORKING DEVICES AND OPERATIONS	61
The operating principles of networking devices and server types.....	61
1. Network Devices.....	61

1.1 Networking Device Types	61
2. Servers.....	65
2.1. Types of servers	65
The inter-dependence of workstation hardware with relevant networking software.	67
1 . VMware Workstation 15.5 Installation.....	67
2. Window server 16 (Installation)	77
A range of server types and justification of the selection of a server, considering a given scenario regarding cost and performance optimization.....	83
1.Range of Server Types	83
2. Suitable server for the scenario.	84
The topology and protocol selected for a given scenario.....	84
Topology for given scenario.	84
Protocol for the given scenario.	84
EFFICIENT NETWORKED SYSTEMS	85
Networked system to meet a given specification	85
Evaluate the design to meet the requirements and analyse user feedback.....	86
1. User Feedback Form of Syntax Solution Company.....	86
1.1 User response Form of Syntax Solution Company.....	89
2. Analizing the user feedback form.	92
The speed of the network service.....	92
The quality of the product.....	93
User friendliness of the product.....	94
The Security of the product.....	95
The organization of the Product.....	96
Installation and the configuration of network services and applications	97
1.Features of windows 11 vs windows 10	97
2. Configuring the Network System.	98
Configuration Part of PC and servers	98

2. Finance Department	99
3.Sales and Marketing Department	100
4.Legal Department.....	101
5.HR Department	102
6.Developers Department.....	103
7.Network Team Department.....	104
8.Server Room Department.....	105
3.Router Configuration	106
Router 0.....	106
Router 1	108
Router 2	110
4.Switch Configuration.	114
Maintenance schedule to support the networked system.	122
IMPLEMENTATION OF A NETWORK SYSTEM.	123
Implement a networked system based on a prepared design.....	123
1. Network Design	123
2. IP Address Table	124
Documentation and the analysing test of the results against expected results.....	125
Potential enhancements for the networked systems.	129
1.User should configure the network daily.	129
2.Check for the viruses and system defectors.	129
3.Upgrade and Update Firmware and Software	129
4.Using Virtual Local Area Network	129
D3: Critical reflection of the Authors work and justification of the valid conclusions.	131
Conclusion.....	131
REFERENCES.....	132

Figures

Figure 1 : Client server architecture(nimesha-dilini.medium.com)	25
Figure 2 : Peer-to-Peer Architecture (Designed by Author)	27
Figure 3 : Types of Networks (Inoformationq.com)	28
Figure 4 : Personal area network (Designed by Author)	29
Figure 5 : Local area network (Design by the author)	30
Figure 6 : Wide area Network (https://www.quora.com)	31
Figure 7 : Wireless Area Network (http://www.sunsystemonline.com)	31
Figure 8: Campus Area Network (community.fs.com)	32
Figure 9 : Metropolitan Area Network (www.sciencedirect.com)	32
Figure 10 : Storage Area Network (www.friktoria.com)	33
Figure 11 : System Area Network (www.networkstraining.com)	33
Figure 12 : Passive Optical Local Area Network (snabaynetworking.com)	34
Figure 13: Enterprise Private Network (www.itrelease.com)	34
Figure 14 : Virtual Private Network (ecomputernotes.com)	35
Figure 15: Home Area Network (www.geeksforgeeks.org)	35
Figure 16 : ISO (International organization for standardization)(www.legalraasta.com)	40
Figure 17 : ANSI (American National Standards Institutes) (http://www.legalraasta.com)	41
Figure 18 : IEEE (Institute of Electrical and Electronics Engineers) (http://www.spacebizguide.com)	41
Figure 19 : INCTS (Inter National Committee for Information Technology)	42
Figure 20 : TIA (Telecommunications Industry Association)	42
Figure 21: Point to Point topology (https://www.itrelease.com)	43
Figure 22 : Star Topology (Design by author)	44
Figure 23 : Bus topology (https://service.snom.com)	45
Figure 24 : Ring topology (https://www.javatpoint.com)	46
Figure 25 : Tree Topology (https://www.itrelease.com)	47
Figure 26 : MESH TOPOLOGY (ITRELEASE.COM)	48
Figure 27 : Daisy Chain Topology (www.educba.com)	49
Figure 28 : Hybrid Topology (www.javatpoint.com)	49
Figure 29 : Extended Star Topology (www.researchgate.net)	50
Figure 30 : Dual Ring Topology (https://www.pinterest.com)	50

Figure 31 : Bandwidth Measurements (networkustad.com)	54
Figure 32: Transmission Control Protocol (www.geeksforgeeks.org)	55
Figure 33 : Internet Protocol (forum.huawei.com)	56
Figure 34 : User Datagram Protocol (www.educba.com)	57
Figure 35 : Post Office Protocol (www.tech-faq.com)	58
Figure 36 : Simple Mail Transfer Protocol (www.educba.com)	58
Figure 37 : File Transfer Protocol (www.ipswitch.com)	59
Figure 38 : Hypertext Transfer Protocol secure (www.globalsign.com)	59
Figure 39 : Telnet (www.teachoo.com)	60
Figure 40 : Gopher Protocol (www.howtogeek.com)	60
Figure 41 : Repeater (https://ecomputerconcepts.com)	61
Figure 42 : Hub (https://www.javatpoint.com)	61
Figure 43 : Bridge (www.easytechjunkie.com)	62
Figure 44 : Switch (infinity-cable-products.com)	62
Figure 45 : Router (www.javatpoint.com)	63
Figure 46 : Gateway (www.hitechwhizz.com)	63
Figure 47 : Brouter (www.learnabhi.com)	64
Figure 48 : NIC (www.elprocus.com)	64
Figure 49 : VMware 1	67
Figure 50 :VMware 2	67
Figure 51 :VMware 3	68
Figure 52 : VMware 4	68
Figure 53 : VMware 5	69
Figure 54 :VMware 6	69
Figure 55 : VMware 7	70
Figure 56 : VMware 8	70
Figure 57 : VMware 9	71
Figure 58: VMware 10	71
Figure 59 : VMware 11	72
Figure 60 :VMware 12	72
Figure 61 : VMware 13	73
Figure 62 :VMware 14	73
Figure 63 : VMware 15	74
Figure 64 : VMware 16	74

Figure 65 : VMware 17	75
Figure 66 : VMware 18	75
Figure 67 : VMware19	76
Figure 68 : VMware 20	76
Figure 69 : A networked system to meet a given specification	85
Figure 70 : User Feedback Form 1	86
Figure 71 : User Feedback Form 2	87
Figure 72 : User Feedback Form 3	88
Figure 73 : Custom care Department PC	98
Figure 74 : Finance Department PC	99
Figure 75 : Sales and Marketing Laptop	100
Figure 76 :Legal Department PC	101
Figure 77 : HR Department PC	102
Figure 78: Developers Department PC	103
Figure 79 : Network Team Department PC	104
Figure 80 : Server Room Department PC	105
Figure 81 : A maintenance schedule to support the networked system.	122
Figure 82 : networked system based on a prepared design	123
Figure 83 : IP Address Table	124

List of Tables

Table 1 : The benefits of Computer Networking	22
Table 2 : Advantages and Disadvantages of a Client server Architecture.....	24
Table 3 : . Advantages and Disadvantages of Peer-to-Peer Architecture	27
Table 4 : Types of Lan network.....	30
Table 5 : Advantages and Disadvantages of Network Types	39
Table 6 : point to point topology.....	44
Table 7 : Star topology.....	44
Table 8 : Bus topology.....	45
Table 9 : Ring Topology	46
Table 10 : Tree topology	47
Table 11 : Mesh Topology	48
Table 12 : Logical Topology.....	52
Table 13 : Range of Servers.....	84
Table 14 : .Features of windows 11 vs windows 10.....	97
Table 15 : Documentation and the analysing test of the results against expected results.	
.....	128

Networking principles and their protocols.

The benefits of different network types and standards.

1. Computer Networks

The modern corporate world is based on networks. The reason is that Nowadays. Networks are utilized to access the internet and obtain information. Network is a collection of connected computers that allows one computer to share its resources, data, and programs. With another computer. In networking physical connections like fiber optic cables and wireless technology are used to connect the devices

2. Benefits of Computer Networking

The Benefits of computer can divide into types. One is Advantage of computer network and other one is Disadvantage of Computer network.

Advantages	Disadvantages
<ul style="list-style-type: none">• Fast File Sharing	<ul style="list-style-type: none">• Robustness
<p>The major advantage of computer network is file sharing. All types of Data like audio, video, Text, and images can be shared easily.</p>	<p>The main server is totally dependent on the network connected systems. Because of that if the main server breaks down the system will not work anymore. Another thing is if there is a problem of linking device the whole system will be shut down.</p>
<ul style="list-style-type: none">• Fast Resource Sharing	<ul style="list-style-type: none">• Malware Attack
<p>Scanners, Printers, Network data and applications can be accessed by remote connection devices, using network connected devices.</p>	<p>A virus can spread quickly through computers in the network as a result of communication. There is high possibility that Malware would spread to the other devices if one of them gets attacked.</p>

<ul style="list-style-type: none"> • Flexibility 	<ul style="list-style-type: none"> • Maintenance
<p>It means in this present period people have requirements they search through the internet it means there is a flexibility in networking.</p>	<p>A computer Network needs a regular maintenance for work effectively. The issue is that basic knowledge is not enough for this. It needs complicated setups and complex modifications too.</p>
<ul style="list-style-type: none"> • Higher Connectivity 	<ul style="list-style-type: none"> • Health Issues
<p>Can connect easily whenever user in another country or individually or public areas. For an example Internet is world wide web, WhatsApp, Facebook etc.</p>	<p>Today's modern generation have many computer games to play in leisure time. These games are most play users as a stressbuster. But playing for long sessions can make a user addicted to it. Because of that it causes many health problems for both mentally and physically.</p>
<p>Accessing a computer network enables communication specially in the business culture. Most of these types of working groups, arranging gatherings, or Receiving individual response can be achieved without any difficult.</p>	<p>The fact that computer networking can decrease a efficiency of a company is biggest issue. Employees can use the internet for purposes other than office work when it is allowed.</p>

Table 1 : The benefits of Computer Networking

3. Network Architectures

A network functional and structural design called as a Network Architecture. This Explains the concept controlling data transmit between network devices and connected to one another. Client – server architecture and Peer -to-peer architecture are the two main types of architectures.

3.1. Client – server architecture

Client request data such as images, documents, videos etc. and the server responds to that data called Client server architecture. It can be simple responding of data or there can be logical manipulation on the data.

3.1.1 Types of client server architecture

1-tier architecture

In this architecture the client server and database all reside on the same Machine. As an example, the author install database and in author's system access it practices sql queries it is called 1 tier architecture.

2-tier architecture

In 2 tier architecture presentation layer runs on client and data is stored on a server. In this architecture a client request for data or resources to server and server process that request. These both tiers are communicated with internet or any other network. This structure is quite easy to maintain and modify.

3-tier architecture

This architecture has three layers. Namely Client, Application and Data layer. The Client layer is the one that request the information. The application layers. Acts as an interface between the Client and Data layer. The data layer in the one the contains the required data. This architecture contains on application layer between the user and the Dbms which is responsible for communicating the user's request to the dbms system and send the response from the dbms to the user.

N-architecture

This architecture also called as a multi-tier architecture. In this Architecture entire presentations, application processing and Data management function are confined from each other. This Architecture complex organized, Flexible, secure architecture.

3.1.2. Advantages and Disadvantages of a Client server Architecture.

Advantages	Disadvantages
<ul style="list-style-type: none"> • Scalability New clients and servers can add to it to make a extensive network. • Store Files Many files can be stored on a server and if any client needs them client can access those files from the server computer. • Expand Server If user want to store more files user can add more storage capacity to the server. • Dedicated Server It can be a file server, Print Server or Database Server. • Backup & Recovery Easy to backup data and recovering the data 	<ul style="list-style-type: none"> • Traffic issues Difficult to manage all request from the server because sometimes request are very high. • Very Expensive High processor and initial investments are need to a server computer but to buy a server is very high. • Server Dependency Always the client computer depends on the server computer. If the server fails the entire network will stop working. • Extra staff Needed A network Administrator is needed to look after the server and also needed more staff to manage the server.

Table 2 : Advantages and Disadvantages of a Client server Architecture.

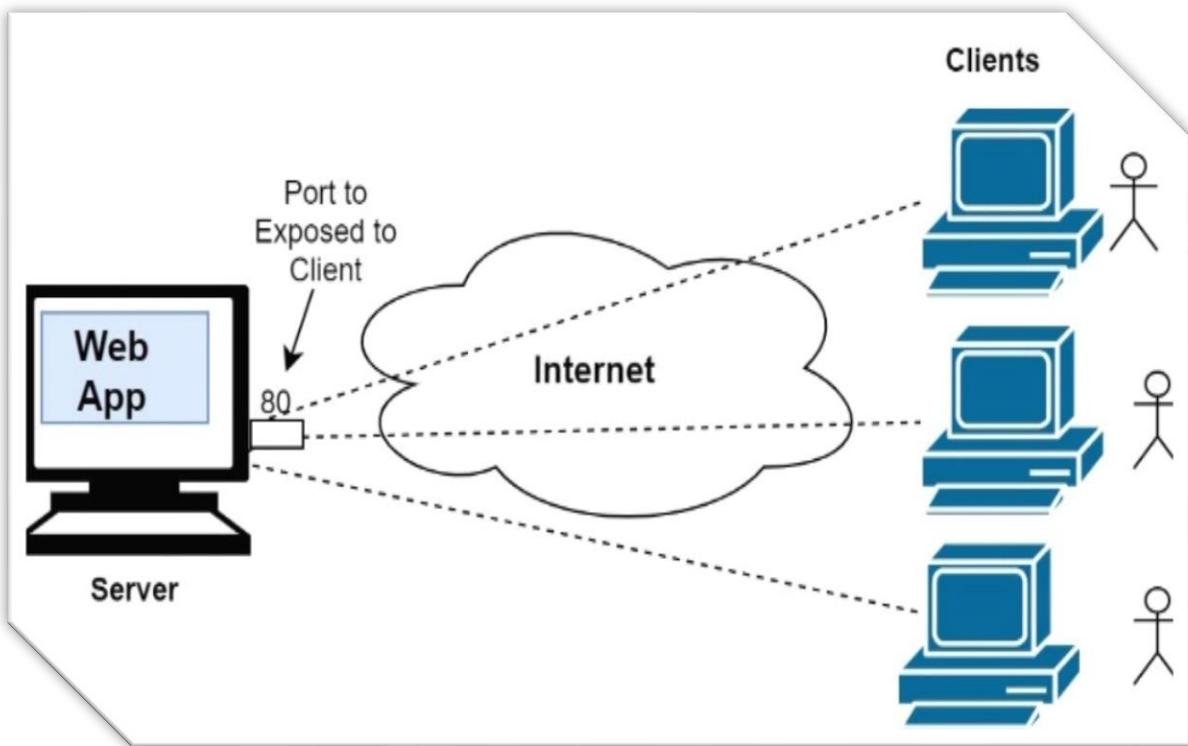


Figure 1 : Client server architecture (nimesha-dilini.medium.com)

3.2 Peer -to- peer architecture

In peer-to-peer architecture all computers are in computer network are connected With every computer in the network. There is no central computer to access as a Sever. Every computer has an equal statue. Anybody can be a server in this architecture.

3.2.1 Types of peer-to-peer Network

- **Pure peer to peer network**

It also uses a form as a fully peer to peer network. All peers in this networks perform the exact similar function because there is no central sever that serves to the network's hub.

- **Unstructured peer to peer network**

This type of network easy to connect various type of devices of Network however given the lack of organization it may be Challenging for users to search for rare information.

- **Structured peer to peer network**

It is not easy to build up this type of network even, so it provides an excellent platform to discovering rare information.

- **Hybrid peer to peer network**

As a result of a centralized powerful device the above network act more like a client server network but these types of network are usually peer to peer networks.

3.2.2. Advantages and Disadvantages of Peer-to-Peer Architecture

Advantages	Disadvantages
<ul style="list-style-type: none">• Cost Building and Maintaining this Network is overall cost is extremely inexpensive and the payment should also done only once.• Reliability In this Network the computers are not dependent on a central system. If a network fails one part, it doesn't matter to the other computers.• Implementation It is easy to setup this network and no need additional knowledge for that only a hub or a switch needed for the connection.	<ul style="list-style-type: none">• Decentralization This has no central server because of that the files are stored on individual machines. This Makes it harder for the user to locate and find files.• Performance This is another issue facing in this network. Because each machine is used by one user and many users are used it then the performance will decrease, and it will decrease because more devices connect to the network.• Backup and Recovery Backup process is made way difficult since there is no central device to save the files on it because of that the files will save different locations then user can't find it easily to backup.

<ul style="list-style-type: none"> Administration <p>As each user does have the power to control the own system, there is no need for a specialized network administrator. User can choose any type of file that user want to share.</p>	<ul style="list-style-type: none"> Virus Attack <p>To protect from viruses every computer must set own rules. There is no central device to monitor and control the spread of virus. Virus, Malware, Trojan can easily spread over the whole network.</p>
--	---

Table 3 : . Advantages and Disadvantages of Peer-to-Peer Architecture

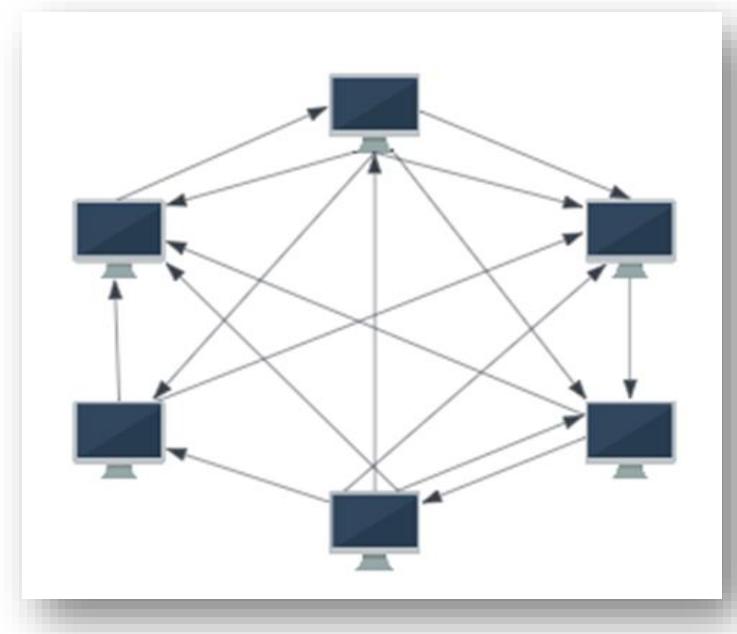


Figure 2 : Peer-to-Peer Architecture (Designed by Author)

4. Types of Networks

Most users are known about 5 types of Networks but there are many kinds of network Types. Namely the network types are,

1. Personal Area Network (PAN)
2. Local Area Network (LAN)
3. Wide Area Network (WAN)
4. Wireless Local Area Network (WLAN)
5. Campus Area Network (CAN)
6. Metropolitan Area Network (MAN)
7. Storage Area Network (SAN)
8. System-Area Network (SAN)
9. Passive Optical Local Area Network (POLAN)
10. Enterprise Private Network (EPN)
11. Virtual Private Network (VPN)
12. Home Area Network (HAN)

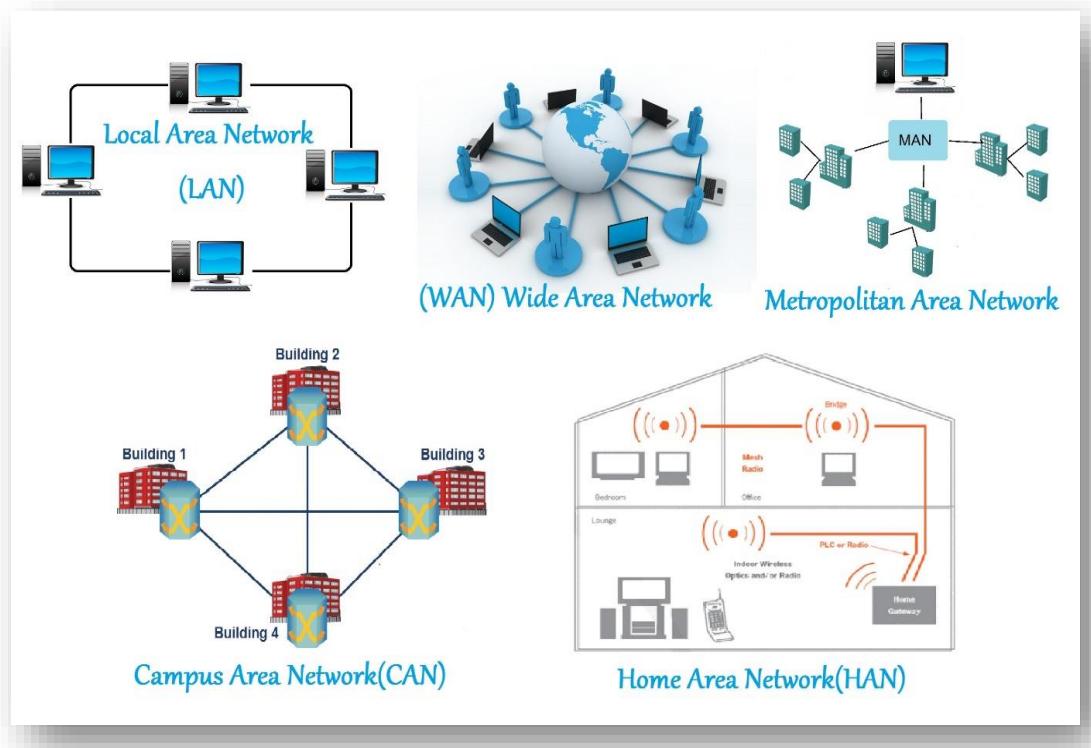


Figure 3 : Types of Networks (Inoformationq.com)

1. Personal Area Network (PAN)

Personal area network (PAN) connects electro devices within the range of an individual person. The range of the personal are network is 10 meters to 30 feet. However this network is divided to types. The two types are called,

- **Wired Personal area network**

In this network physical wires are used such as USB or Fire wire to connect devices.

- **Wireless Personal area network**

Wireless personal area network means that without a wired Connection such as Bluetooth, Infrared, Ultra-wideband and Wi-Fi connect the devices. In this type of the network spread To 5 to 10 meters. Also Personal area network used in several areas like Body area network, Offline network and Small home office.

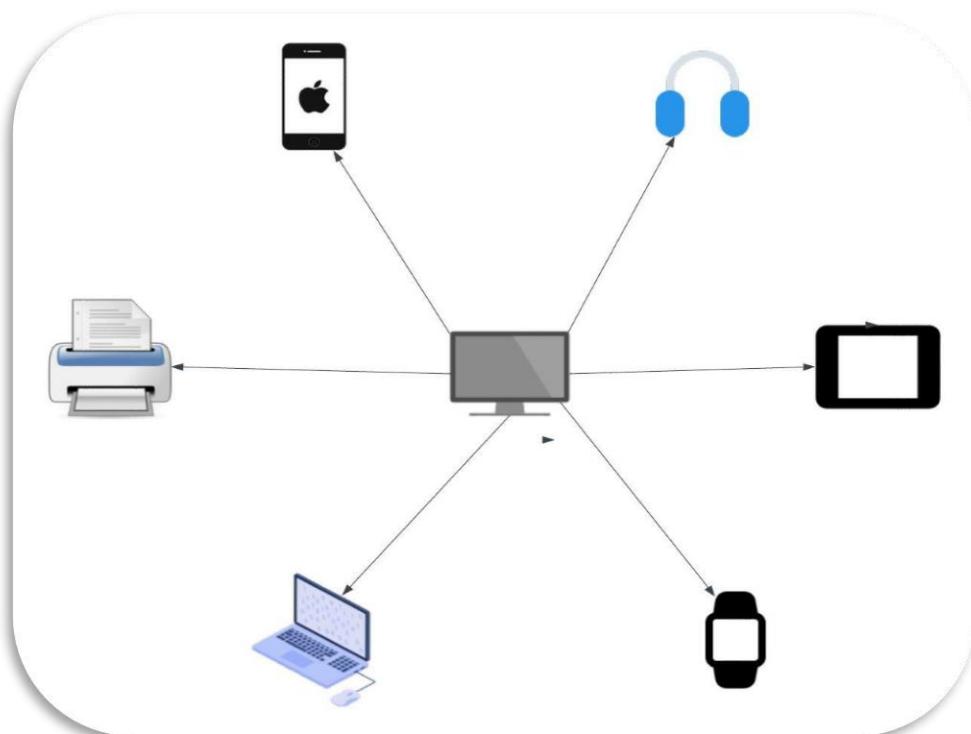


Figure 4 : Personal area network (Designed by Author)

2. Local Area Network (LAN)

Local area network is a network that connect devices with wired or wireless in a building, Office, School etc. In the past mid of 1970s the first LAN design has been developed.

2.1 The types of LAN networks

1	Client server LAN	A single server connects to multiple devices.
2	Peer to Peer LAN	No central device. All devices are inter connected to each other
3	Token ring LAN	Nodes are connect like a ring and all connected devices are assigned to token.
4	Token bus LAN	Nodes are connected like a tree branch and token share right side and left side.
5	Wired LAN	This is used electronic waves to transfer data through optical fiber.
6	Cloud managed LAN	This checks the network performance and security.

Table 4 : Types of Lan network

2.2 Key components of a LAN

- Public Internet
- Wired end user device
- Mobile end user device
- Modem
- Centralized server
- Network switches
- Wi-Fi router

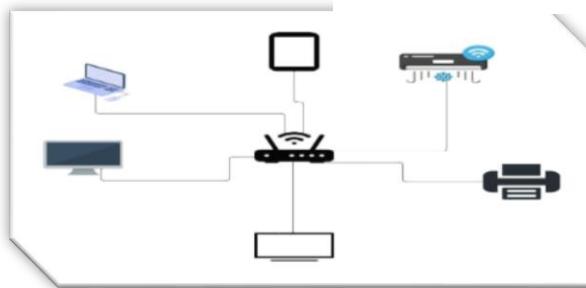


Figure 5 : Local area network (Design by the author)

3. Wide Area Network (WAN)

This is the Network that spread large geographical area. That means this spread through a Country or worldwide. For an example Internet is wide area network user can Communicate or share anything wherever user in the world.

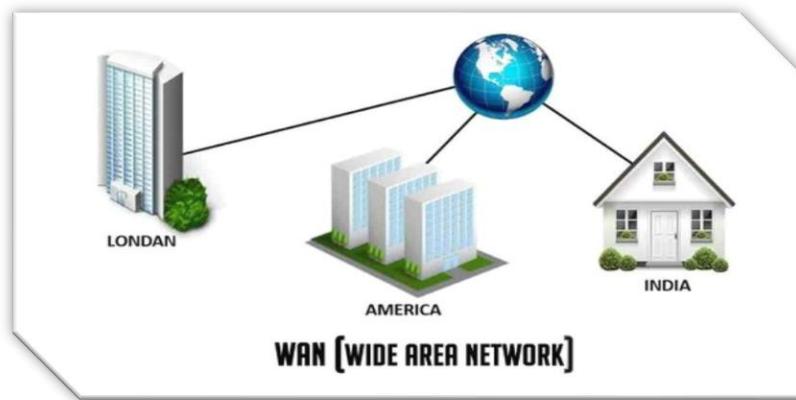


Figure 6 : Wide area Network (<https://www.quora.com>)

4. Wireless Local Area Network (WLAN)

This is also a type of a local area network. The difference is this LAN relates to a Wireless communication. In WLAN at least one or more devices relate to Wireless. For an example Wi-Fi router is WLAN.



Figure 7 : Wireless Area Network (<http://www.sunsystemonline.com>)

5. Campus Area Network (CAN)

In Limit area that connected two or more LAN s are called Campus area network (CAN).

For an example in university there are several buildings that connected to each other building in a university area.



Figure 8: Campus Area Network (community.fs.com)

6. Metropolitan Area Network (MAN)

This is bigger than the can network. This network that connected buildings only inside a city. This commonly connected with a high-speed connection such as fiber optic cables. This can share data and resources quickly.

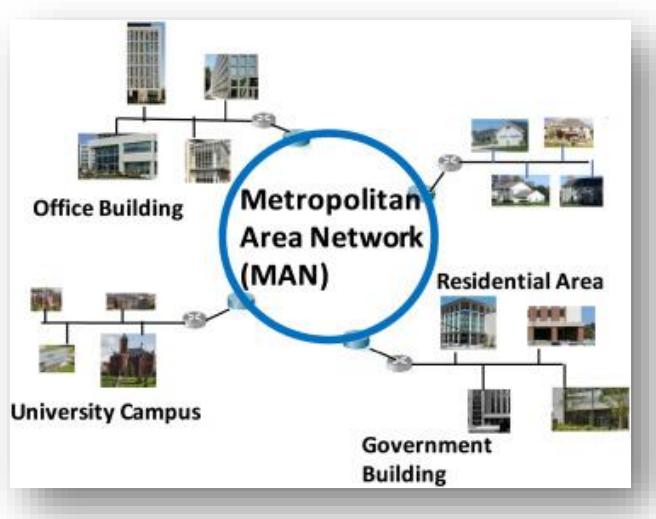


Figure 9 : Metropolitan Area Network (www.sciencedirect.com)

7. Storage Area Network (SAN)

This is a high-speed network. This can store many data and can accessed to it. This network is specialty designed to store the data. Storage area network has disk arrays, switches and servers. SAN is used in LAN for avoid Network traffics. But this is no a part of Local area network. Because of that SAN doesn't get any distracters from network traffics.

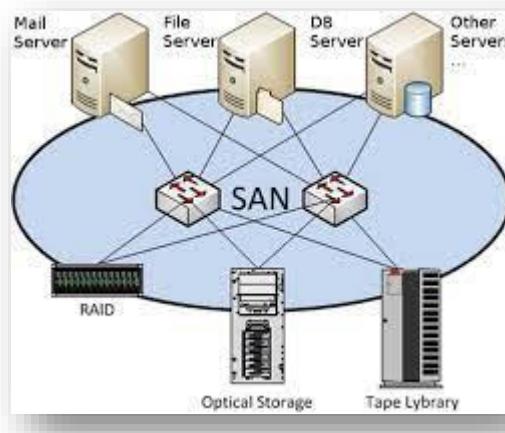


Figure 10 : Storage Area Network (www.frikatoria.com)

8. System-Area Network (SAN)

A system area network is a group of devices that interconnected by a high speed connection as an example clusters of client server computers. In this network there is no specify person or year behind the invention.

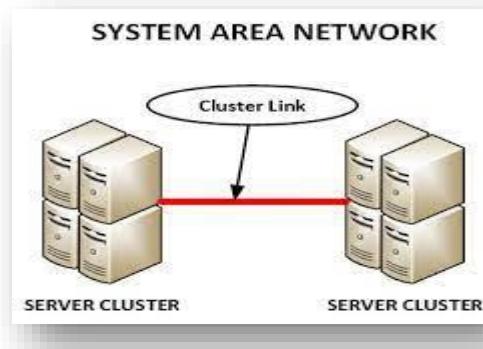


Figure 11 : System Area Network (www.networkstraining.com)

9. Passive Optical Local Area Network (POLAN)

This network is speed fiber from the data center to the desktop. In this network there is called jeep on architecture. Jeep on architecture delivers converged voice, video and data gigabit bandwidth layer to each computer. The information transported security to make the passive MPO connectors are adding to save time and money.

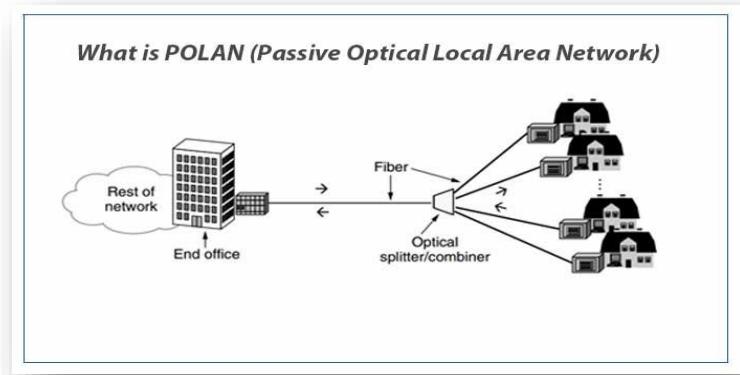


Figure 12 : Passive Optical Local Area Network (snabaynetworking.com)

10. Enterprise Private Network (EPN)

Enterprise network is built by business to communicate or interconnected with other company sites. This network was built to share computer resources. This networking was made in 1970s by AT&T. The purpose of this network is have high speed internet and organized data sharing.

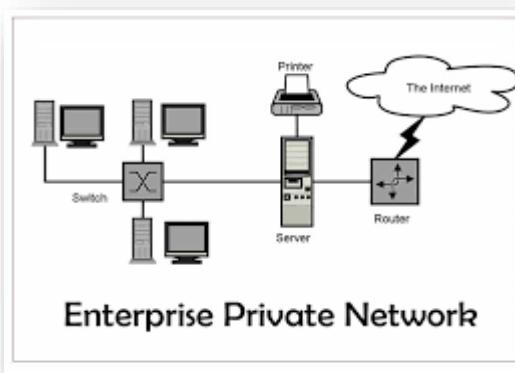


Figure 13: Enterprise Private Network (www.itrelease.com)

11. Virtual Private Network (VPN)

Virtual private network is a protect network connection when user using public Networks. This makes difficult for stealers to steal data from the user. Also, there are different kinds of VPNs. Such as,

- SSL VPN
- Site to Site VPN
- Client to Server VPN

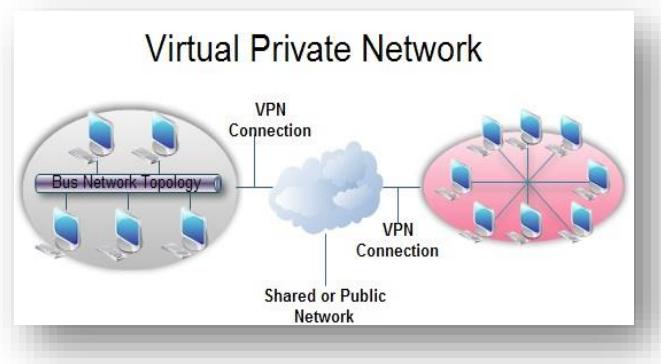


Figure 14 : Virtual Private Network (ecomputernotes.com)

12. Home Area Network (HAN)

This Network connect with all digital devices such as laptops, computers, smart phones in a home. Home Area Network can be wired or wireless and it is a type of a Local Area Network.

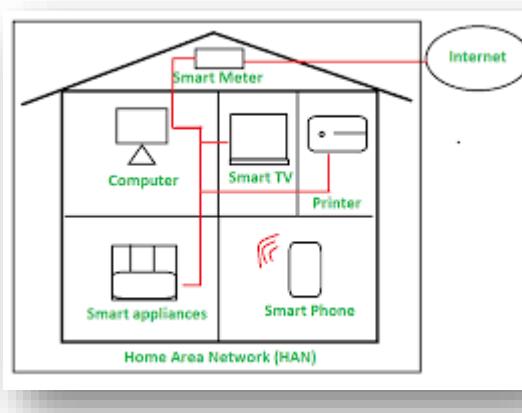


Figure 15: Home Area Network (www.geeksforgeeks.org)

4.1 Advantages and Disadvantages of Network Types.

Network Type	Advantages	Disadvantages
Personal Area Network (PAN)	<ul style="list-style-type: none"> • Can conserve space. 	<ul style="list-style-type: none"> • This network can operate in less range of areas.
	<ul style="list-style-type: none"> • Simple to use. 	<ul style="list-style-type: none"> • Slow data sharing.
	<ul style="list-style-type: none"> • It is trustworthy. 	<ul style="list-style-type: none"> • Health related problems.
	<ul style="list-style-type: none"> • Cost is inexpensive 	<ul style="list-style-type: none"> • Data can be lost because of interfere with radio signals
	<ul style="list-style-type: none"> • It is protected. 	<ul style="list-style-type: none"> • Infrared signals give service only in a straight line.
Local Area Network (LAN)	<ul style="list-style-type: none"> • Easily can share devices. 	<ul style="list-style-type: none"> • It is difficult to install, and it is expensive.
	<ul style="list-style-type: none"> • With a fast performance easily share data. 	<ul style="list-style-type: none"> • A problem with information security.
	<ul style="list-style-type: none"> • Cheaper Costs. 	<ul style="list-style-type: none"> • Major restriction due to distance
	<ul style="list-style-type: none"> • User can save their work centrally on the networks file server. 	<ul style="list-style-type: none"> • If the server fails all devices could be adversely affected.
Wide Area Network (WAN)	<ul style="list-style-type: none"> • High Efficiency 	<ul style="list-style-type: none"> • This is a complicated and complex network.
	<ul style="list-style-type: none"> • Cover a large network. 	<ul style="list-style-type: none"> • Hard to maintain the network.
	<ul style="list-style-type: none"> • Communication is easy. 	<ul style="list-style-type: none"> • Problems of security.
	<ul style="list-style-type: none"> • Spread information over a wide area. 	<ul style="list-style-type: none"> • This is a public network and user privacy will be enhanced significantly.
	<ul style="list-style-type: none"> • Any other network user can receive messages quickly. 	<ul style="list-style-type: none"> • Need of high performance.

Wireless Local Area Network (WLAN)	<ul style="list-style-type: none"> It's a trustworthy method of communicating. 	<ul style="list-style-type: none"> WLAN calls for a license.
	<ul style="list-style-type: none"> Workstations are simpler to feature or remove. 	<ul style="list-style-type: none"> WLAN uses frequency, which could cause interference with other frequency-using devices.
	<ul style="list-style-type: none"> Workstations are simpler to feature or remove. 	<ul style="list-style-type: none"> It's a limited area to hide.
	<ul style="list-style-type: none"> The sunshine of sight is not necessary for reproduction. 	<ul style="list-style-type: none"> Data transfer rate decreases as there are more connected devices.
	<ul style="list-style-type: none"> Workstations are simpler to feature or delete. 	<ul style="list-style-type: none"> Chances of errors are high.
Campus Area Network (CAN)	<ul style="list-style-type: none"> Sharing Data is Simple 	<ul style="list-style-type: none"> It can support up to a 40-meter length
	<ul style="list-style-type: none"> Connect Wirelessly 	<ul style="list-style-type: none"> Unwanted interactions between all nodes in a CAN network appear.
	<ul style="list-style-type: none"> File Transfers Happen Quickly 	<ul style="list-style-type: none"> High Cost for software development and maintenance
	<ul style="list-style-type: none"> Economical 	<ul style="list-style-type: none"> Limited number of nodes
	<ul style="list-style-type: none"> Internet connection shared 	<ul style="list-style-type: none"> Node interactions that are undesirable
Metropolitan Area Network (MAN)	<ul style="list-style-type: none"> High speed than WAN 	<ul style="list-style-type: none"> Hackers target
	<ul style="list-style-type: none"> MAN has a higher level of security than WAN. 	<ul style="list-style-type: none"> To set up, technical personnel are needed.
	<ul style="list-style-type: none"> A MAN usually encompasses several blocks of a city or an entire city 	<ul style="list-style-type: none"> When compared to LAN, the data rate is low.

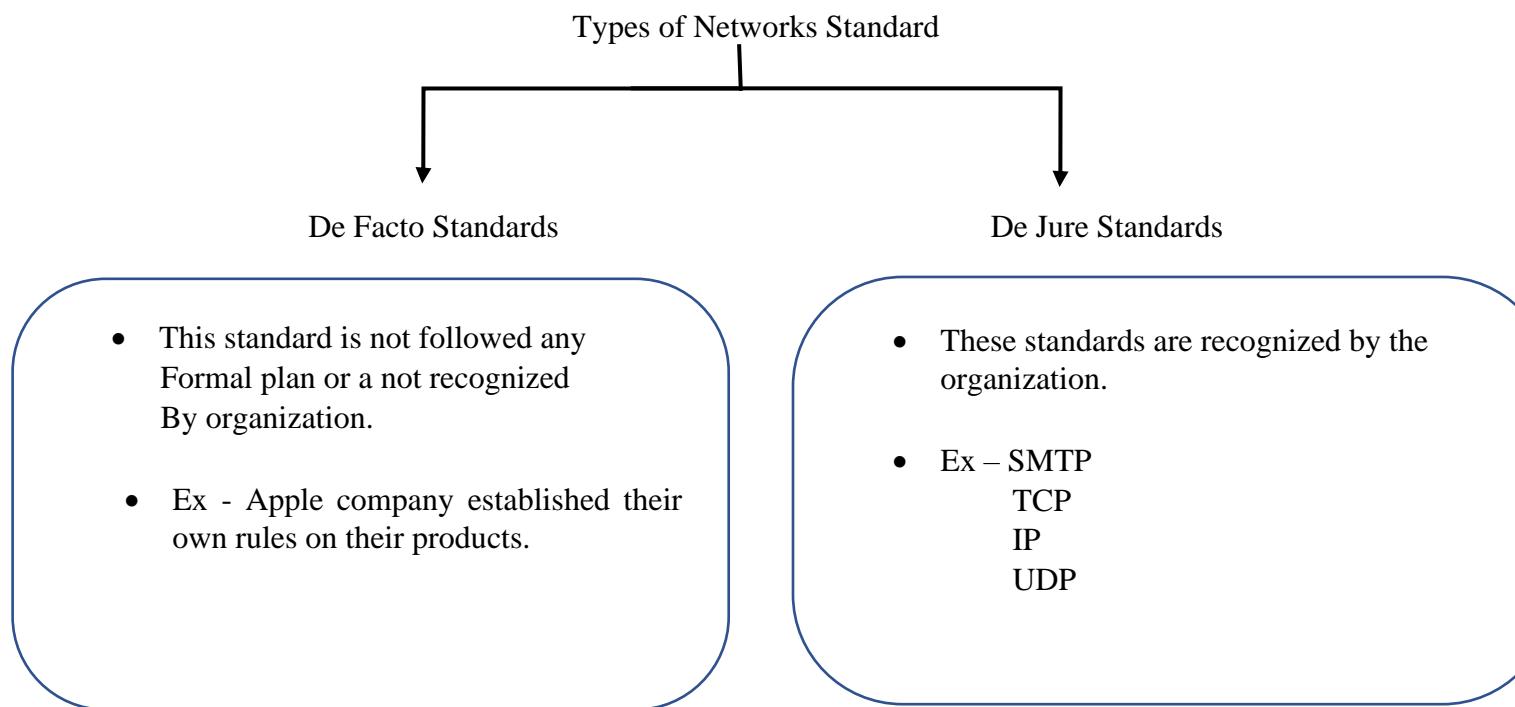
	<ul style="list-style-type: none"> A MAN usually encompasses several blocks of a city or an entire city 	<ul style="list-style-type: none"> More cable requires for a MAN connection from one place to another
Storage Area Network (SAN)	<ul style="list-style-type: none"> Speedy 	<ul style="list-style-type: none"> Expensive
	<ul style="list-style-type: none"> Flexible 	<ul style="list-style-type: none"> Complex
	<ul style="list-style-type: none"> Speedy, Flexible 	<ul style="list-style-type: none"> Privacy
	<ul style="list-style-type: none"> Reduced hard disk usage 	<ul style="list-style-type: none"> Not Good for High Traffic
	<ul style="list-style-type: none"> Effective Data Security 	<ul style="list-style-type: none"> Maintenance
Passive Optical Local Area Network (POLAN)	<ul style="list-style-type: none"> High rate. 	<ul style="list-style-type: none"> installing problems
	<ul style="list-style-type: none"> a greater distance 	<ul style="list-style-type: none"> problem evolve
	<ul style="list-style-type: none"> Less cable is required. 	<ul style="list-style-type: none"> Transfer problem
	<ul style="list-style-type: none"> both upstream and downstream, high 	<ul style="list-style-type: none"> The difficulty at the corporate level
	<ul style="list-style-type: none"> Numerous connections Use less Energy 	<ul style="list-style-type: none"> Detection of Individual Bandwidth Splitter Failures
Enterprise Private Network (EPN)	<ul style="list-style-type: none"> Secure than other public networks of its kind. 	<ul style="list-style-type: none"> unavailable with certainty
	<ul style="list-style-type: none"> This network can swiftly expand without incurring significant costs. 	<ul style="list-style-type: none"> unpredictable behavior
	<ul style="list-style-type: none"> It is best for business users 	<ul style="list-style-type: none"> a lack of fine-grained security
	<ul style="list-style-type: none"> Through EPN, several offices are centralized. 	<ul style="list-style-type: none"> Scalability is hampered by the complexity

	<ul style="list-style-type: none"> EPN is cost-effective for big companies 	<ul style="list-style-type: none"> Not intended for ongoing use. Never was an enterprise-wide WAN connection the use case for remote access VPNs.
Virtual Private Network (VPN)	<ul style="list-style-type: none"> Safe Connection for Distance Work 	<ul style="list-style-type: none"> Missing Connections
	<ul style="list-style-type: none"> Cost-Effective Security 	<ul style="list-style-type: none"> Not All Countries Allow the Use of VPNs
	<ul style="list-style-type: none"> Ensure Safety by Remaining anonymous 	<ul style="list-style-type: none"> High-quality VPNs Are Expensive
	<ul style="list-style-type: none"> VPNs Improve Online Gaming 	<ul style="list-style-type: none"> Choosing the Wrong VPN Could Endanger Your Privacy
	<ul style="list-style-type: none"> VPNs Can Get Around Firewalls 	<ul style="list-style-type: none"> Not All Devices Support VPNs Natively
Home Area Network (HAN)	<ul style="list-style-type: none"> Multiuser 	<ul style="list-style-type: none"> Slow Connectivity
	<ul style="list-style-type: none"> Security 	<ul style="list-style-type: none"> Requires High Security
	<ul style="list-style-type: none"> sharing of resources 	<ul style="list-style-type: none"> Expensive
	<ul style="list-style-type: none"> Accessibility 	<ul style="list-style-type: none"> Wi-Fi - microwaves
	<ul style="list-style-type: none"> Maintenance 	<ul style="list-style-type: none"> Lack of WIFI password

Table 5 : Advantages and Disadvantages of Network Types

6. Network Standards

A network that begins designed from the documents than contain technical and physical specifications are called Network Standards.



5.1 Network Standards Organizations.

1) ISO (International organization for standardization)

ISO stand for Internet society. Iso founded in 1992 and handles Internet standards Education and development. The mission of ISO is making open Internet development and help to raise the organization that use internet and individuals worldwide.



Figure 16 : ISO (International organization for standardization)(www.legalraasta.com)

2) ANSI (American National Standards Institutes)

ANSI is a private nonprofit organization. ANSI was founded in 1918. ANSI represents and serves for standards ,developers ,government ,Manufacturing, Academia etc. For an example SQL is an ANSI because SQL follow the rule and regulations of ANSI.



Figure 17 : ANSI (American National Standards Institutes)
(<http://www.legalraasta.com>)

3) IEEE (Institute of Electrical and Electronics Engineers)

This is worldwide educational and professional organization. Nowadays IEEE was spread more than 160 countries. IEEE developers worldwide In a broad range of industries such as power and energy, health care, Learning technology etc.



Figure 18 : IEEE (Institute of Electrical and Electronics Engineers)
(<http://www.spacebizguide.com>)

4) INCTS (International Committee for Information Technology)

INCTS stands for manage and create standards in Information And Communication technologies. INCTS was founded in 1980 This develops standards and products in processing, transfer, data Storage etc.



Figure 19 : INCTS (Inter National Committee for Information Technology)

(<https://data:image>)

5) TIA (Telecommunications Industry Association)

TIA represent the interest of worldwide information and communication technology industry. The company that involves such as telecommunicating broadband, mobile, wireless etc.



Figure 20 : TIA (Telecommunications Industry Association)

The impact of network topology, communication, and bandwidth Requirements.

1. The impact of network topology.

Topology means a Greek word. “Topo” means place and “logy” means study. However, Network topology means the arrangement of a communication network. Network topology can divide into two parts that are called,

1. Physical topology
2. Logical topology

1.1 Physical topology

1) Point to Point Topology

This topology is the simplest topology in the network topology. Point to Point topology connects two nodes directly together with a common link. In Point-to-Point Topology Transfer data can be multiple ways like simplex, full duplex and half duplex.

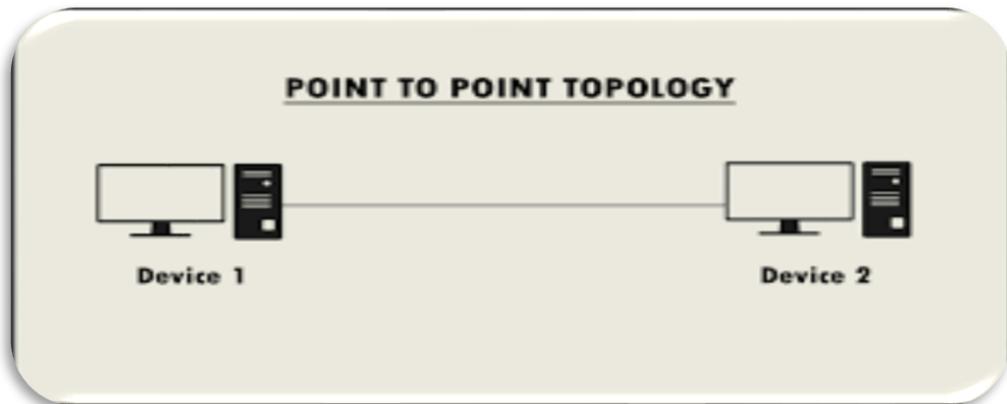


Figure 21: Point to Point topology (<https://www.itrelease.com>)

ADVANTAGE	DISADVANTAGE
<ul style="list-style-type: none">Node can be replaced quickly	<ul style="list-style-type: none">This topology use for small areas
<ul style="list-style-type: none">Easy to handle and maintain	<ul style="list-style-type: none">The entire network is depends on the cable or a single link.
<ul style="list-style-type: none">Each point to point can use different	<ul style="list-style-type: none">There is a only sever stay if it fails

networks	the system fails.
• Security	
• Low cost	

Table 6 : point to point topology

2) STAR TOPOLOGY

This Topology consists of a central node to which all other nodes are connected by a single path. It is the topology used in most existing information networks involving data processing or voice communications.

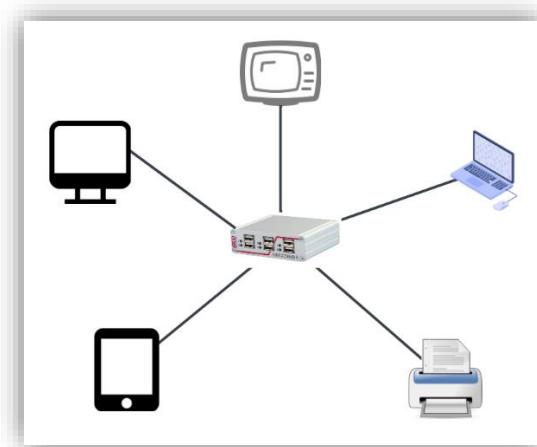


Figure 22 : Star Topology (Design by author)

ADVANTAGES	DISADVANTAGES
• Ease of Service	• Long Cable length
• One Device per Connection	• Difficult to Expand
• Centralized Control	• Central node Dependency
• Simple Access Protocols	• Extra hardware is required

Table 7 : Star topology

3) BUS TOPOLOGY

The linear topology is another well-liked one for data networks. The different nodes are connected to a single length of the transmission medium, which is often a coaxial wire. The topology is utilized in conventional data communication networks, where the host is located at one end of the bus and connects with numerous terminals attached along its length. Any station's transmission can be picked up by another station because it travels the entire length of the bus in both directions. At each end of the bus are terminators that take in the signal and remove it from the bus. Data is transferred in discrete units called packets. In addition to a header specifying the destination address, each packet also contains some data bits. When a station wants to deliver data, it does so in packets.

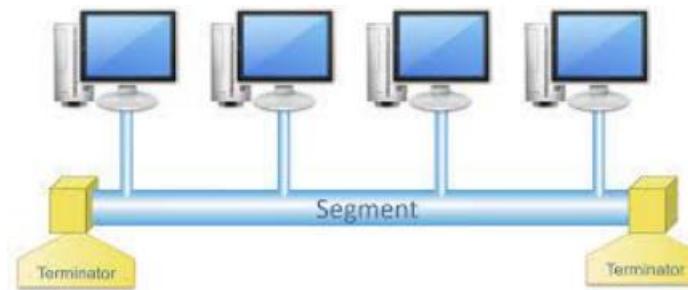


Figure 23 : Bus topology (<https://service.snom.com>)

ADVANTAGES	DISADVANTAGES
<ul style="list-style-type: none"> • Short Cable Length 	<ul style="list-style-type: none"> • Fault Diagnosis is difficult
<ul style="list-style-type: none"> • Resilient Architecture 	<ul style="list-style-type: none"> • Fault isolation is difficult
<ul style="list-style-type: none"> • Easy to Extend 	<ul style="list-style-type: none"> • Repeater configuration
<ul style="list-style-type: none"> • Easy to Connect or remove a device. 	<ul style="list-style-type: none"> • Nodes must be intelligent
<ul style="list-style-type: none"> • Easy to understand the topology. 	<ul style="list-style-type: none"> • Packet loss is high

Table 8 : Bus topology

4) RING TOPOLOGY

Each node in this topology is linked to two and only two surrounding nodes. One of the nearby nodes sends data to the other, which is then accepted. As a result, information only moves from node to node around the ring in one way. It returns to the sender node, which removes it, after traveling through each node. It's crucial to remember that information "passes through" each node rather than "travels past" it. Accordingly, the signal might be enhanced before being "replayed" on the external channel.

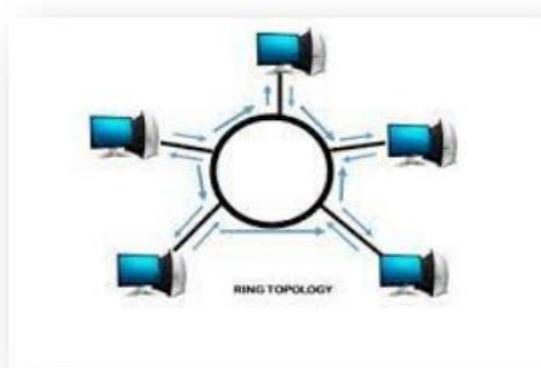


Figure 24 : Ring topology (<https://www.javatpoint.com>)

ADVANTAGES	DISADVANTAGES
▪ Short Cable Length	▪ Node Failure Causes Network Failure
▪ No Wiring closet space Required	▪ Difficult to diagnose Faults
▪ Suitable For Optical Fibers	▪ Network Reconfiguration is difficult
▪ Easy to Manage	▪ Not Scalable
▪ Data transferring is Speedy	▪ Depending on one cable.
▪ Low interaction	▪ This is Expensive

Table 9 : Ring Topology

4) TREE TOPOLOGY

A unique kind of structure called a tree topology has numerous connected parts arranged like the branches of a tree. For instance, tree topologies are widely used to arrange the data in a database or the machines in a business network.

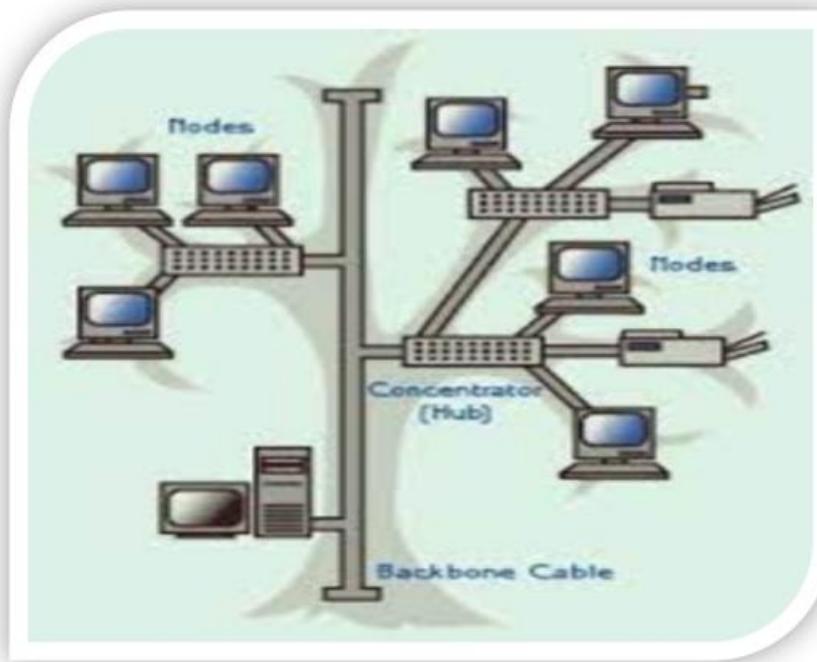


Figure 25 : Tree Topology (<https://www.itrelease.com>)

ADVANTAGES	DISADVANTAGES
<ul style="list-style-type: none">• Reliable	<ul style="list-style-type: none">• Cost
<ul style="list-style-type: none">• Highly Secure	<ul style="list-style-type: none">• Maintenance
<ul style="list-style-type: none">• Easy Expansion	<ul style="list-style-type: none">• Security

Table 10 : Tree topology

4)MESH TOPOLOGY

A network configuration known as a mesh topology has devices such as computers and routers connected. Most transmissions can be spread with this architecture even if one of the connections fails. It is a topology that wireless networks frequently employ. Here is a picture of a straightforward computer configuration on a mesh network.

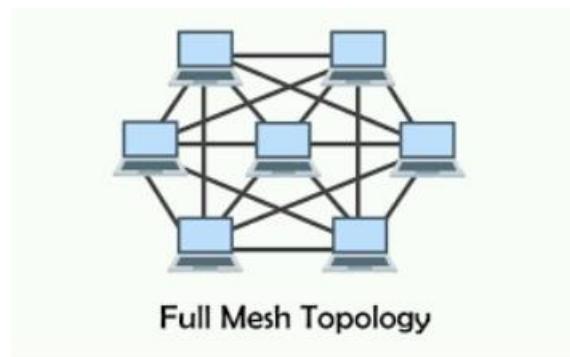


Figure 26 : MESH TOPOLOGY (ITRELEASE.COM)

Advantages	Disvantages
Easy To Add New Devices	Difficult
Almost Impossible to take down	Complex Structure
Scalability Is Simple	Costly Compared to Others

Table 11 : Mesh Topology

5) Daisy Chain Topology

This is a network that can connect one computer to another computer without bothering about another devices. This network is also simple network, and it can add more ethernet devices to the network. This type of network can be linear or ring topology type.

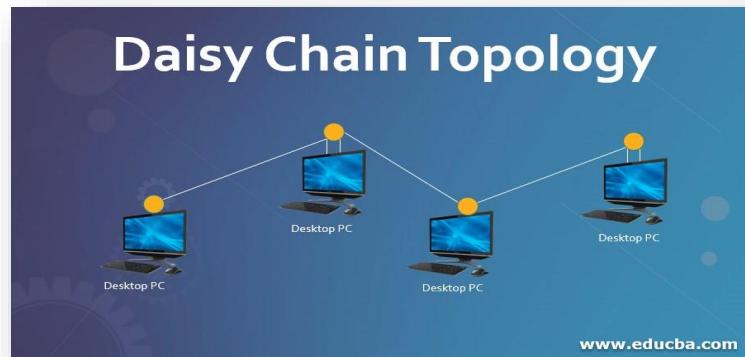


Figure 27 : Daisy Chain Topology (www.educba.com)

6) Hybrid Topology

The meaning of hybrid topology is that can design a network structure with 2 or more topogies like star, bus, ring, mesh, tree like wise. The biggest example for hybrid topology is the Internet. There are also have two types for hybrid topologies .there are

- Star – ring hybrid topology
- Star – bus hybrid topology

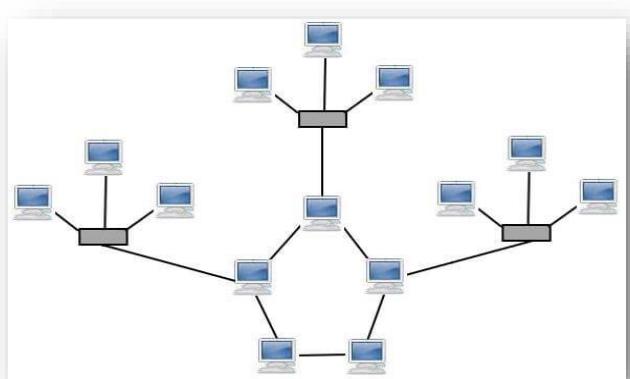


Figure 28 : Hybrid Topology (www.javatpoint.com)

7) Extended Star Topology

In this Network there are multiple switches and hubs and all connected to a one main hub. This is a large network. This is like a crystal type topology.

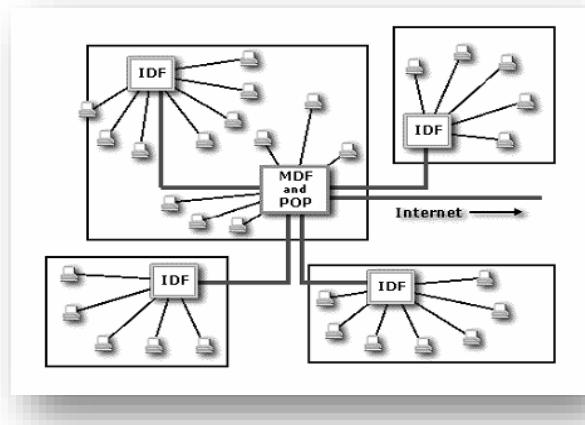


Figure 29 : Extended Star Topology (www.researchgate.net)

8) Dual Ring Topology

This topology uses two rings for the Network and the two rings are called as one is a primary ring and other one is secondary ring. Incase if the primary ring has a failure, then the secondary ring will handle the network.

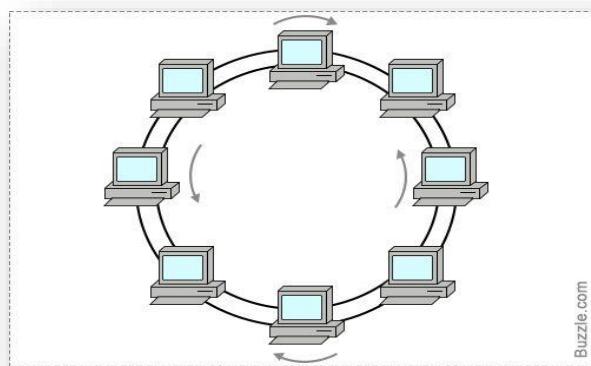


Figure 30 : Dual Ring Topology (https://www.pinterest.com)

1.2 Logical Topology

This topology shows how data will pass from one device to another device through network. As examples,

- Ethernet
- Giga Ethernet
- Fast Ethernet

LOGICAL TOPOLOGY	EXPLANATION
ETHERNET	<ul style="list-style-type: none">• This was made in 80's to connect devices in a home or a building it called as LAN also.• This can connect multiple devices and store and share information for others.• Ethernet is a wired system that firstly use with coaxial cable and now it is developed and using twisted pair copper wiring and fibre optics wiring.• Twisted pair wiring was invented in 1881 by Alexander Graham Bell.• 1983 – Ethernet was standardized into the IEEE802.3 Standard by Electrical and Electronic Engineers.• Ethernet Divided into two parts. That are called,• Physical Layer• Data Link Layer• These two layers are the first and second layer of the OSI (Open system Interconnect) Model.

GIGA ETHERNET	<ul style="list-style-type: none">• Dr Robert Metcalf was the founder of the gigabit ethernet then intel, digital and xerox introduce the gigabit ethernet in 1970s.• The IEEE 802.3 Committee approved the first gigabit ethernet in 1988.• One gigabit per second is the maximum allowable data rate that giga ethernet can allow.• Gigabit ethernet works using regular Ethernet cable like CAT5E AND CAT6 cabling stands but if there is a long distance then use the fibre optic cables and special cables.
FAST ETHERNET	<ul style="list-style-type: none">• Fast Ethernet was created in 1995 under IEEE 802.3U standard.• In local area networks fast ethernet carry data traffic at 100 mega bit per second.• This has cable transmission and network protocols.• User can use fast ethernet and twisted pair cables.• Fast ethernet has various types. That are: -<ul style="list-style-type: none">• 100 Base TX• 100 Base T2• 100 Base T4• 100 Base T1

Table 12 : Logical Topology

1.3 The importance of Network topologies.

1. User can see how the network functions through a network topology
2. IT administrator can understand how the network work when user make a network topology.
3. User can solve problems easily when user make a network topology.
4. Explain how the network devices and applications work in a network through a topology.
5. Gives a distributed network to been shown geographically.

2. Communication and Bandwidth Requirements.

2.1. Bandwidth

- In each time period over a network connection that transferring data through a wired or wireless communication of a maximum capacity when it is measuring It is called as Bandwidth.
- Bandwidth can represent in a number of bits, kilobits, megabits or gigabits that transfer in 1 second.
- When a data connection has more bandwidth more data will send and receive at one at a time.

2.2. The amount of bandwidth that needs for various types of services.

- **25 Mbps** - 4k ultra-HD Video streaming with Netflix or YouTube.
- **5Mbps** - HD 1080p video streaming Netflix or YouTube
- **3Mbps** - 720p video calling like zoom meeting
- **1.5Mbps** - Broadcast
- **0.5Mbps** - Live streaming such as websites
- **150kbps** - Screen sharing
- **80kbps** - VOIP Calling

2.3 Importance of bandwidth

- For emails small amount of bandwidth is enough because of that little amount of data been transmitted
- Video Conferencing needs lots of bandwidth because lots of data transmitted.
- Bandwidth isn't free.
- Bandwidth is flint.

2.4 Bandwidth Measurements.

Unit	Abreviation	Binary Value	Decimal value	Decimal Size
Bit	b	0 or 1	0 or 1	1/8 of a byte
Byte	B	8 bits	8 bits	1 byte
Kilobyte	KB	1024^1 bytes	1000^1 bytes	1000 bytes
Megabyte	MB	1024^2 bytes	1000^2 bytes	1,000,000 bytes
Gigabyte	GB	1024^3 bytes	1000^3 bytes	1,000,000,000 bytes
Terabyte	TB	1024^4 bytes	1000^4 bytes	1,000,000,000,000 bytes
Petabyte	PB	1024^5 bytes	1000^5 bytes	1,000,000,000,000,000 bytes
Exabyte	EB	1024^6 bytes	1000^6 bytes	1,000,000,000,000,000,000 bytes
Zettabyte	ZB	1024^7 bytes	1000^7 bytes	1,000,000,000,000,000,000,000 bytes
Yottabyte	YB	1024^8 bytes	1000^8 bytes	1,000,000,000,000,000,000,000,000 bytes

Figure 31 : Bandwidth Measurements (networkustad.com)

Common networking principles and protocols that enable the effectiveness of networked systems.

1. Network Protocols

Network protocol known as set of rules for communicating between two computers. For example a person that speaking Japanese and a person that speaking Sinhala, they can't communicate each other because they have different languages, but they have a solution they can speak English to communicate. That's two computers also communicate each other they use a set of rules to understand the language that communicate.

1.1. Types of Network Protocols.

- **Transmission control protocol (TCP)**
 - This is a protocol that use in network communicating by data transferring like internet.
 - This protocol is placed between application layer and the network layer.
 - This protocol is a most important protocol.
 - Transmission Control Protocol has a end to end communication.
 - This protocol organized the data and then client and server can easily transfer the data.
 - This protocol can perform the roll of sender and a receiver because this protocol is a full duplex server.
 - TCP has an error controller to handle the errors.

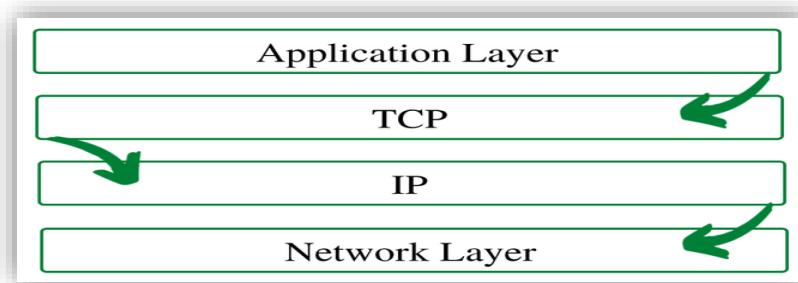


Figure 32: Transmission Control Protocol (www.geeksforgeeks.org)

- **Internet protocol (IP)**

- Internet protocol is a protocol that data sent one computer to another computer through internet.
- The first version of Ip protocol is version 4 it is also known as IPv4 and second version is 6 it is known as IPv6 this was clarified by IETF in 1998.
- The difference between IPv4 and IPv6 is Ipv4 uses 32 bites addressing and IPv6 uses 128 bites for addressing.
- Internet protocol characterize 2 things. That are known as,
- Format of IP Packet
 - Header and payload components are added to IP packet before it sent through network.
 - Ip header has lots of information about Ip packet such as
 - Header length
 - Packet length
 - Source Ip address
 - Destination Ip address
- IP addressing system
 - Ip address System also categorize into two section that are,
 - Public address
 - Public addresses are used in wide area Networks.
 - Private address
 - Private addresses are used in Personal area Network.



Figure 33 : Internet Protocol (forum.huawei.com)

- **User Datagram Protocol (UDP)**
- User Datagram Protocol is used for Time sensitive transmission like playback etc... through internet.
- This protocol was made in 1980 by David. P. Reed.
- The Benefits of UDP are,
 - UDP has a useful speed.
 - UDP is suitable for Broadcasting
 - There is error detection also.
 - The packet transmission needs less time to transfer.
- The UDP Header structure rows are,
 - Source port
 - Destination port
 - Length
 - Checksum

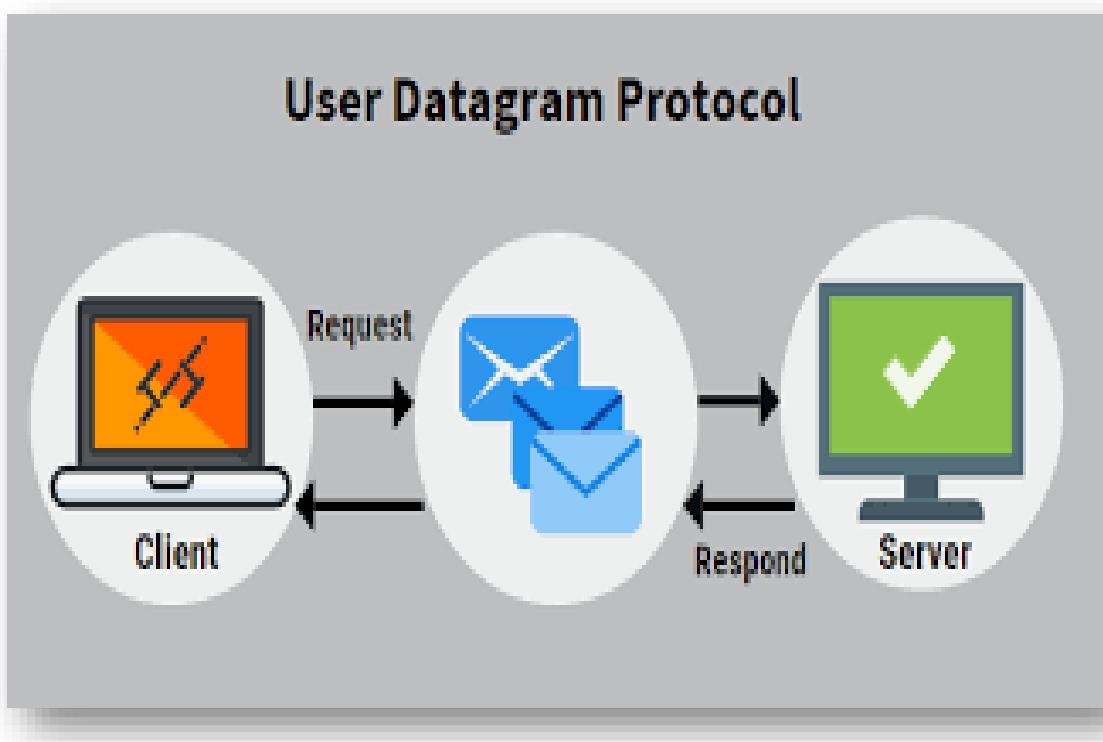


Figure 34 : User Datagram Protocol (www.educba.com)

- **Post office Protocol (POP)**

- This is an internet protocol that recover emails from an isolate mail server.
- This is also a application layer of OSI model this provides end users to get emails easily.
- This protocol was 1984 by the internet engineering task force.
- In 1985 POP2 version has introduce and the POP3 version was introduce in 1988.

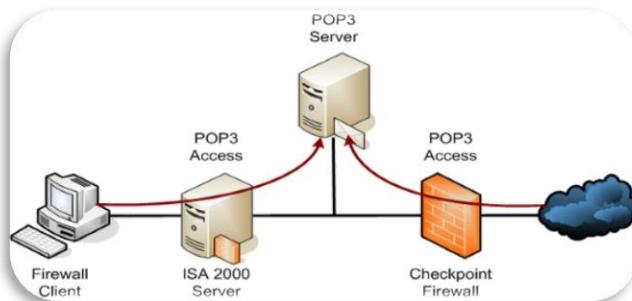


Figure 35 : Post Office Protocol (www.tech-faq.com)

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

- Simple Mail Transfer Protocol is set of communication instruction that allows to a software to transfer electronic mail through internet.
- This protocol used for sending messages through email address.
- When user send message to another person through email it is okay to
 - Share text, images, videos etc...
- In this protocol a one message can send to a one person or many.
- This protocol has two types that are,
 - End to End Method
 - Store and Forward Method



Figure 36 : Simple Mail Transfer Protocol (www.educba.com)

- **File Transfer Protocol (FTP)**
 - This Protocol is used for when transfer files through TCP or IP Model.
 - Businesspeople use file transfer protocol is use for share files between computers but websites use file protocol for uploading and downloading of files in website servers.
 - The Types of File Transfer Protocol
 - Ftp Plain
 - Ftps
 - Ftpes

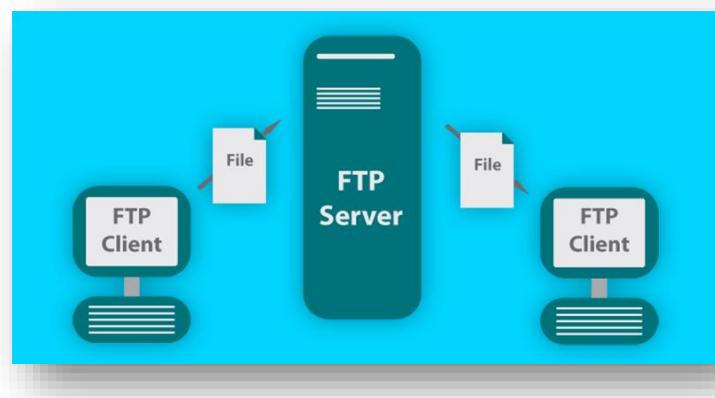


Figure 37 : File Transfer Protocol (www.ipswitch.com)

- **Hypertext Transfer Protocol Secure (HTTPS)**
 - This protocol is the secure version of Http.
 - Https are mostly used for online transactions such as online banking and online shopping etc...
 - Https uses 443 port for Data communication.



Figure 38 : Hypertext Transfer Protocol secure (www.globalsign.com)

- **Telnet**
- Telnet is a protocol that uses computer to access virtually.
- This is used for communicating with a remote device.

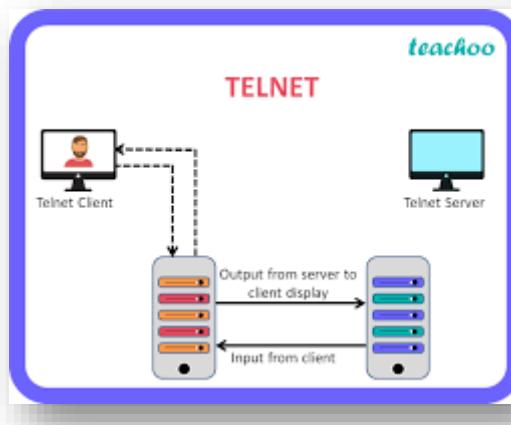


Figure 39 : Telnet (www.teachoo.com)

- **Gopher**

- This is an application layer that can pull out and see a web document that stores in a remote web server.
- Gopher was founded in 1991 and was discovered by the University of Minnesota.
- Gopher is designed for sharing documents on the internet.



Figure 40 : Gopher Protocol (www.howtogeek.com)

Networking Devices and Operations

The operating principles of networking devices and server types.

1. Network Devices.

Network devices, also known as networking hardware, are physical devices that allow hardware on a computer network to communicate and interact with one another.

(GeeksforGeeks, 2022)

1.1 Networking Device Types

- **Repeater**

Before a network signal becomes weak these devices will help to regenerate the signals in same network. This device controls the physical layer. (GeeksforGeeks, 2022)



Figure 41 : Repeater (<https://ecomputerconcepts.com>)

- **Hub**

Hub Is use for connecting branches, wires of a topology. Like star topology. There are 3 types of hubs that are,

- Active Hub
- Passive Hub
- Intelligent Hub

(GeeksforGeeks, 2022)



Figure 42 : Hub (<https://www.javatpoint.com>)

- **Bridge**

This network device connects two or more network portions together. Bridge is like a Hub because there are connect Lan components with protocols that identified. Bridges also work at physical and data link in OSI model. There is main two types of Bridges that are known as, (GeeksforGeeks, 2022)

- Transparent Bridge
- Source Routing Bridge



Figure 43 : Bridge (www.easytechjunkie.com)

- **Switch**

A switch will check errors before forwarding the data in network. This device is a data link layer device. (GeeksforGeeks, 2022)



Figure 44 : Switch (infinity-cable-products.com)

- **Router**

Router is transfer data packets to others on a IP address. This device is a layer device. Routers connect WAN and PAN usually.

(GeeksforGeeks, 2022)



Figure 45 : Router (www.javatpoint.com)

- **Gateway**

Gateway is also known as protocol converter. This are Network layer devices. This device works like a ambassador that get data from Network Devices or system.
(GeeksforGeeks, 2022)



Figure 46 : Gateway (www.hitechwhizz.com)

- **Brouter**

This device is a multiple device that use bridge and router. This device can work as a data link Layer or network layer. This works like transfer data packets through network and filter Lan traffic. (GeeksforGeeks, 2022)

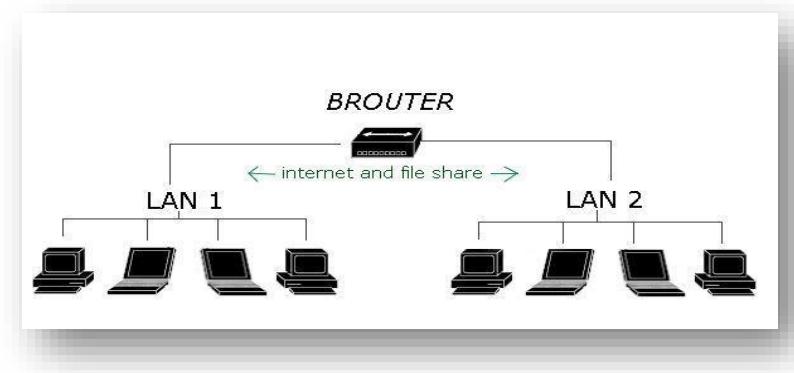


Figure 47 : Brouter (www.learnabhi.com)

- **NIC**

NIC means Network Interface Card. This is a Wi-Fi card that use to a device for WIFI. NIC has 2 layers that are known as physical and data link layer of a network system. (GeeksforGeeks, 2022)



Figure 48 : NIC (www.elprocus.com)

2. Servers

This is a software or hardware device that accept reply for request through network. In a network servers act as a computer or software systems. Servers can be any device that share or store information. (Team, 2021)

2.1. Types of servers

- **Web Server**

Web server is used with a public domain software for access the world wide web. This server can save information from web to the user computer. (Team, 2021)

- **Proxy server**

This server acts as a bridge between host server and client server. Proxy share information from a website to user computer Ip address after it is passes to proxy server. (Team, 2021)

- **Virtual server**

In this server its store and connect data over virtual space. Virtual servers are common in Web hosting environments because they are affordable and offer quicker resource control. (Team, 2021) (techopedia, 2018)

- **File transfer protocol server**

This server can locate files from one computer to another computer. Every server has an FTP address that users can access through TCP/IP using a browser or an FTP client to connect to. (Team, 2021) (Abba, 2022)

- **Application server**

Through virtual server connects these servers join clients to software applications. These applications use operating systems and server hardware. (techopedia, 2018)

- **File server**

File server can store data for many users. File server is in central storage place. (Team, 2021)

- **Database server**

This is a large storage space that can organize any multiple programs, in a data architecture database can work independently. (Team, 2021)

- **Mail server**

Email server means that emails stores and delivering emails. (Team, 2021)

- **Print server**

To print over a network a print server establishes remote connection with nearby computers. (Team, 2021)

The inter-dependence of workstation hardware with relevant networking software.

1 . VMware Workstation 15.5 Installation

1 – Install VMware.

https://my.vmware.com/en/web/vmware/downloads/info/slug/desktop_end_user_computing/vmware_workstation_pro/16_0



Figure 49 : VMware 1

Now in this interface user should click next button

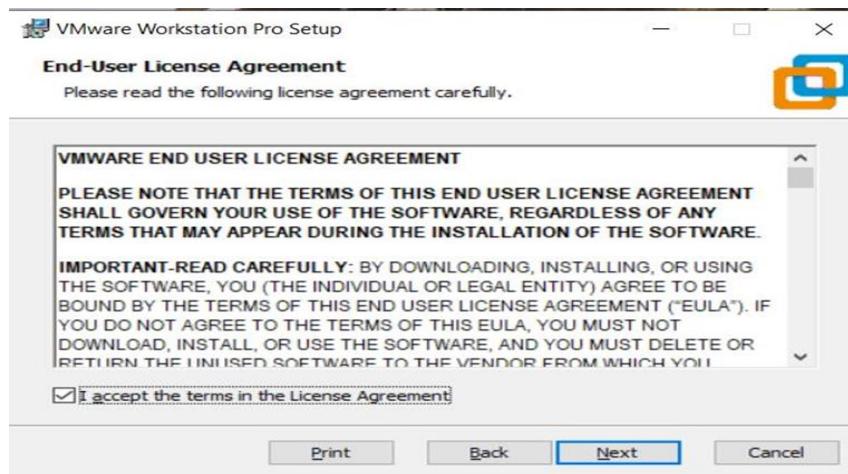


Figure 50 :VMware 2

2: This user license agreement user should click on the square that has a sentence of “I accept the terms in the license agreement” after that click on next button.

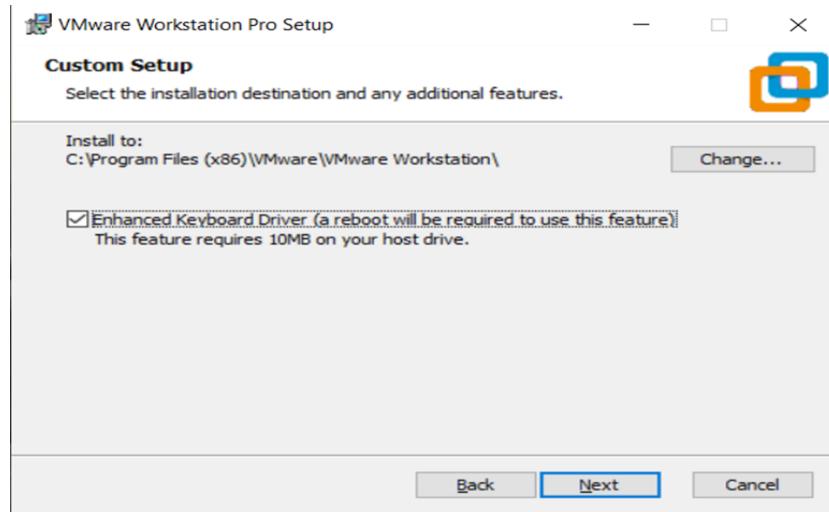


Figure 51 :VMware 3

3: This custom setup interface user should click above the sentence about “Enhanced keyboard Driver” and click the next button.

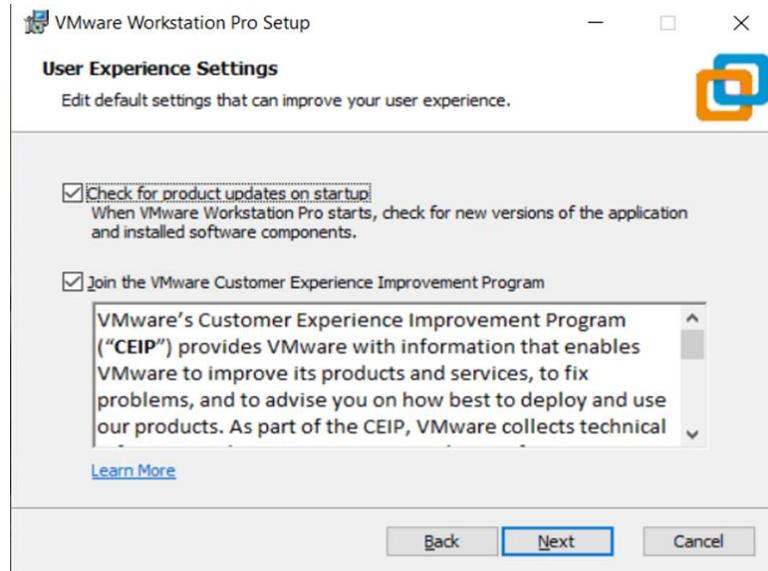


Figure 52 : VMware 4

4: In user experience settings interface user should click Next button

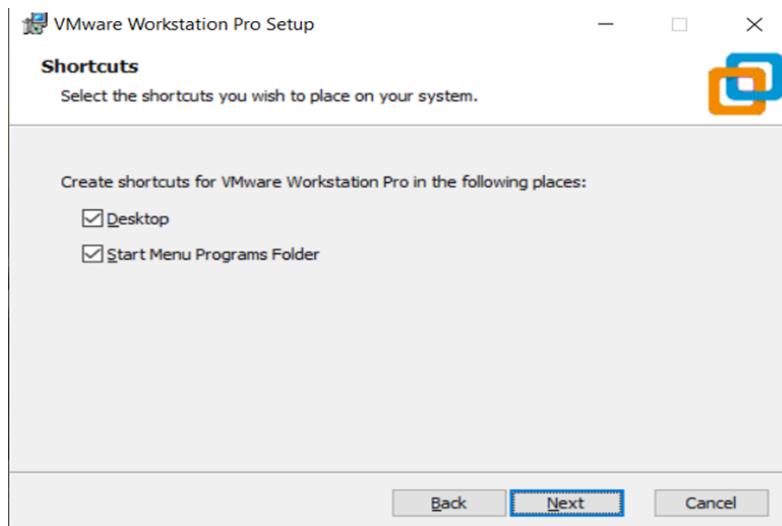


Figure 53 : VMware 5

5: In shortcuts interface user should click next button.

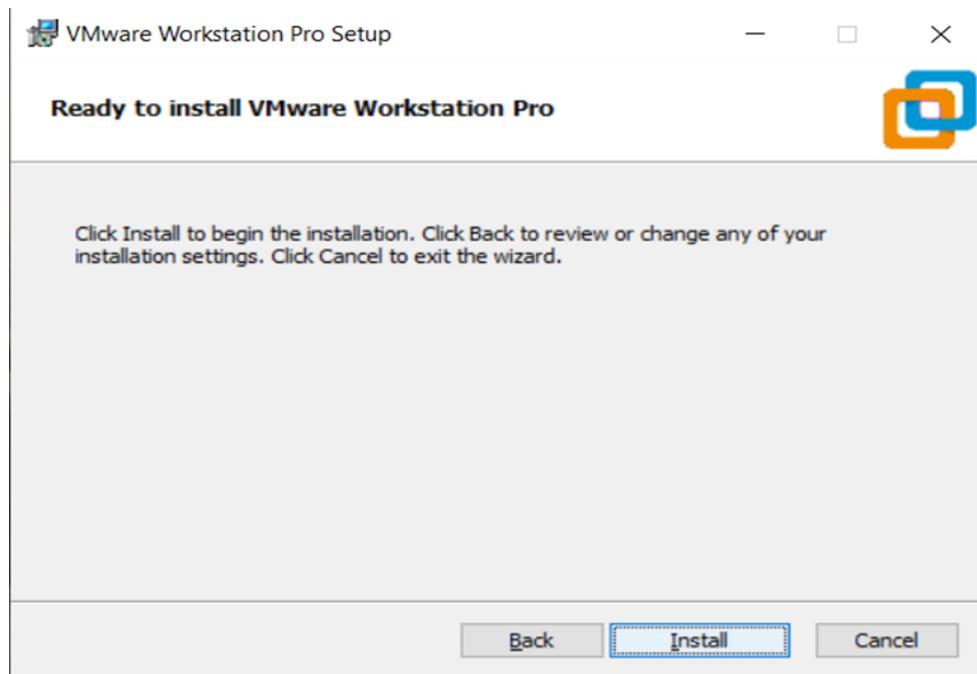


Figure 54 :VMware 6

6: In this interface user should click on install button and it will start to install .

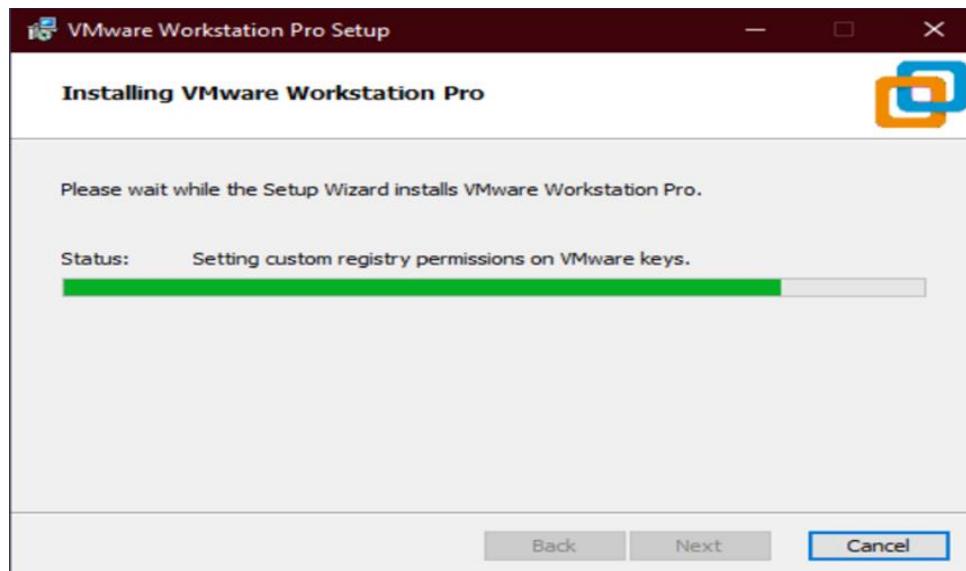


Figure 55 : VMware 7

7: This interface shows the installing of Vmware after installing click the next button.

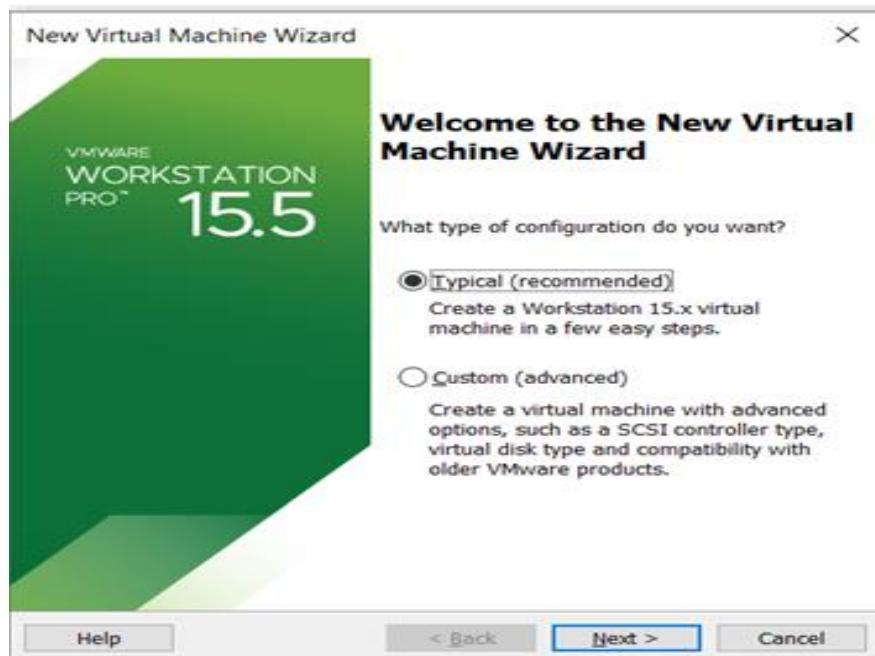


Figure 56 : VMware 8

8: when the Vmware workstation installed then click the new virtual machine and when this interface appear user should click that shows a sentence about “typical(recommended)” after that click next button.

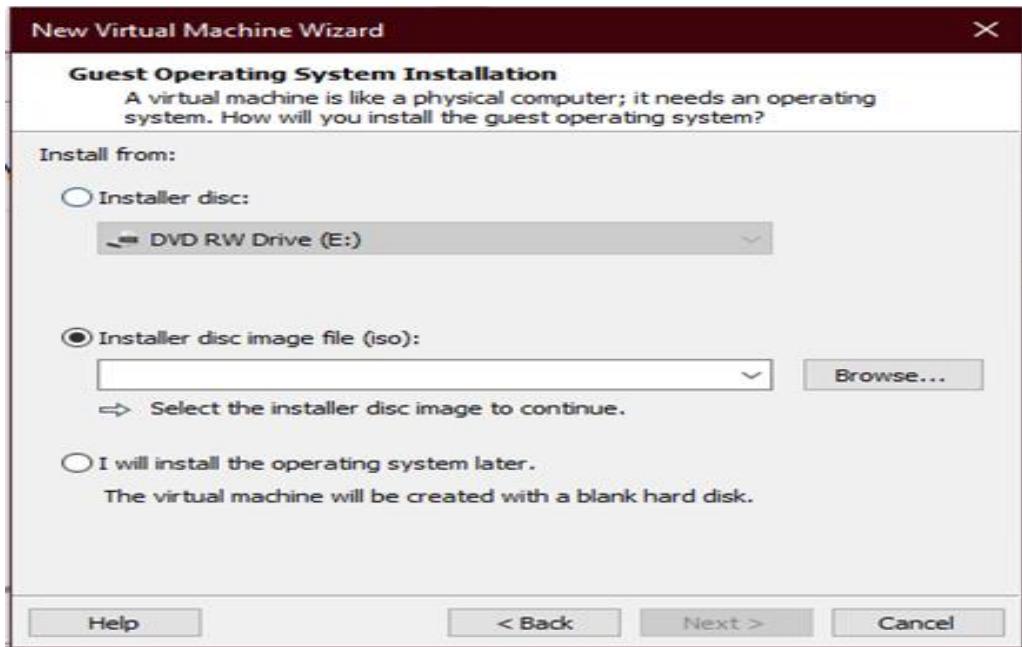


Figure 57 : VMware 9

9: In this interface user must click the browse button and select the disc image file and then user can click on next button.

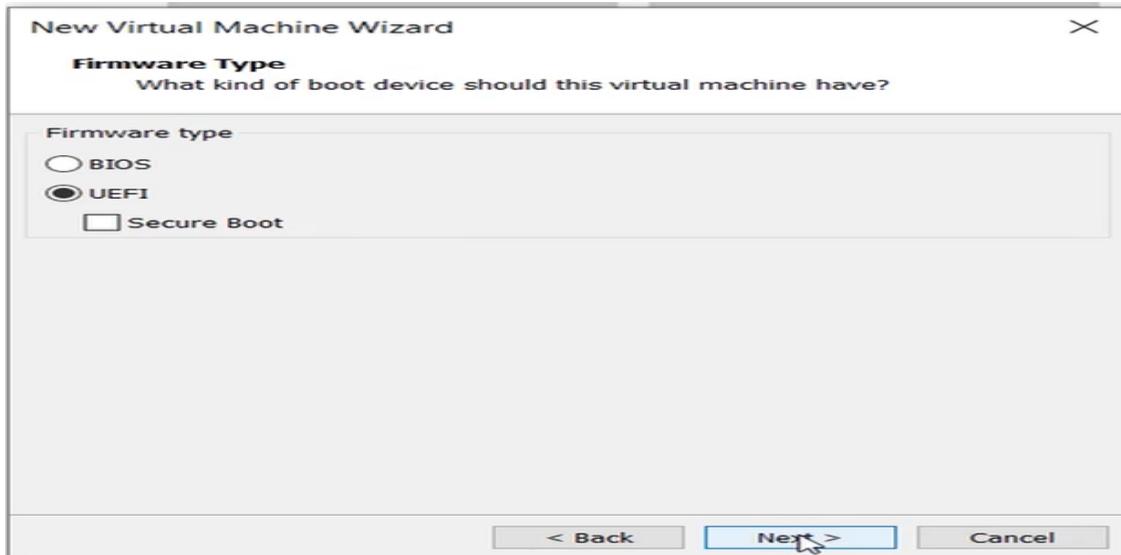


Figure 58: VMware 10

10: This interface user should click the “ bios” and then click the next button

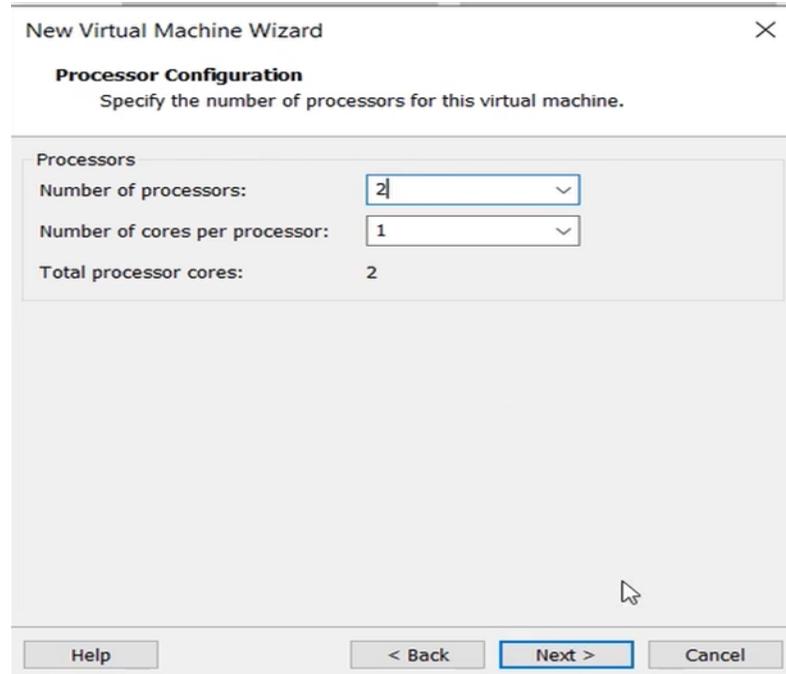


Figure 59 : VMware 11

11: In this interface user should choose for “number of process” number 2 and for “number of cores per processor” number 1 and then select next button.

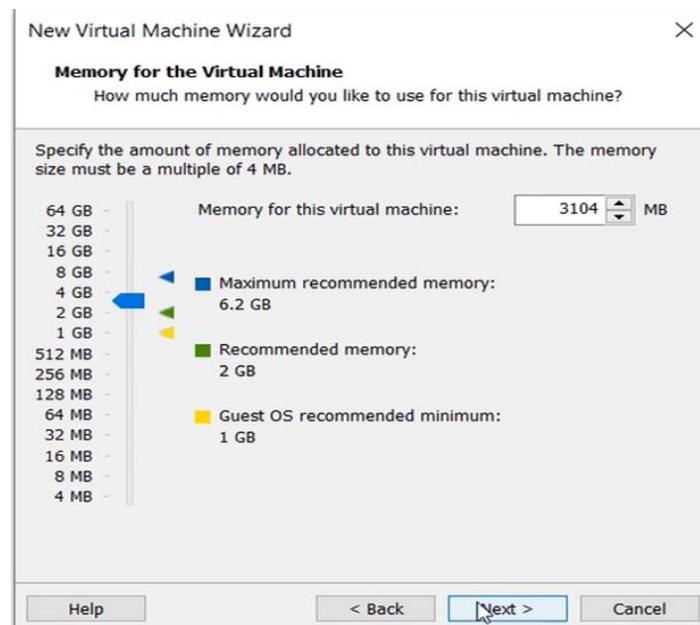


Figure 60 :VMware 12

12: This interface user should select the “memory of the virtual machine” and the user select 3104 MB for it and select the next button

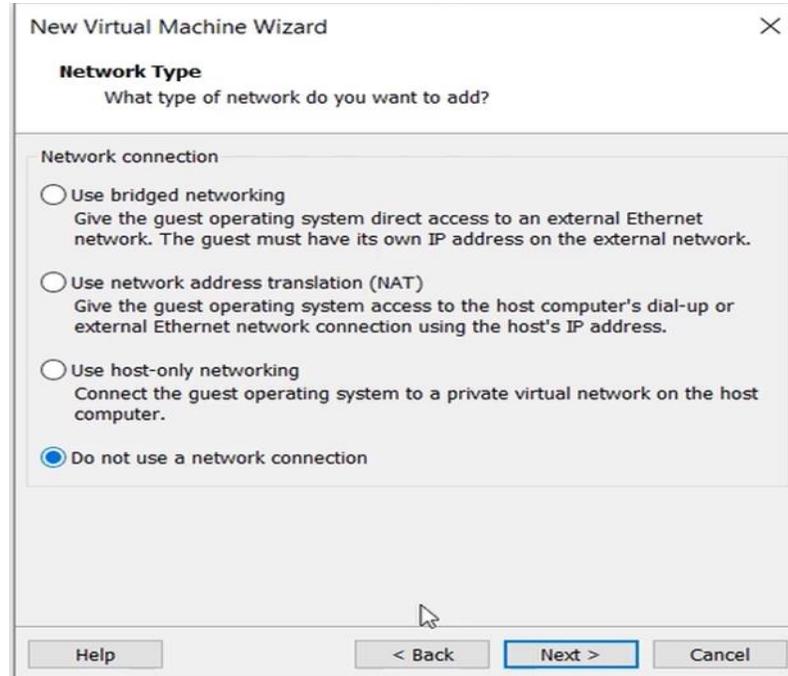


Figure 61 : VMware 13

13: This interface user should click on “Do not use a network connection” and click the next button.

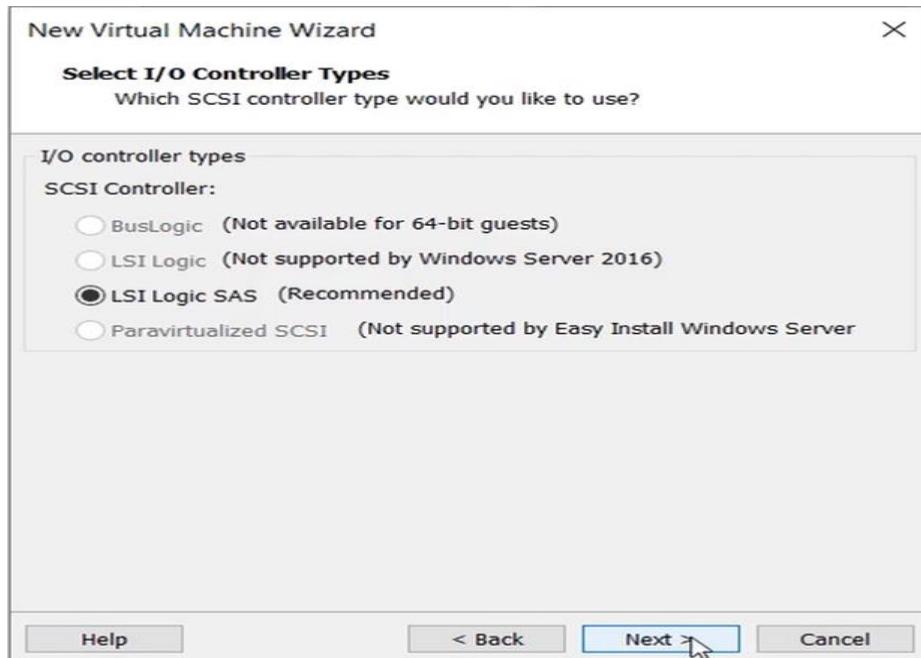


Figure 62 :VMware 14

14: In this interface user need to select next button.

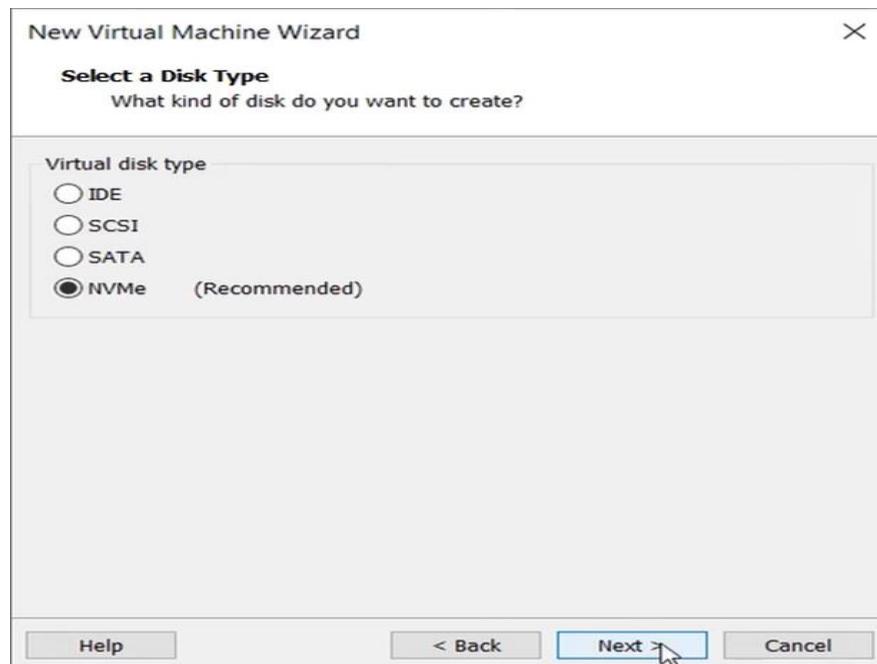


Figure 63 : VMware 15

15 : This interface is about select a disk type then select the disk type of that show “NVMe” And then click the next button.

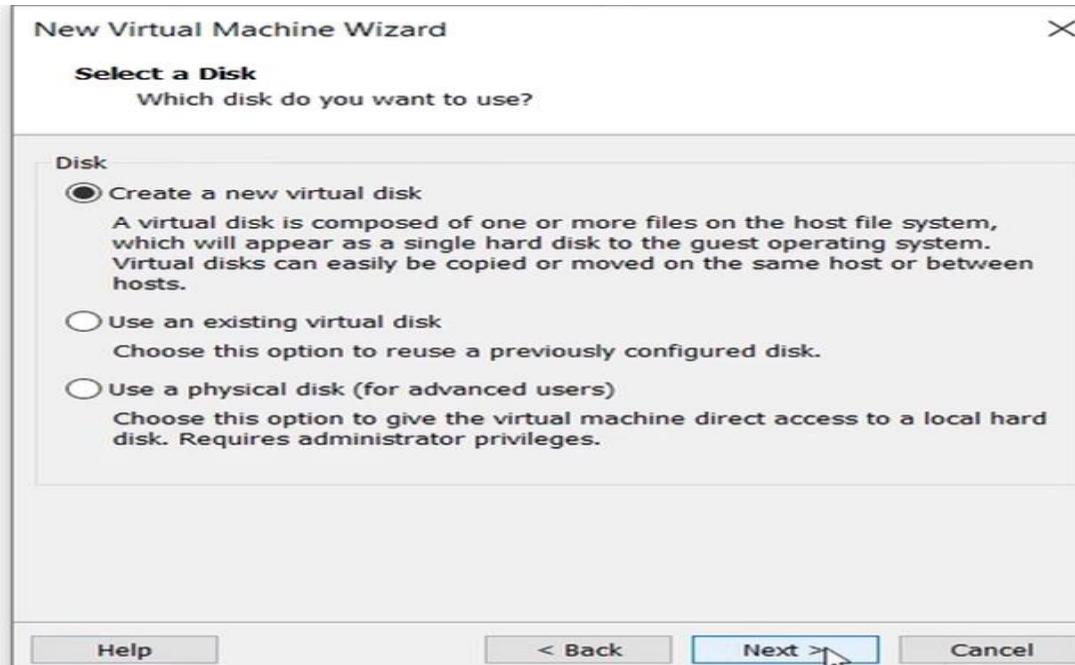


Figure 64 : VMware 16

16: Then click that shows “Create a new virtual disk” and then click the next button.

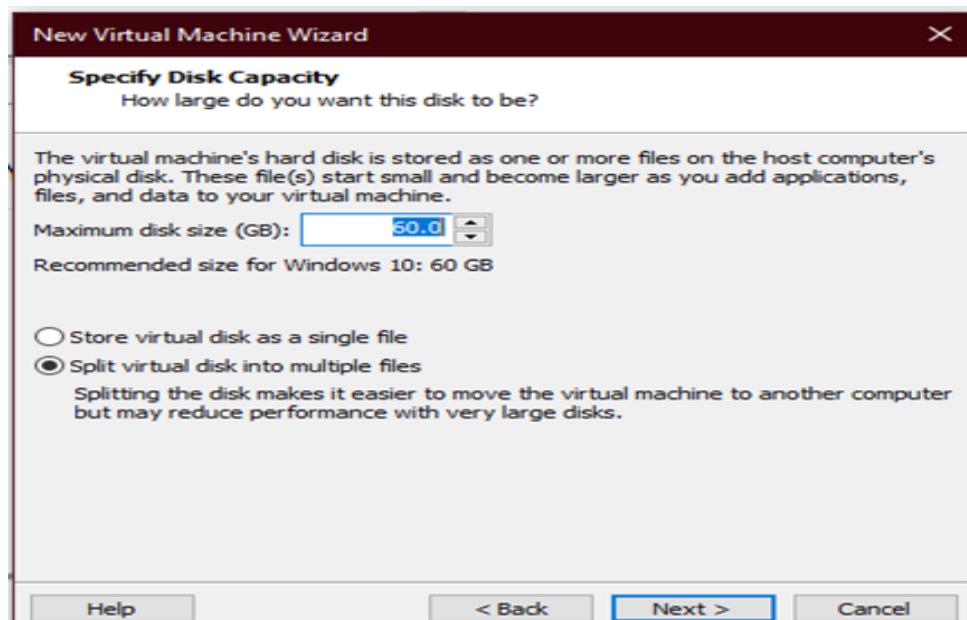


Figure 65 : VMware 17

17: This interface user needs to fill the “maximum disk size (GB)” and then click the “split virtual disk into multiple files” text and then click the next button.

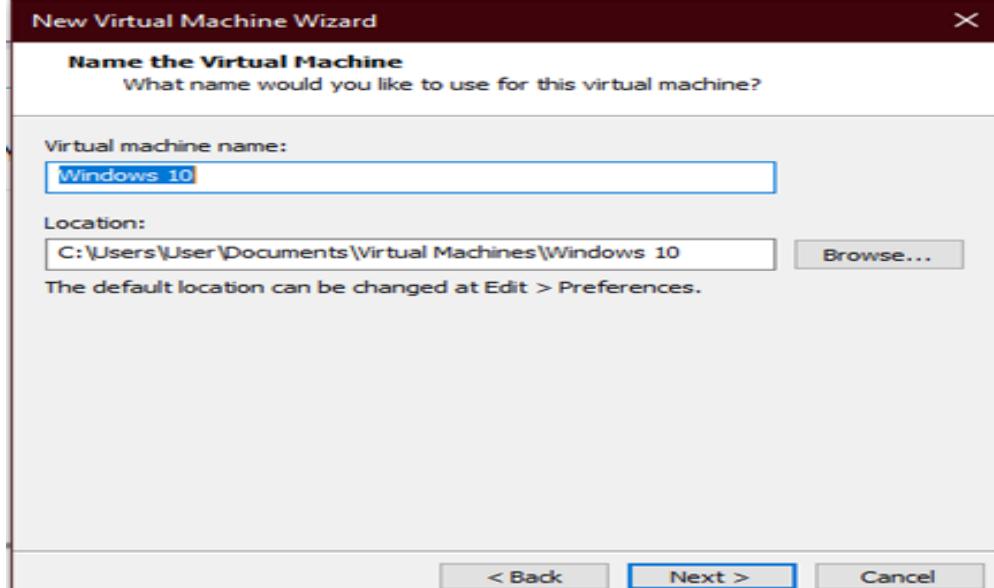


Figure 66 : VMware 18

18: This interface user need to fill a name for “Virtual machine name” and then user should browse a location and fill it then user can click next button.

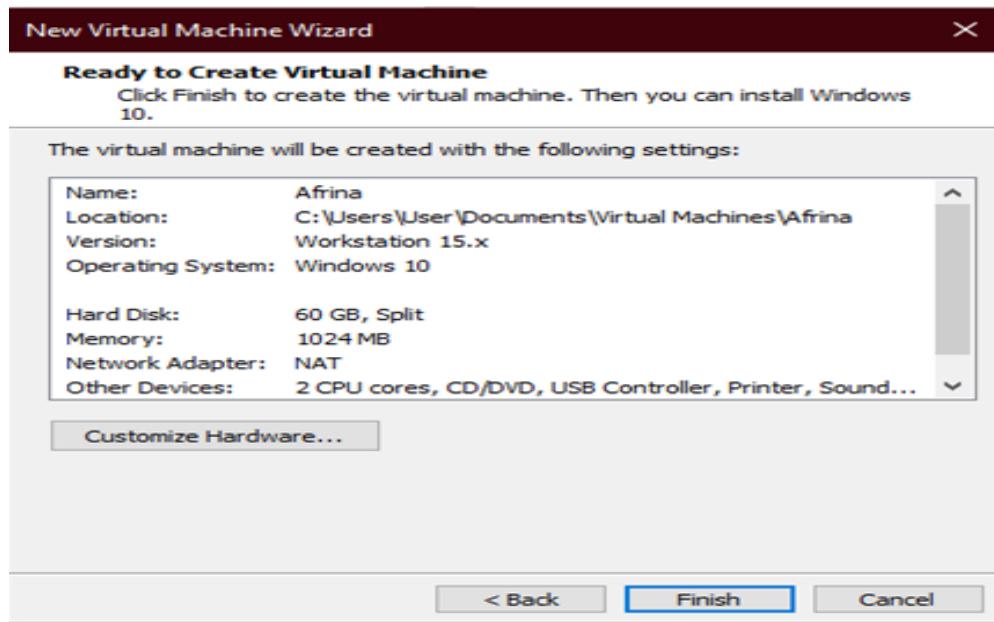


Figure 67 : VMware19

19: When there is interface that called “Ready to create virtual machine” then user can click the finish buttons.

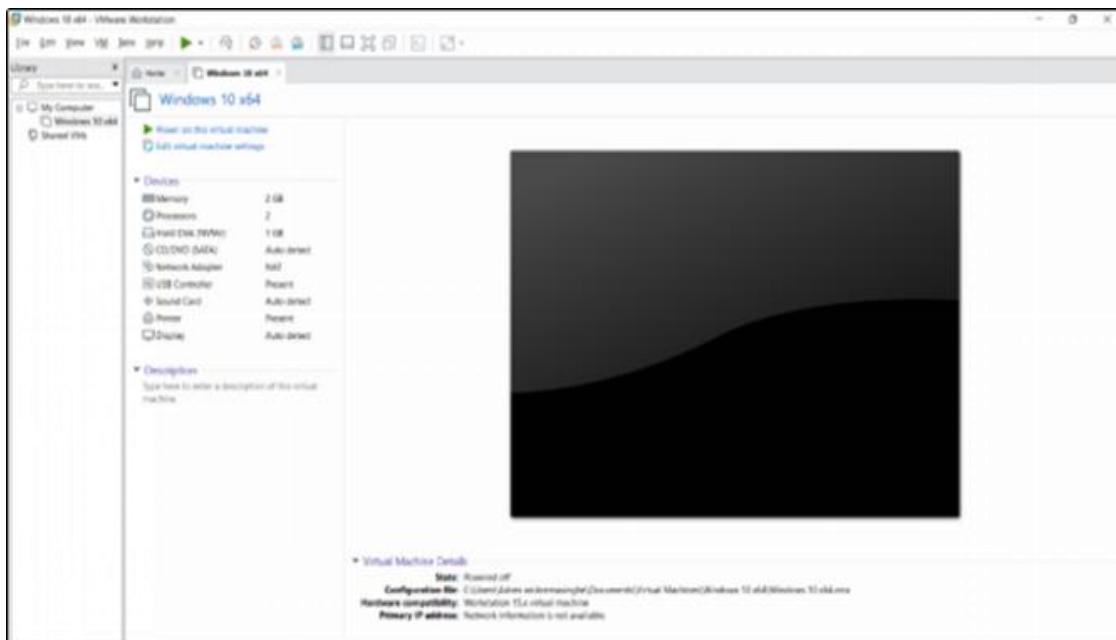
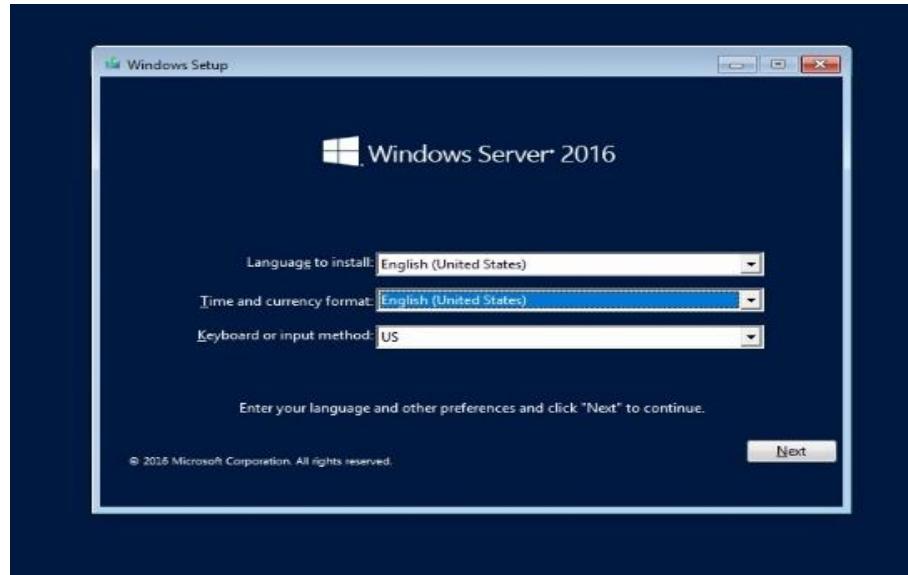


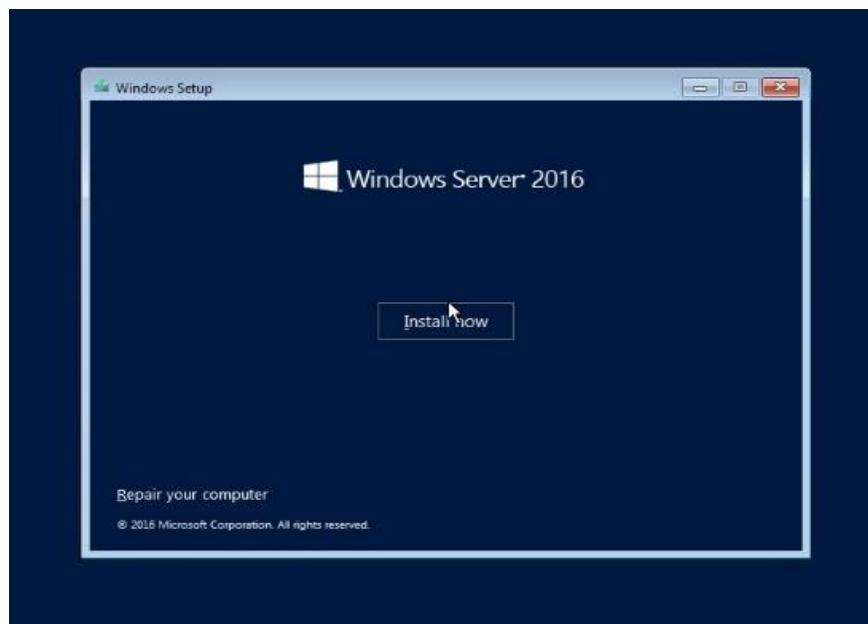
Figure 68 : VMware 20

20: After clicking the finish button the virtual machine is created and this interface will display on user’s laptop.

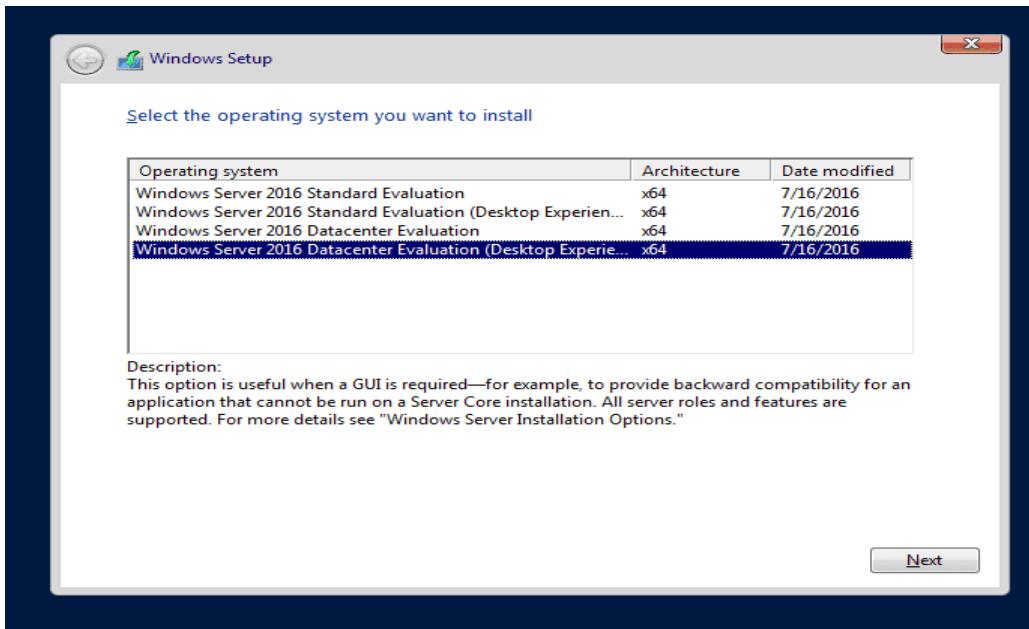
2. Window server 16 (Installation)



1: when this interface appears user should fill the text of “language to install” , “Time and current format” and select the “Keyboard or input method” then after all of this user can click next button.



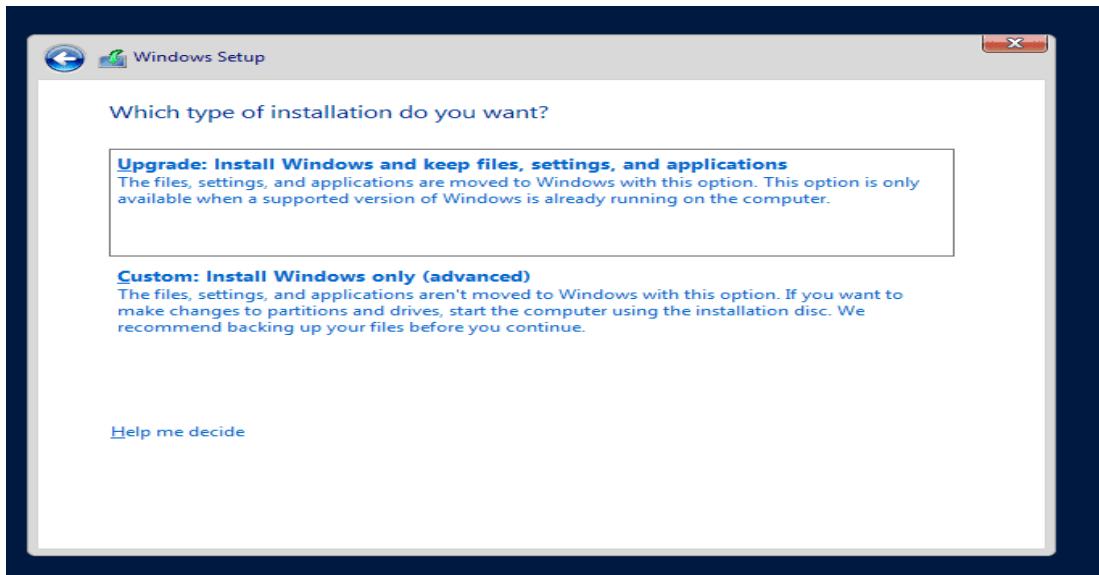
2 : In this interface user should click the “install now” to process it.



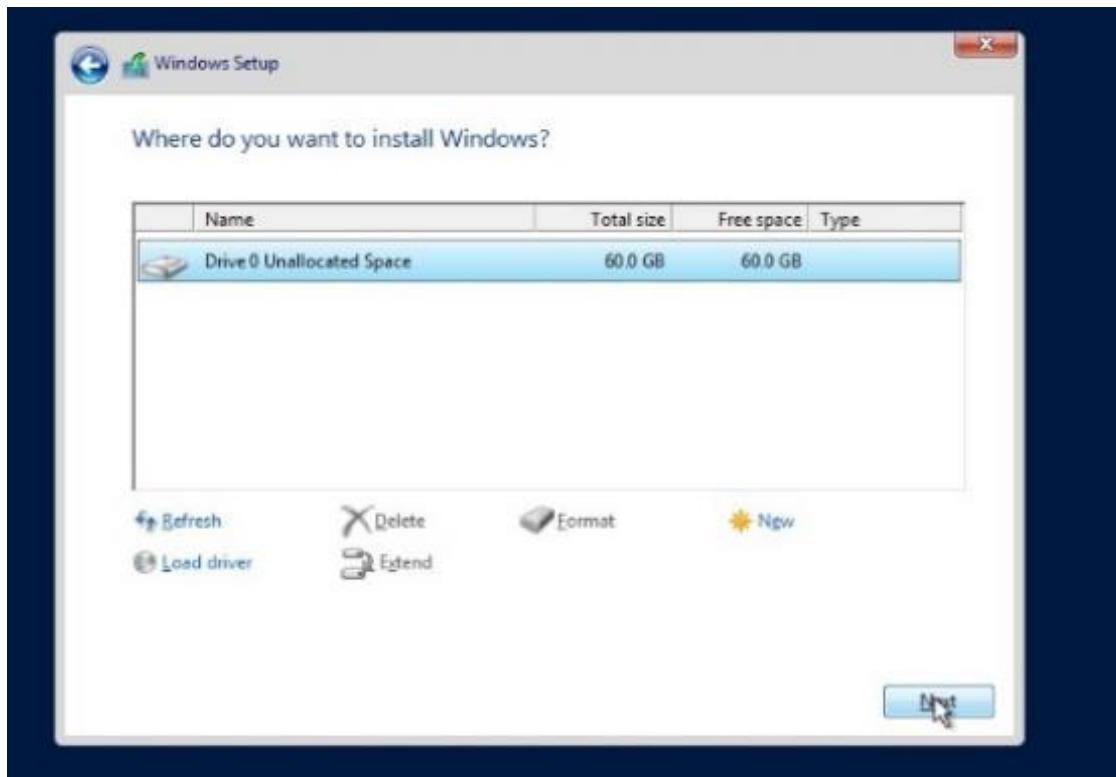
3 : Select the version that user wants and then click the next button.



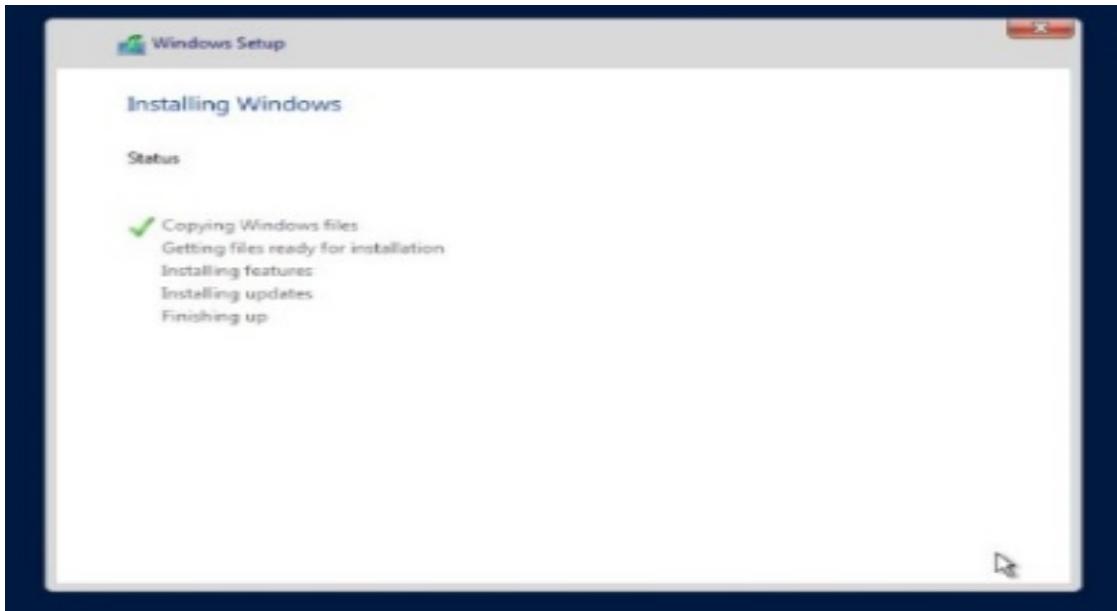
4 : In this applicable notice and license terms interface user should click the next button.



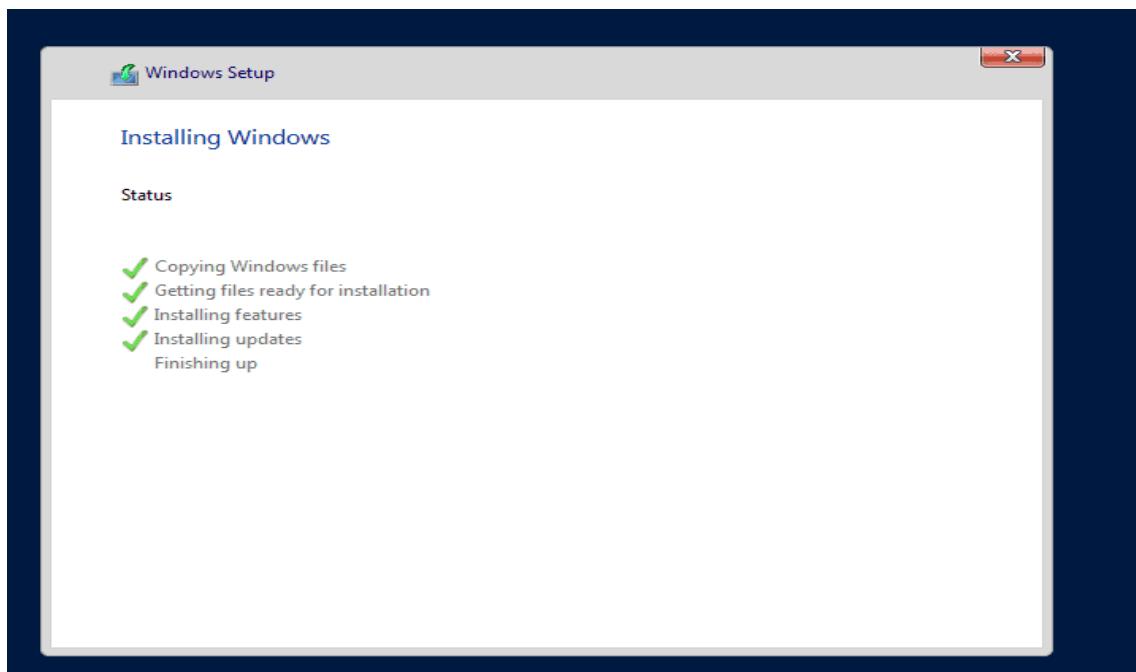
- 5 : In this interface user can select “Upgrade” or “Custom” and select it to go to other interface.



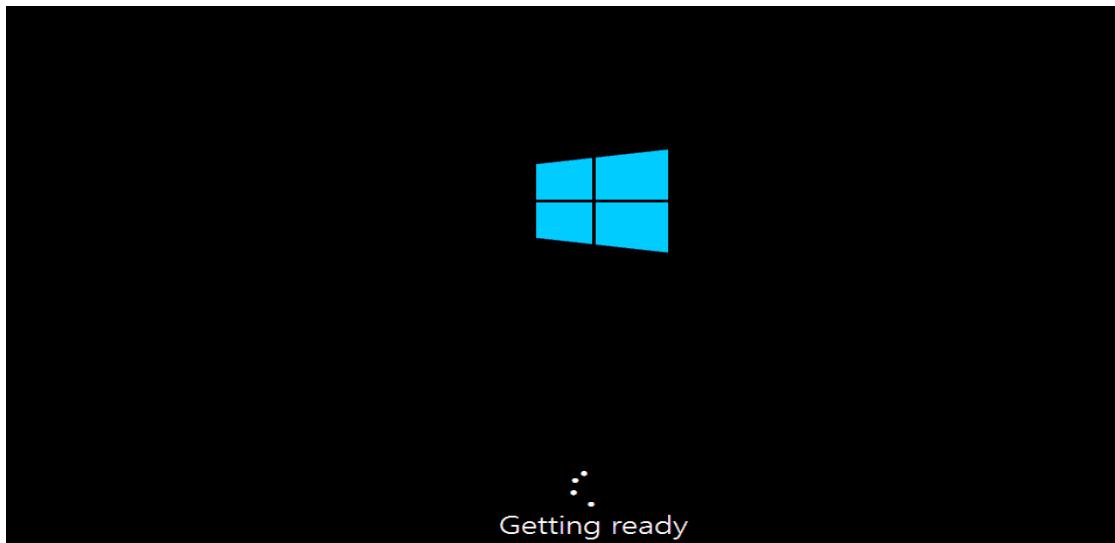
- 6 : Select the “Drive 0 Unallocated Space” and click the Next button.



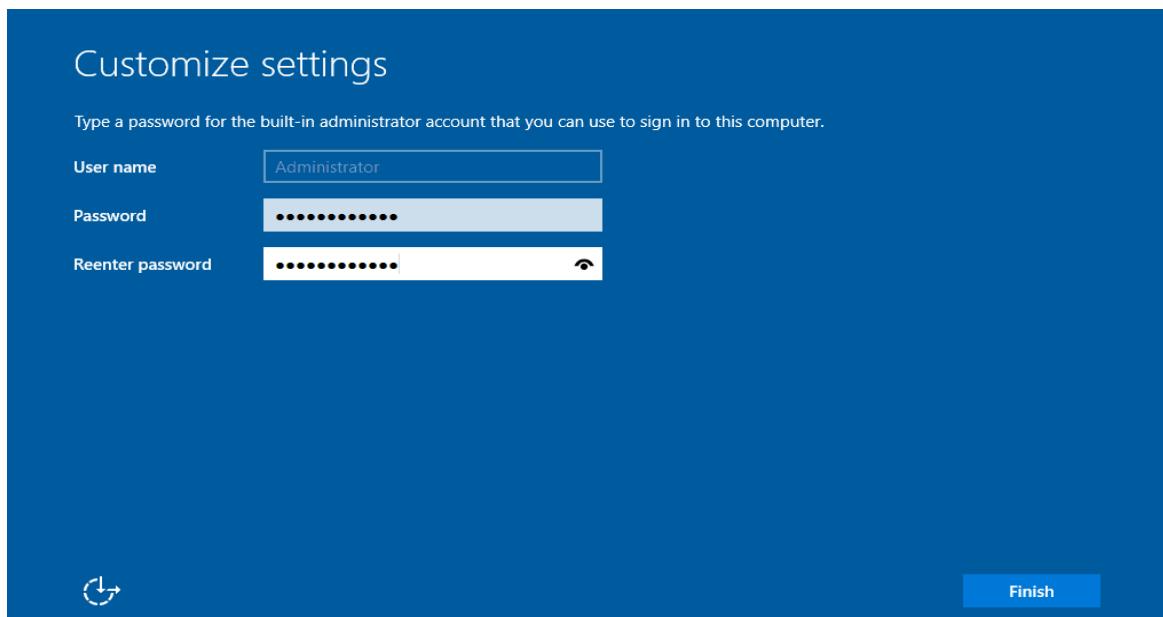
7 : In this interface user can see that windows server is installing .



8 : When the installing process done its interface like this.



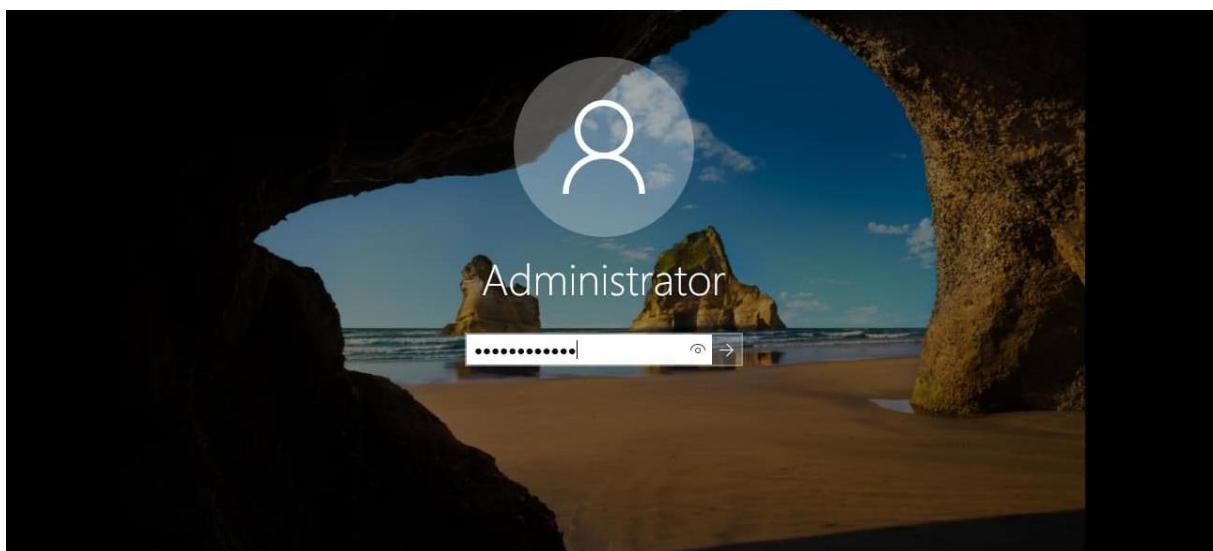
9 : After the installation done it will get ready for the other interface.



10 : Then this interface appear in this user can fill the user name and passwords and then click then finish button.



11 : After that interface this interface will appear.



12 : This login form will appear.

This is how window server 16 will install.

A range of server types and justification of the selection of a server, considering a given scenario regarding cost and performance optimization.

1. Range of Server Types

Server Type	Sample	Features	Price (RS)
Dell EMC PowerEdge T440 Tower server		<ul style="list-style-type: none"> Has a Intel Xeon Processor. Memory is 16 DDR4 DIMM SLOTS Brand is Dell. Drive Bays are Up to 4 or 8x3.5 Security is TPM 1.2/2.0 optional Bezel is Optional Security bezel. 	Rs.135000.00
PowerEdge T430 Tower server		<ul style="list-style-type: none"> It has 2 powerful sockets Processor is intel E5-2600 Maximum RAM – 384GB 	Rs 122,000.00
HPE ProLiant ML 30		<ul style="list-style-type: none"> This is designed for small offices There is a 64GB memory. System support 4X SATA drives and M2 slot integrated. 	Rs 195,000.00

Lenovo think ST250 V2 Towe server		<ul style="list-style-type: none"> • Memory is up to 128GB • Single fixed power supply is used for this. • 2XGBE on board ports in Network Interface. 	
---	---	--	--

Table 13 : Range of Servers

2. Suitable server for the scenario.

Author thinks that for Syntax Solution Company Suitable server is the Dell EMC PowerEdge T440 Tower because it has 16 DDr4 memory. Author thinks that for this company it has many users, and this is large network system. In this period most companies and workers use this for make their work easier. This has a very good security and no worry to at all. But the only thing is this price is very high.

The topology and protocol selected for a given scenario

- **Topology for given scenario.**

For the Syntax solution company author guess that for the network system they should choose the Hybrid topology to connect because for this type of network system user can connect a tree topology with a star topology then the work will be easier to do and author suggest another topology that is star topology because there has a central device in this topology then the network can control with the central device.

- **Protocol for the given scenario.**

Author suggests that for the syntax solution company the best protocol is that Hyper Text secure (HTTPS). This protocol can secure the web pages and websites. And it is useful when people using websites because if it is a not secure web site people can disconnect it.

Efficient networked systems

Networked system to meet a given specification

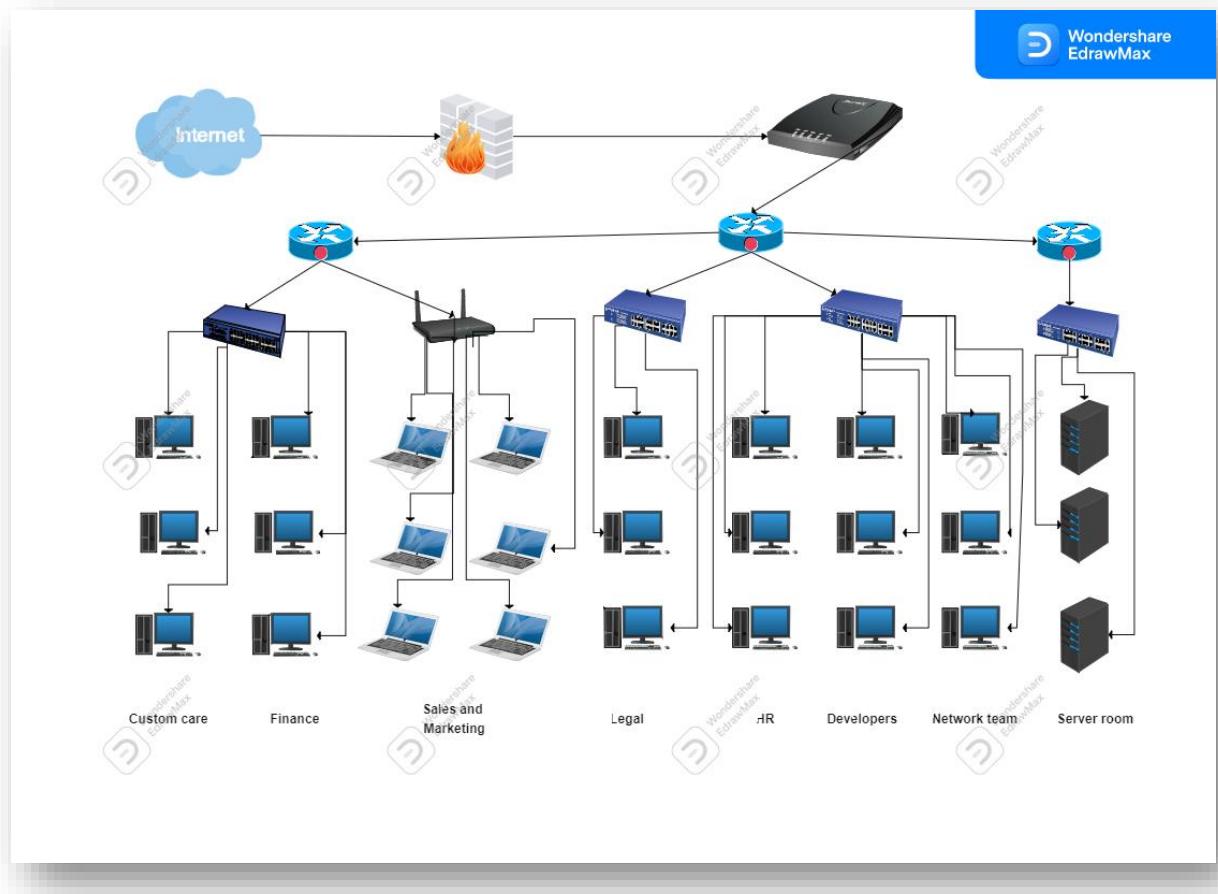


Figure 69 : A networked system to meet a given specification

This is a design of authors Network, and it is design in Edrawmax tool. This network system has 8 departments. The departments are used routers, switches, pc, laptops and also, Wi-Fi routers. The departments and the number of users used are displayed on below. That are,

- Customer care - 10 users
- Sales and marketing - 20 users
- Finance - 25 users
- Legal - 5 users
- HR - 10users
- Developers - 55 users
- Network team - 5 users

Evaluate the design to meet the requirements and analyse user feedback

1. User Feedback Form of Syntax Solution Company.



Feel Free to Drop us your Feedback

Fill the correct feedback.

 ranudigk@gmail.com (not shared) [Switch account](#) 

* Required

Name *

Your answer

Email address *

Your answer

Contact number *

Your answer

Figure 70 : User Feedback Form 1

Birthday *

Date
mm/dd/yyyy

1. How the speed of our network service ? *

Highly satisfied
 Satisfied
 Neutral
 Unsatisfied
 Highly unsatisfied

2. How the quality of our product ? *

Highly satisfied
 Satisfied
 Neutral
 Unsatisfied
 Highly unsatisfied

3. How the quality of our product ? *

Highly satisfied
 Satisfied
 Neutral
 Unsatisfied
 Highly unsatisfied

Figure 71 : User Feedback Form 2

4. How the user friendly of our product ? *

Highly satisfied
 Satisfied
 Neutral
 Unsatisfied
 Highly unsatisfied

5. How the user security of our product ? *

Highly satisfied
 Satisfied
 Neutral
 Unsatisfied
 Highly unsatisfied

6. How the organization of our product ? *

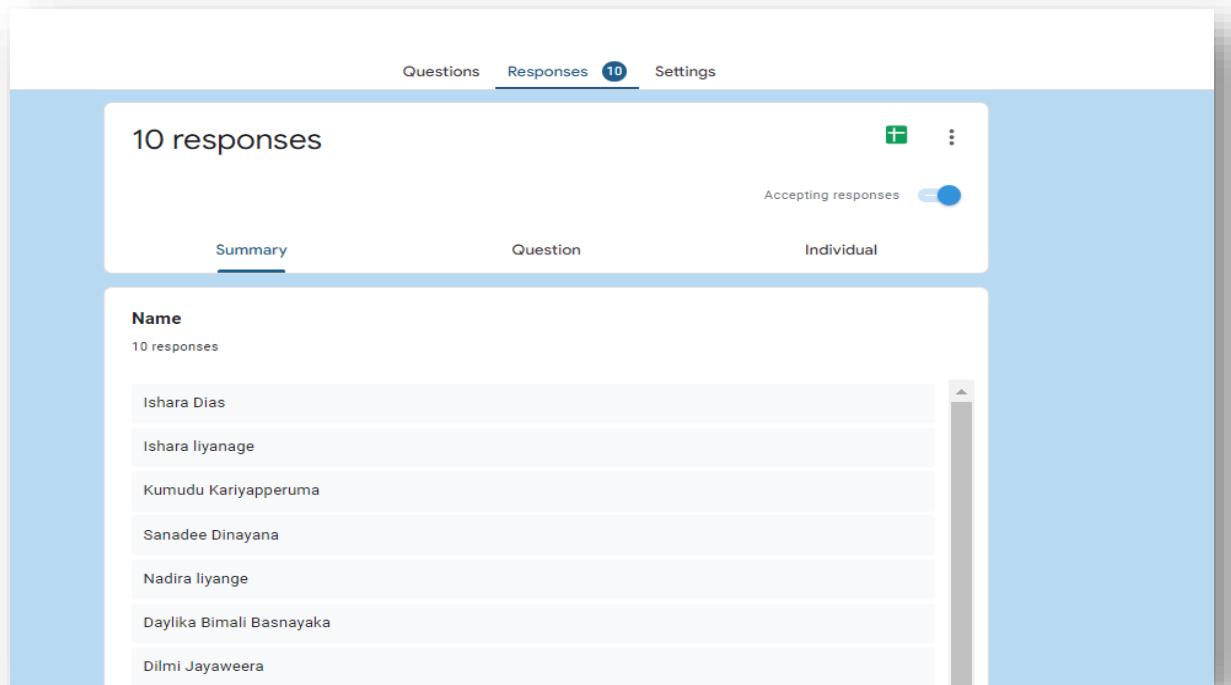
Highly satisfied
 Satisfied
 Neutral
 Unsatisfied
 Highly Unsatisfied

Comment and Suggestions of our product !

Your answer

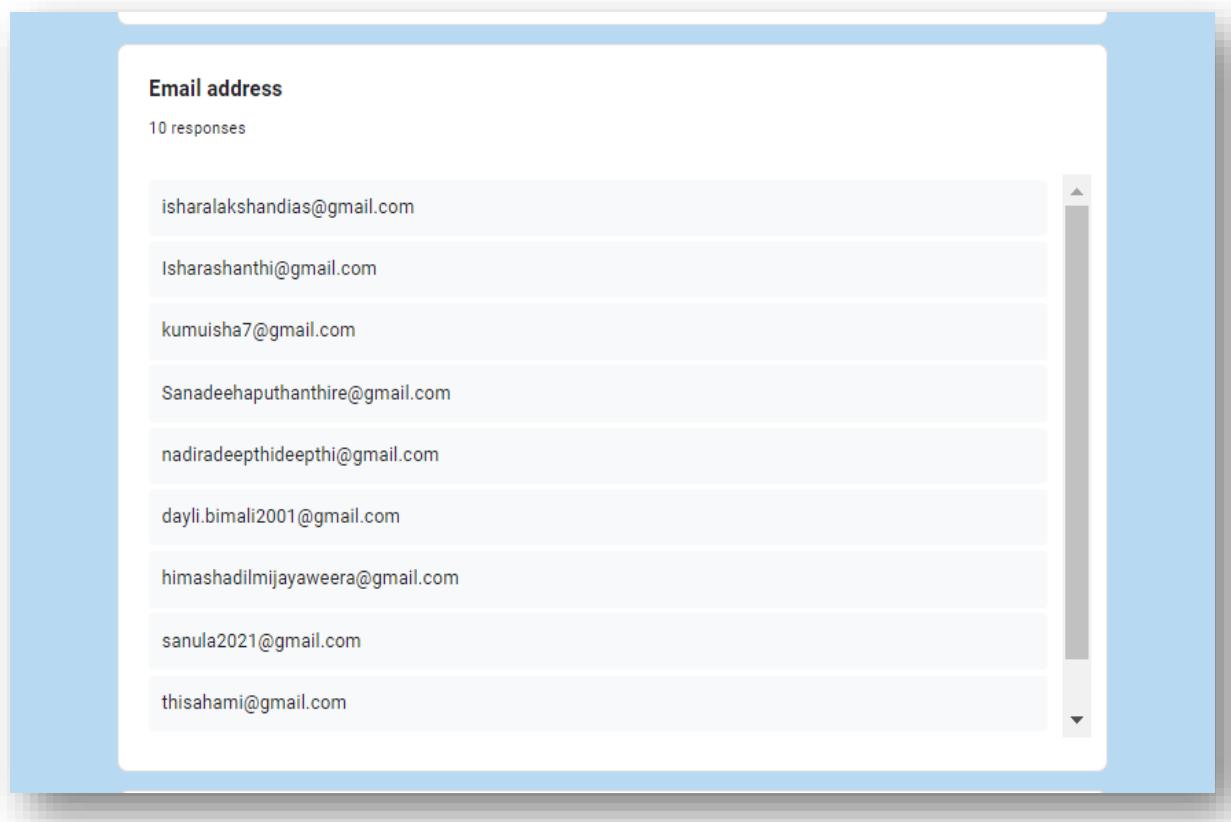
Figure 72 : User Feedback Form 3

1.1 User response Form of Syntax Solution Company.



The screenshot shows a Google Sheets interface with the 'Responses' tab selected. It displays 10 responses under the 'Name' column. The responses listed are:

- Ishara Dias
- Ishara liyanage
- Kumudu Kariyapperuma
- Sanadee Dinayana
- Nadira liyange
- Daylika Bimali Basnayaka
- Dilmi Jayaweera



The screenshot shows a Google Sheets interface with the 'Responses' tab selected. It displays 10 responses under the 'Email address' column. The responses listed are:

- isharalakshandias@gmail.com
- Isharashanthi@gmail.com
- kumuisha7@gmail.com
- Sanadeehaputhanthire@gmail.com
- nadiradeepthideepthi@gmail.com
- dayli.bimali2001@gmail.com
- himashadilmijayaweera@gmail.com
- sanula2021@gmail.com
- thisahami@gmail.com

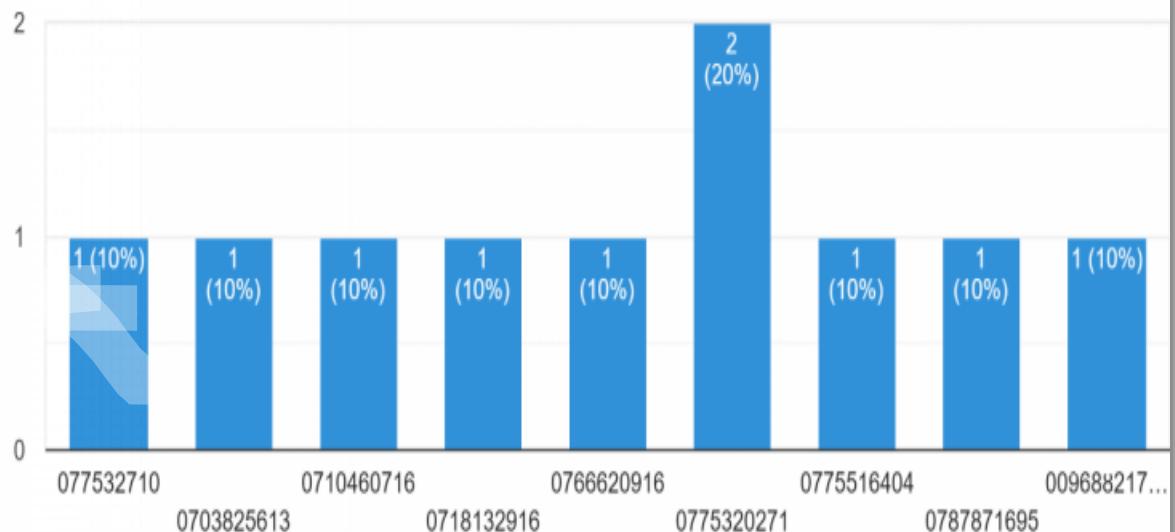
Birthday

10 responses



Contact number

10 responses



Comment and Suggestions of our product !

7 responses

-

Great Product and Highly Communication

Good

Productive and help us to gain the knowledge

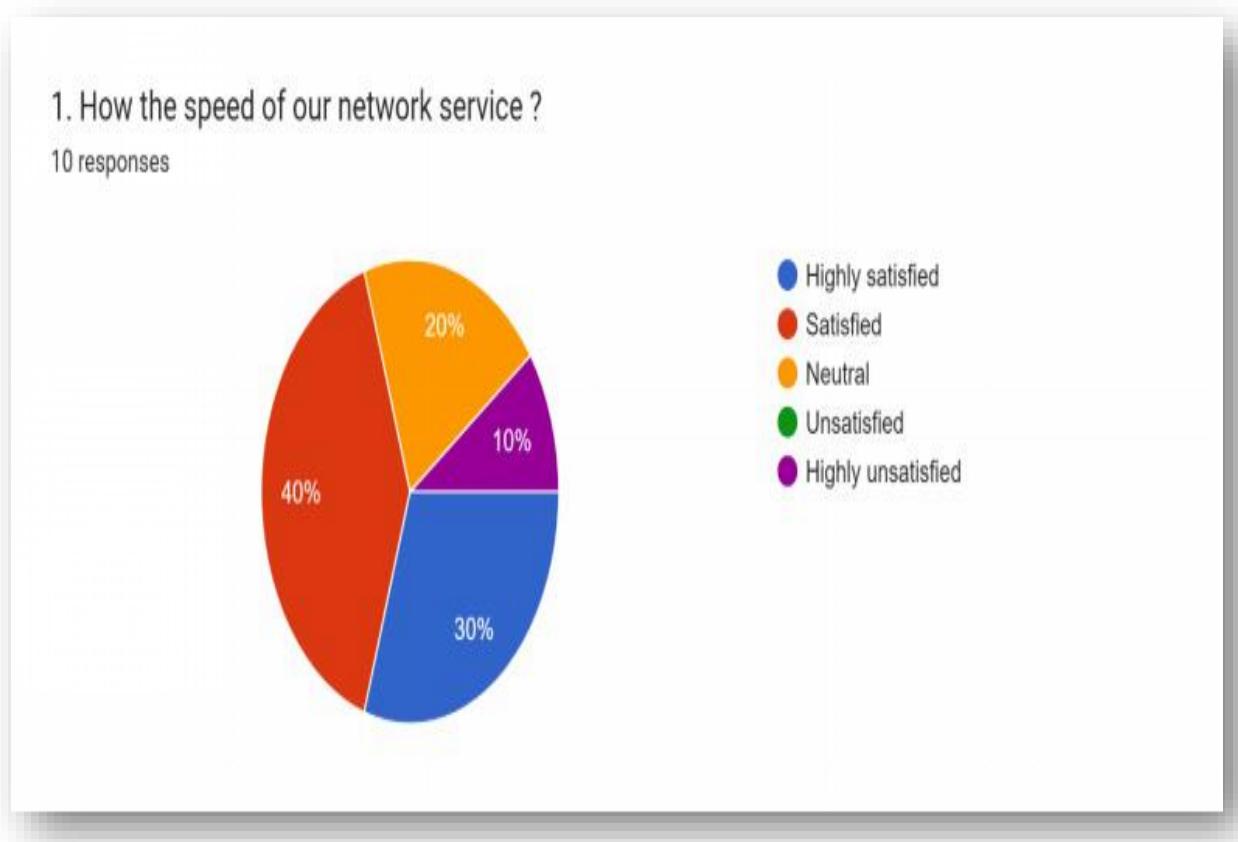
Blah blah blah

Great work 🔥

2. Analizing the user feedback form.

In this part user have the responses of the questions about the Syntax Solution company.

- **The speed of the network service**

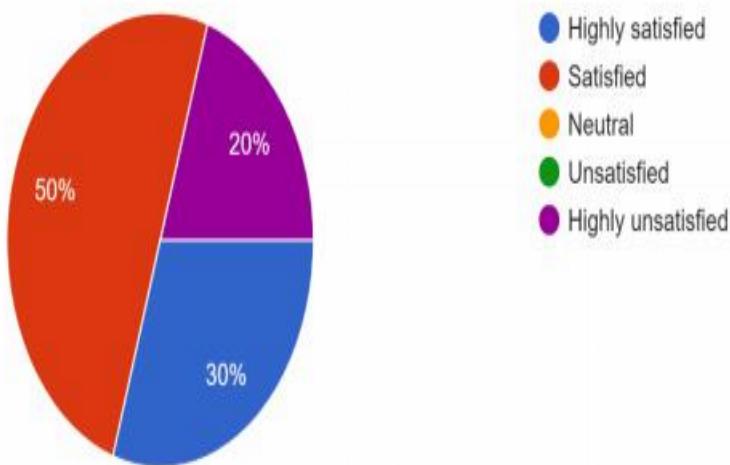


In this pie chart user can realize that 30% of people satisfied about the speed of the network service while 10% of people are highly unsatisfied. So, user can think that this means that the network speed is okay. The most people are Satisfied about the speed of the network 40% of people satisfied about the speed of the network service. Some people are chosen neutral of the speed of the network that percentage is 20%. However overall can guess that speed of the network is enough.

- The quality of the product

3. How the quality of our product ?

10 responses

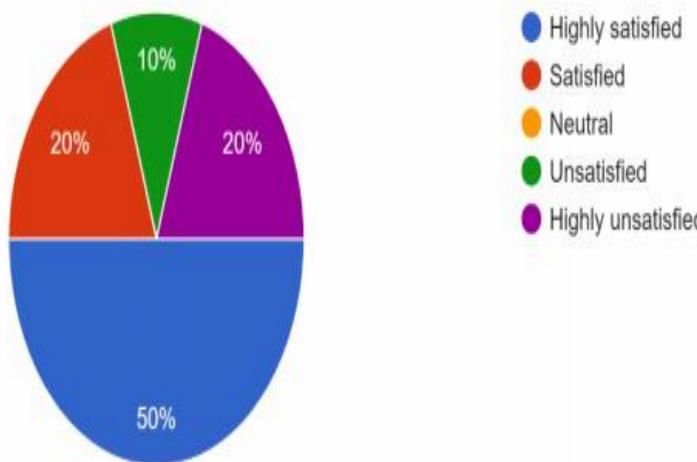


This Pie Chart user can see about Responses about the quality of the product. Highly satisfied people are the percentage of 30% but most people are satisfied about the quality of the product the percentage of it is 50%. The percentage of 20 is the people the choose highly unsatisfied. In this pie chart user can guess that the quality of product should made more quality.

- User friendliness of the product

4. How the user friendly of our product ?

10 responses

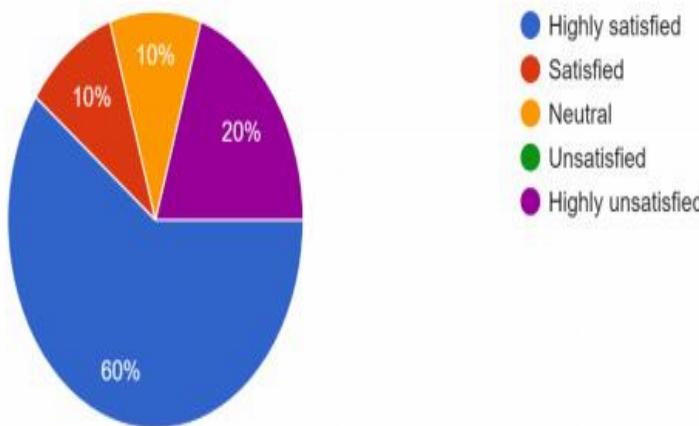


In this Pie Chart user can realize that the user friendly of the product. 50% people choose highly satisfied about the product that means a half of the people. Equal number of percentages that means 20 percent of people choose Satisfied and highly unsatisfied and 10% of people choose unsatisfied. This pie chart realized that it very good for the people.

- The Security of the product

5. How the user security of our product ?

10 responses

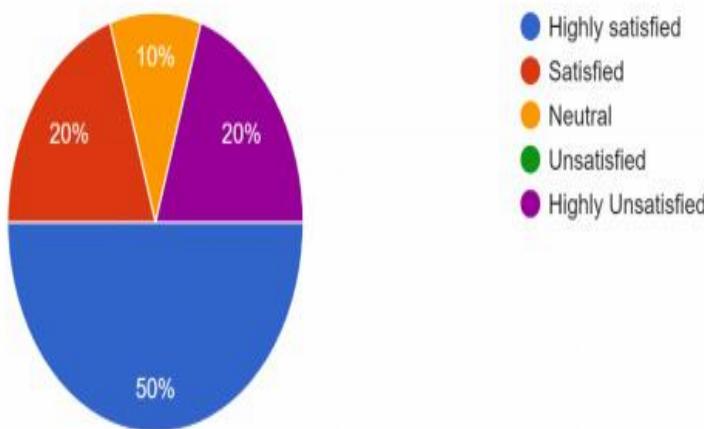


The above pie chart shows the security of the product and 60% of people choose the highly satisfied and equal number of people that means 10% choose satisfied and neutral. But 20% of people choose unsatisfied of this security of the product. Over role user can guess that security is very good of this product.

- **The organization of the Product**

6. How the organization of our product ?

10 responses



This pie chart shows the organization count of the product. 50% people choose Highly satisfied about the organization of this product. Equal percentage about 10 people response that this product organization is satisfied and highly unsatisfied. There are also 10% of people choose neutral. All of this pie chart user can think that they have achieve their customer's needs.

Installation and the configuration of network services and applications

When user select a operating system, they should need to look after some point such as,

- What are the agreements that user should agree?
- What is the purpose of configuring the operating system.

How ever author choose a operating system for the syntax solution company It is windows 11 because when compare the windows 11 and windows 10 operating system windows 11 features are better than windows 10. Let's look the features of windows 7 vs windows 10.

1.Features of windows 11 vs windows 10

Feature	Windows 10	Windows 11
Generation	<ul style="list-style-type: none"> • Last version of Windows 	<ul style="list-style-type: none"> • Latest version of Operating systems
Released Date	<ul style="list-style-type: none"> • 2015 July 15 	<ul style="list-style-type: none"> • 2021 June 24
Functionality	<ul style="list-style-type: none"> • Android 	<ul style="list-style-type: none"> • MAC OS
Installations	<ul style="list-style-type: none"> • Can install only windows apps in the store. 	<ul style="list-style-type: none"> • Can install Android, IOS and Windows apps.
Ram	<ul style="list-style-type: none"> • Minimum 2GB RAM 	<ul style="list-style-type: none"> • Minimum 4GB RAM
Storage	<ul style="list-style-type: none"> • 32GB 	<ul style="list-style-type: none"> • 64GB
The adjustment of the start menu	<ul style="list-style-type: none"> • Adjusted the screen of start menu to the left side 	<ul style="list-style-type: none"> • Adjusted the screen to the center and user can adjust it.

Table 14 : .Features of windows 11 vs windows 10

2. Configuring the Network System.

Author in this section explaining the configuring part with using authors network design to clarify the part.

- Configuration Part of PC and servers

1. Custom care Department

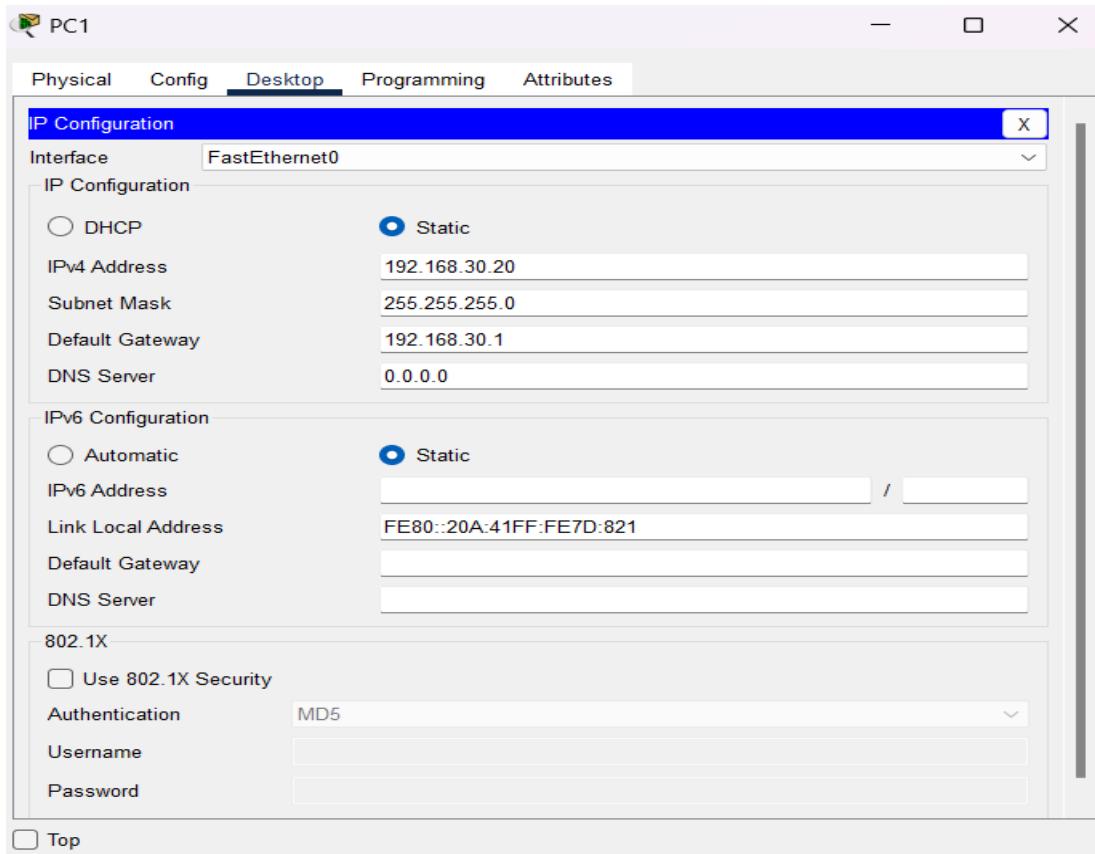


Figure 73 : Custom care Department PC

- In this interface author used IP address as 192.168.30.20 and for the default gateway used 192.168.30.1.

2. Finance Department

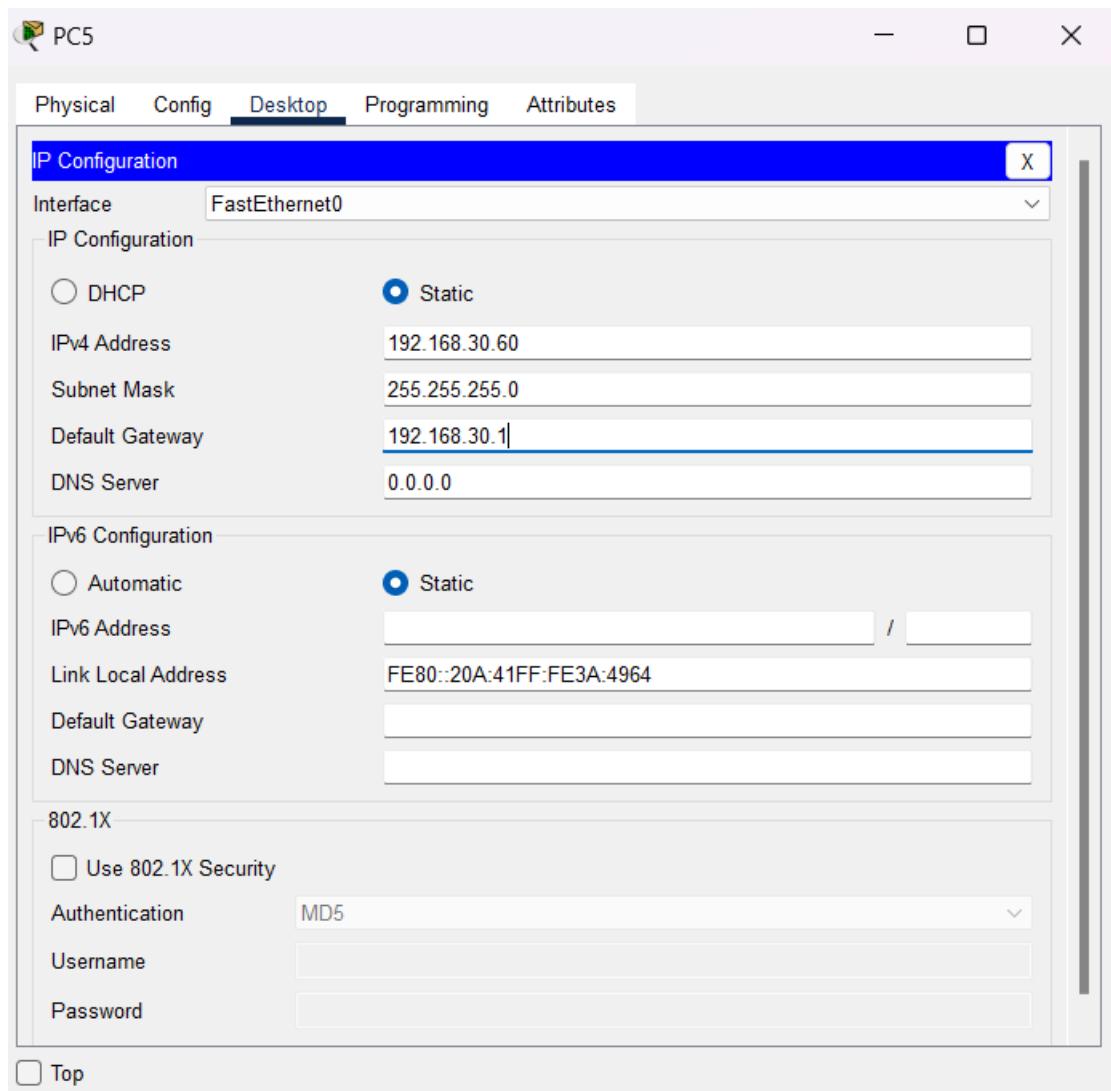


Figure 74 : Finance Department PC

- In this interface author used IP address as 192.168.30.60 and for the default gateway used 192.168.30.1.

3.Sales and Marketing Department

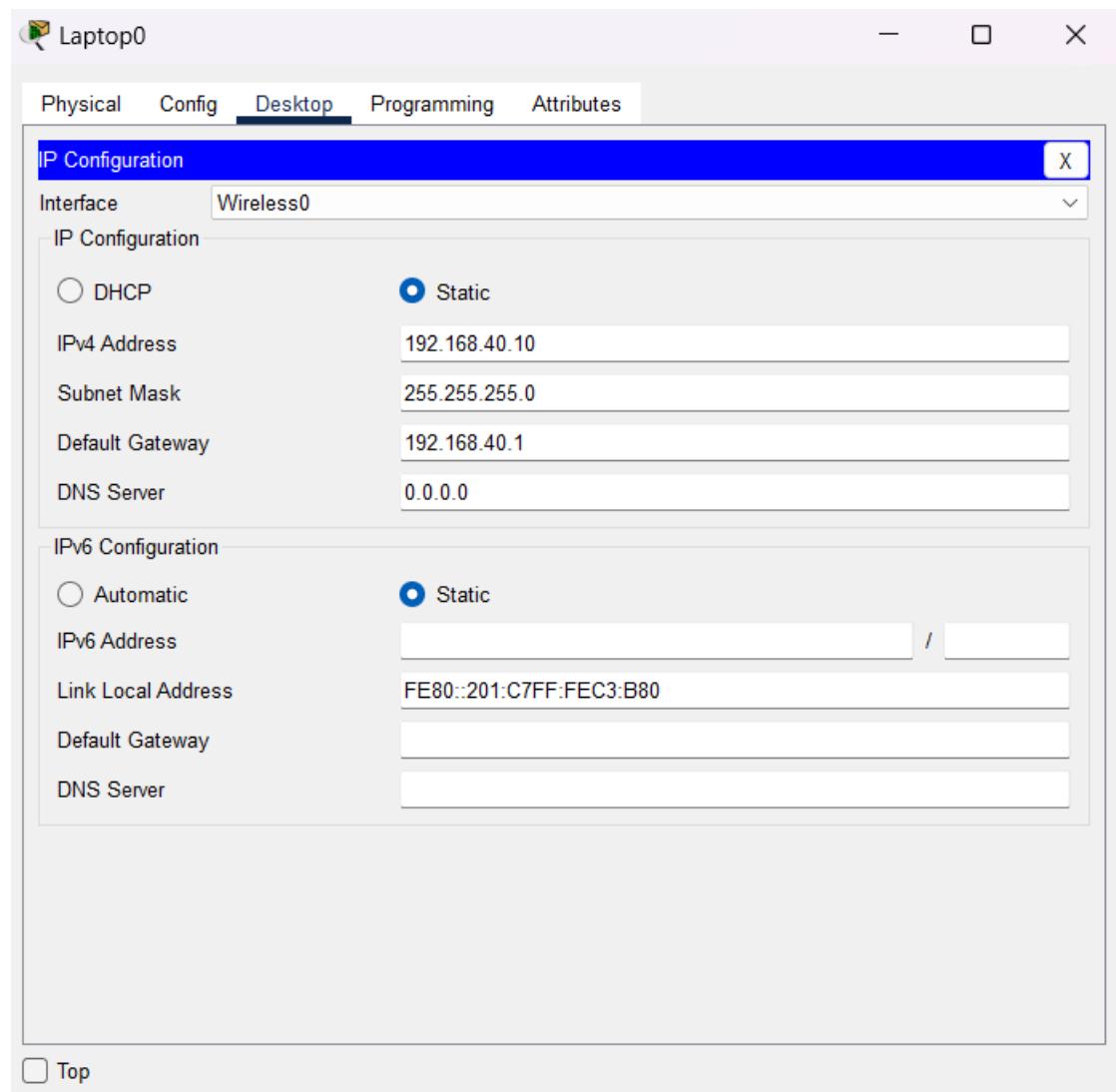


Figure 75 : Sales and Marketing Laptop

- In this interface author used IP address as 192.168.40.10 and for the default gateway used 192.168.40.1.

4.Legal Department

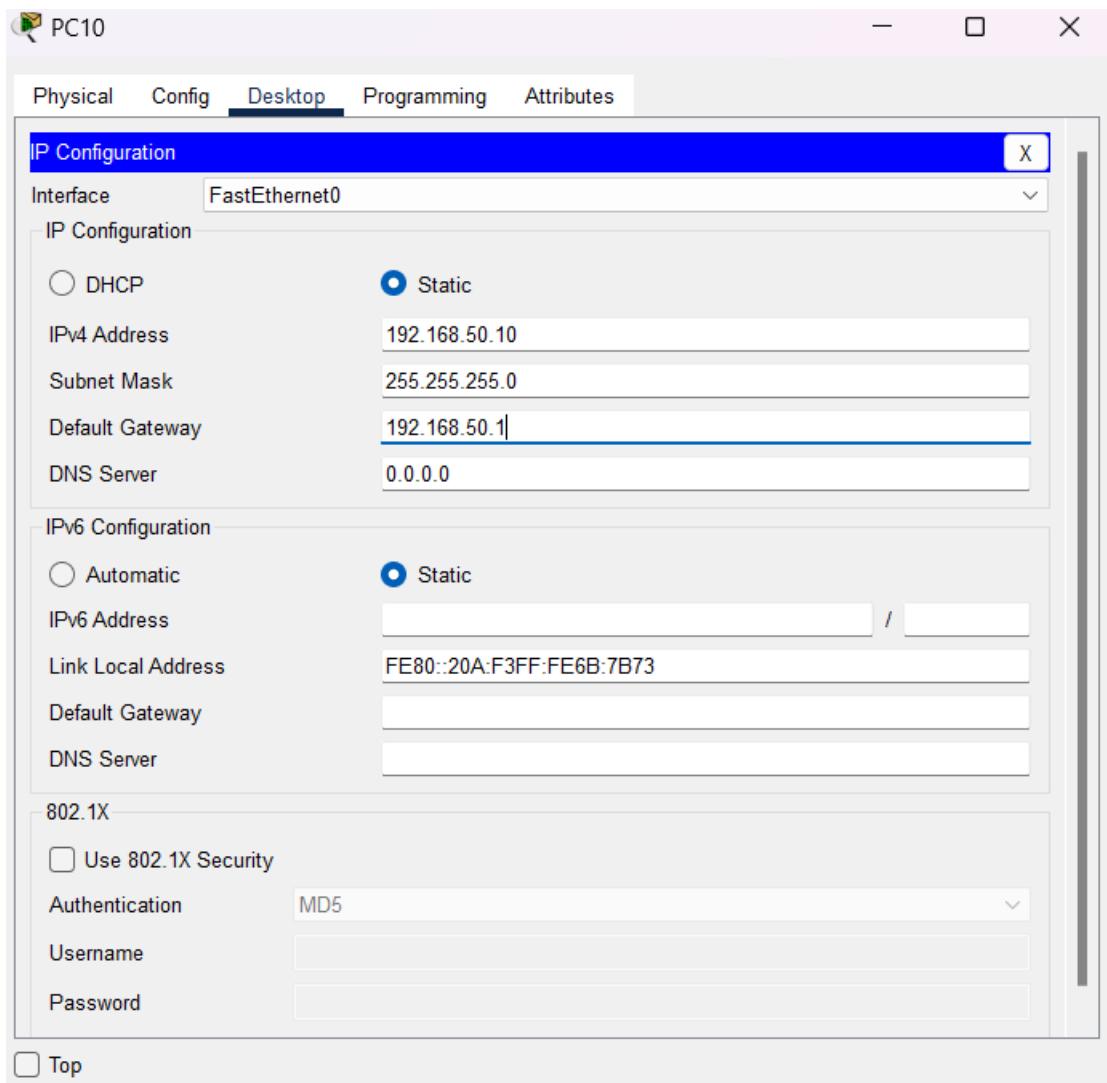


Figure 76 :Legal Department PC

- In this interface author used IP address as 192.168.50.10 and for the default gateway used 192.168.50.1.

5.HR Department

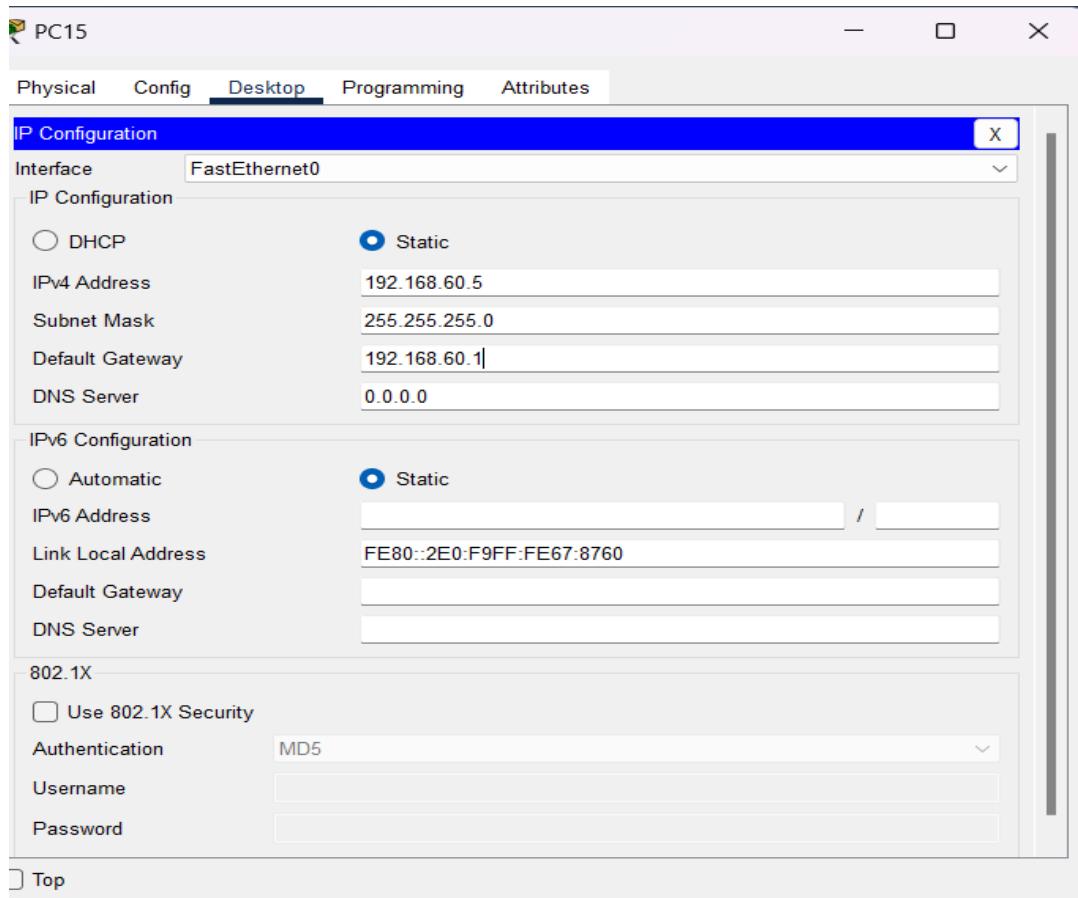


Figure 77 : HR Department PC

- In this interface author used IP address as 192.168.60.5 and for the default gateway used 192.168.60.1.

6. Developers Department

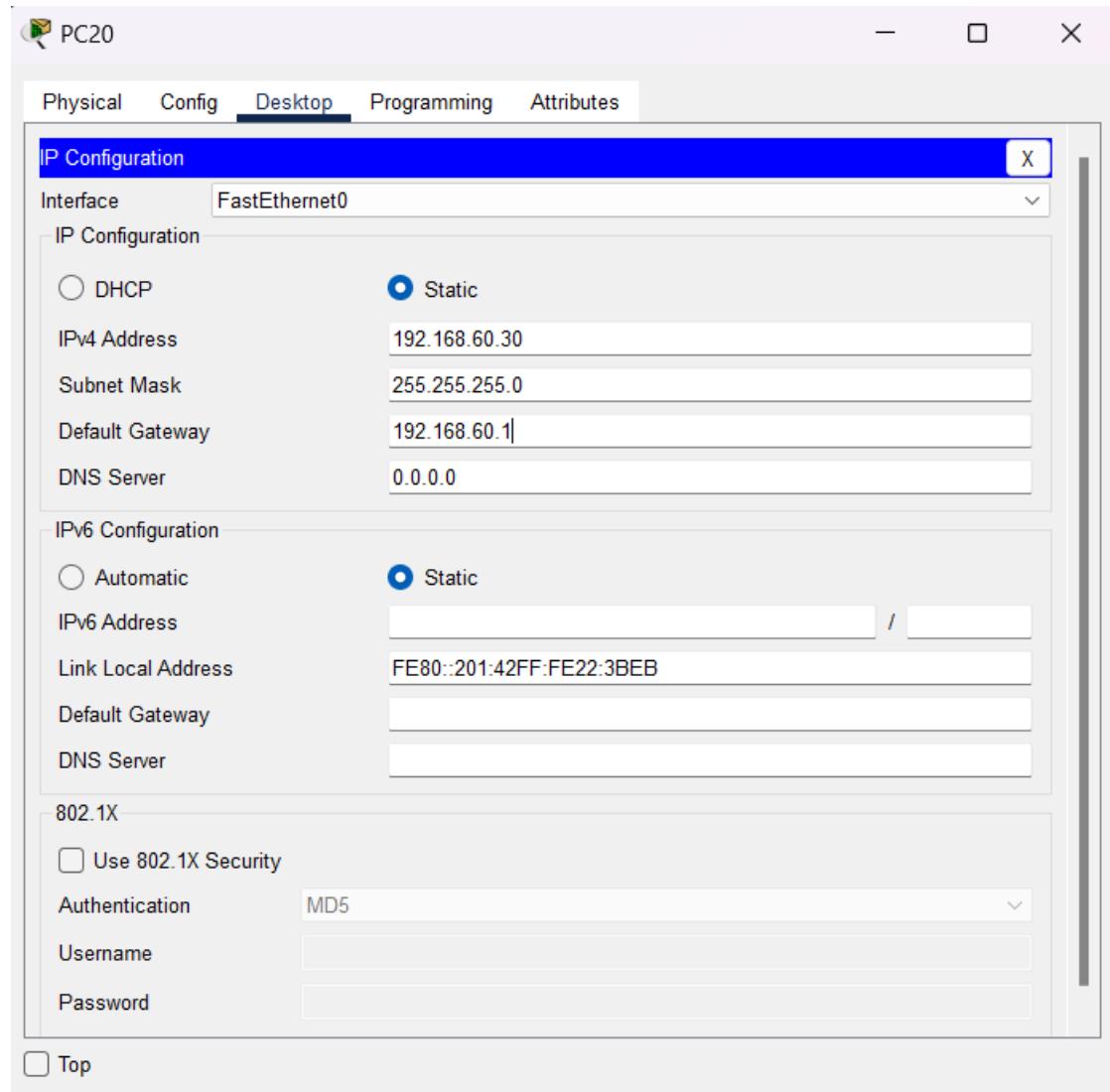


Figure 78: Developers Department PC

- In this interface author used IP address as 192.168.60.30 and for the default gateway used 192.168.60.1.

7.Network Team Department

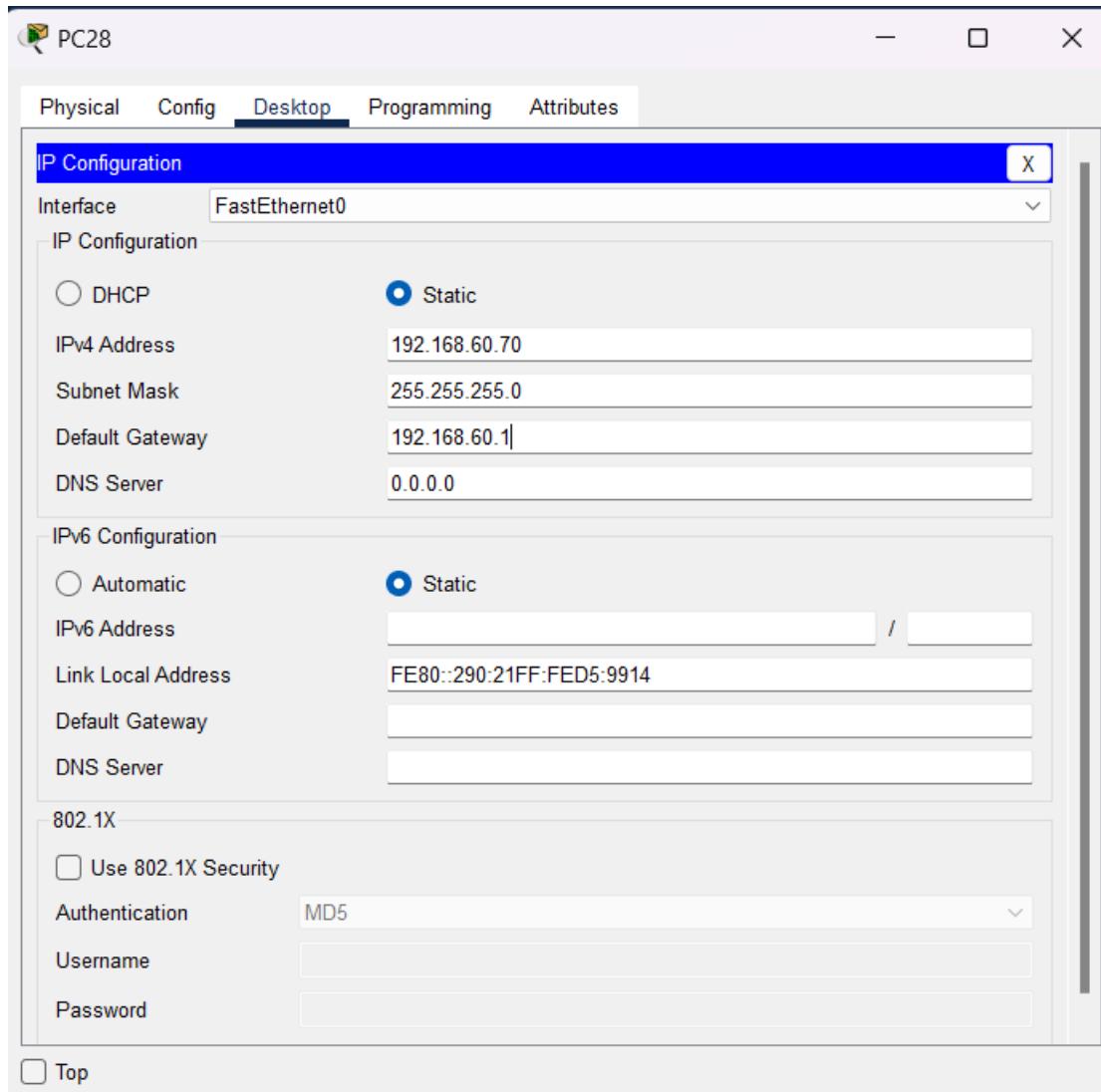


Figure 79 : Network Team Department PC

- In this interface author used IP address as 192.168.60.70 and for the default gateway used 192.168.60.1.

8.Server Room Department

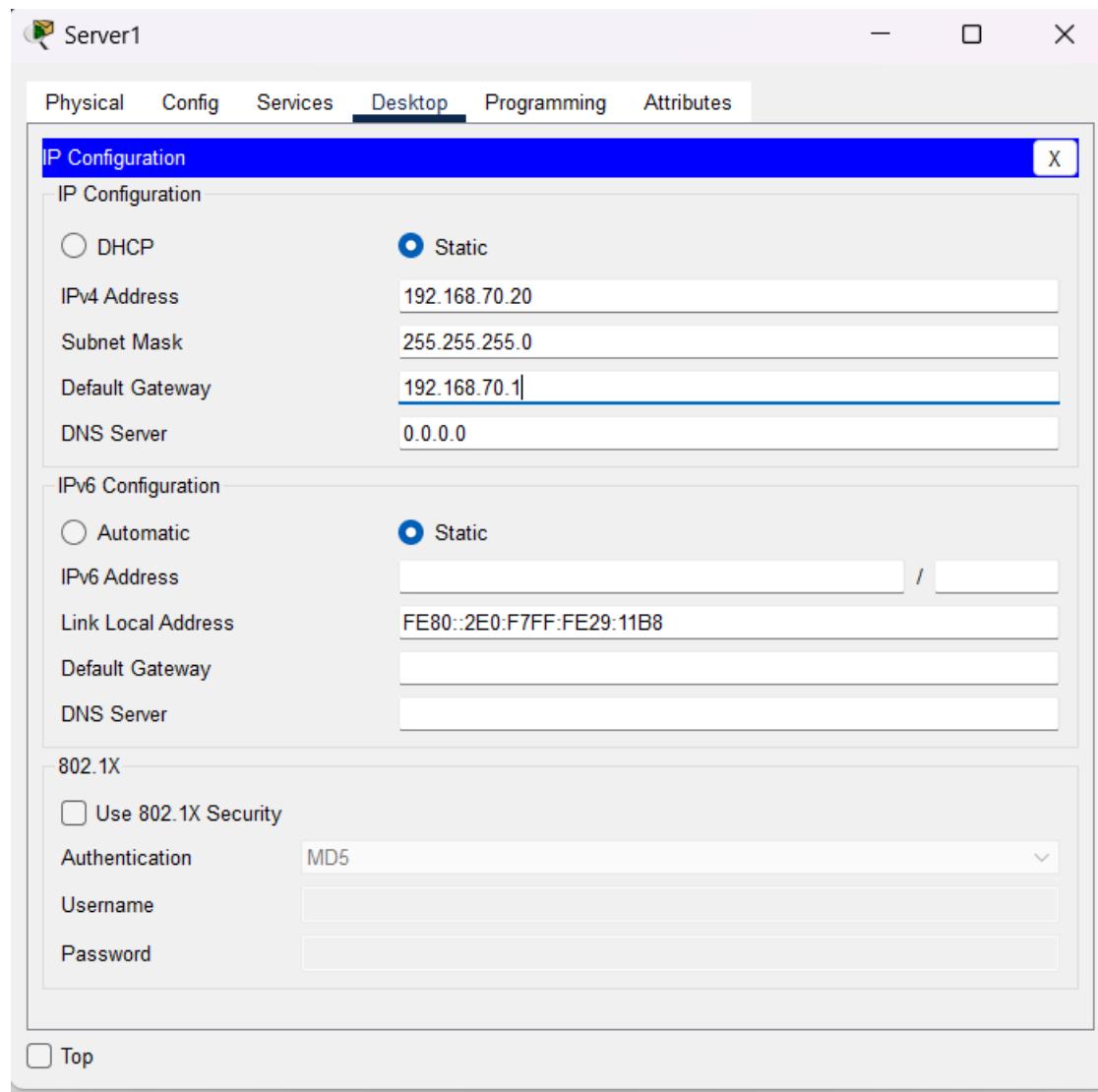
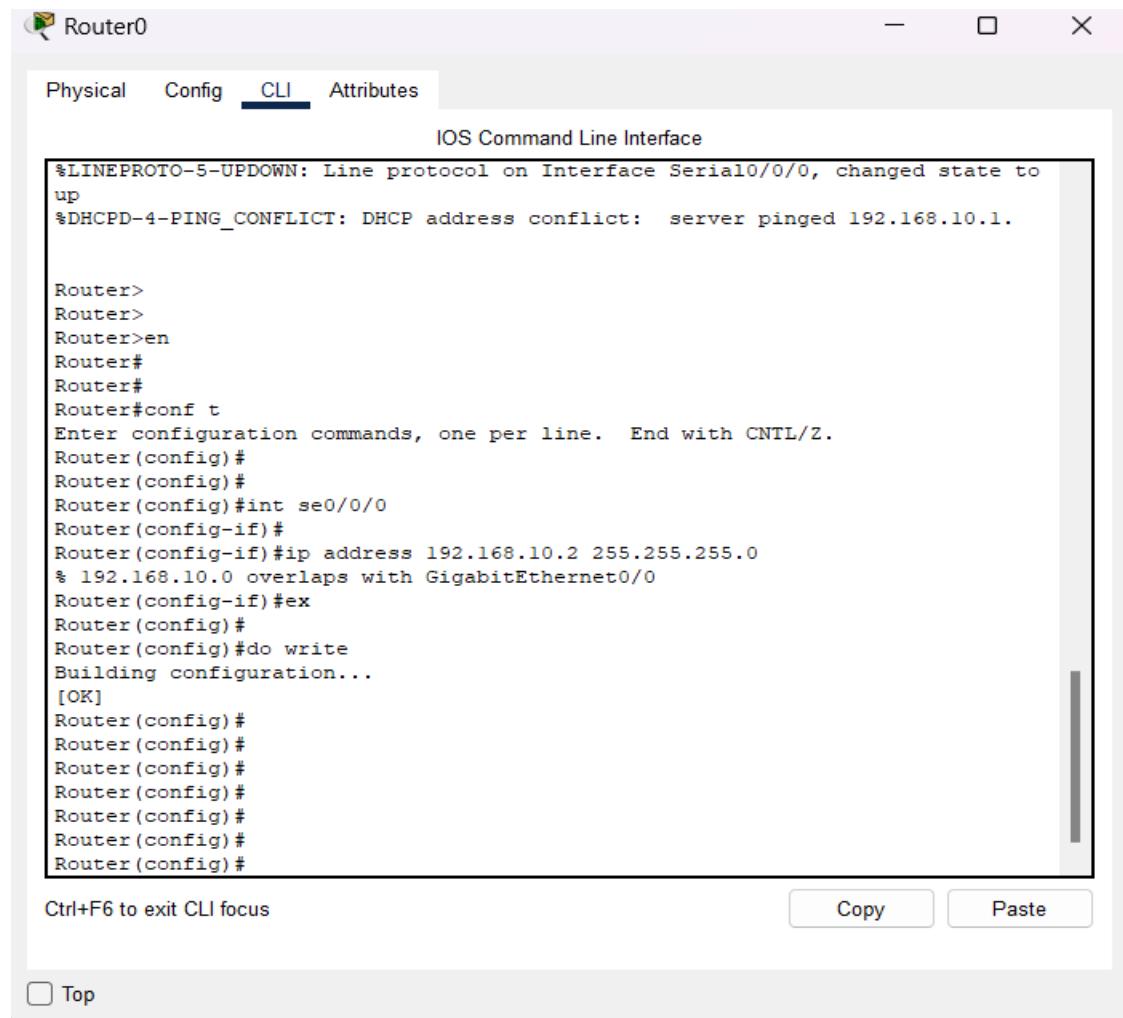


Figure 80 : Server Room Department PC

- In this interface author used IP address as 192.168.70.20 and for the default gateway used 192.168.70.1.

3.Router Configuration

- Router 0



Router>>> Router>>> Router>en Router# Router# Router#conf t Enter configuration commands, one per line. End with CNTL/Z. Router(config)# Router(config)# Router(config)#int se0/0/0 Router(config-if)# Router(config-if)#ip address 192.168.10.2 255.255.255.0 % 192.168.10.0 overlaps with GigabitEthernet0/0 Router(config-if)#ex Router(config)# Router(config)#do write Building configuration... [OK] Router(config)# Router(config)# Router(config)# Router(config)# Router(config)# Router(config)# Router(config)#

Ctrl+F6 to exit CLI focus

Top

Router 0

Router0

Physical Config **CLI** Attributes

IOS Command Line Interface

```
Router>
Router>
Router>en
Router#
Router#
Router#
Router#
Router#
Router#
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#
Router(config)#
Router(config)#
Router(config)#
Router(config)#
Router(config)#int gig
Router(config)#int gigabitEthernet 0/0
Router(config-if)##DHCPD-4-PING_CONFLICT: DHCP address conflict: server
pinged 192.168.10.1.

Router(config-if)#no sh
Router(config-if)#ex
Router(config)#int gig
Router(config)#int gigabitEthernet 0/1
Router(config-if)#no sh
Router(config-if)#ex
Router(config)#ex
Router#
%SYS-5-CONFIG_I: Configured from console by console

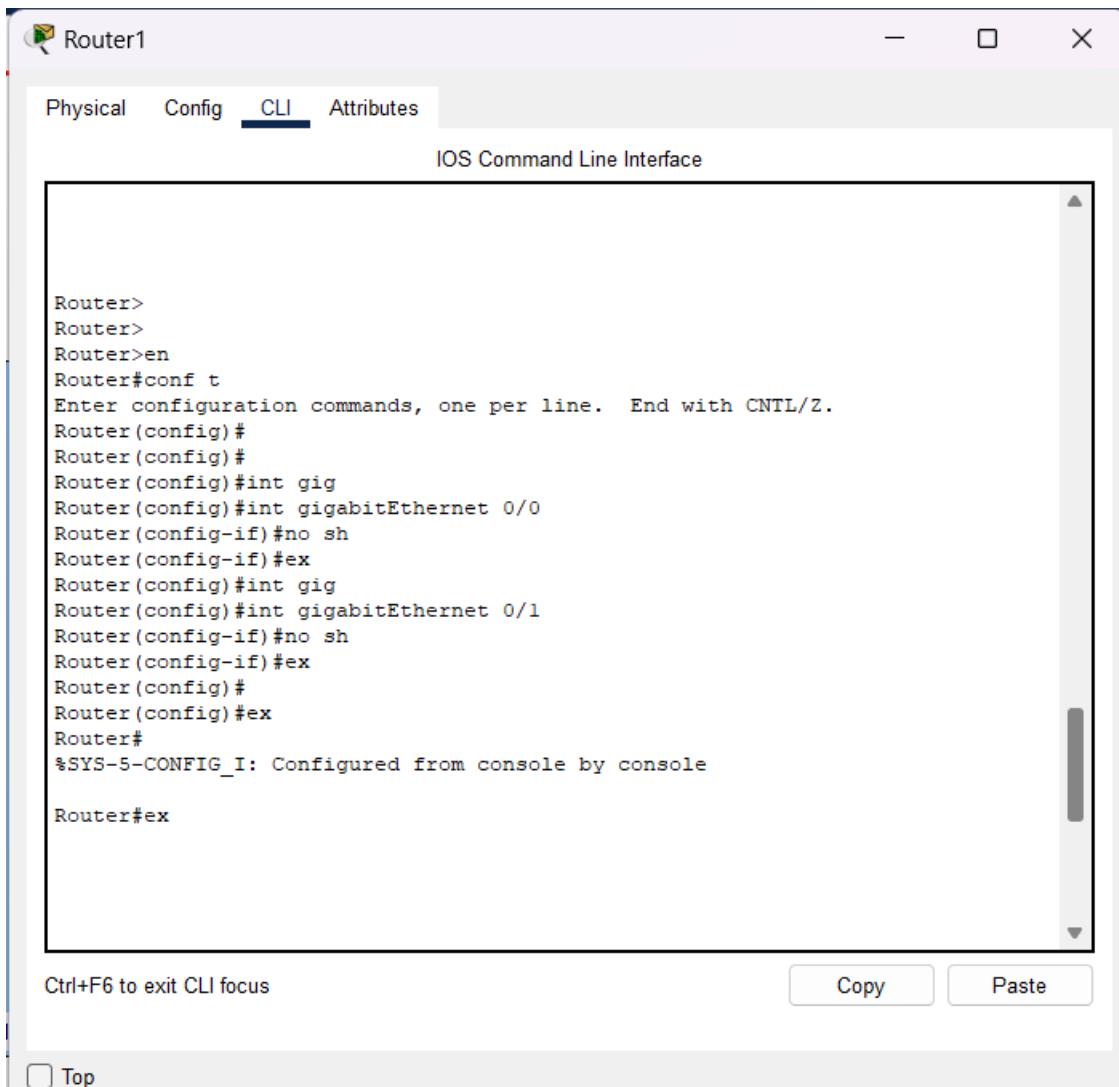
Router#
```

Ctrl+F6 to exit CLI focus

Top

Router 0

- Router 1



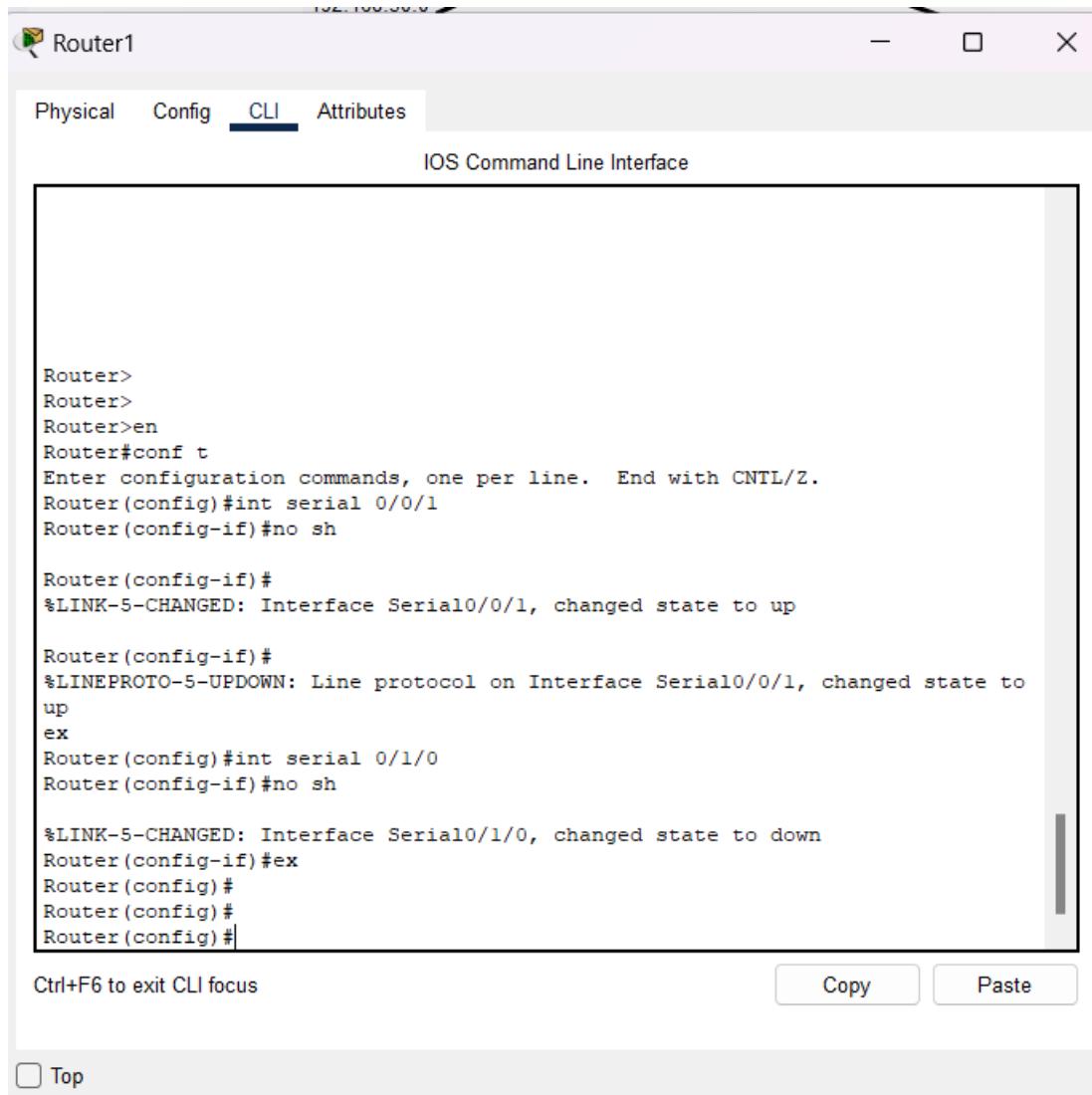
The screenshot shows a Windows-style application window titled "Router1". The tab bar at the top has "Physical", "Config", "CLI" (which is selected), and "Attributes". Below the tabs is a title bar "IOS Command Line Interface". The main area is a scrollable text box containing the following configuration commands:

```
Router>
Router>
Router>en
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#
Router(config)#
Router(config)#int gig
Router(config)#int gigabitEthernet 0/0
Router(config-if)#no sh
Router(config-if)#ex
Router(config)#int gig
Router(config)#int gigabitEthernet 0/1
Router(config-if)#no sh
Router(config-if)#ex
Router(config)#
Router(config)#ex
Router#
%SYS-5-CONFIG_I: Configured from console by console

Router#ex
```

At the bottom left of the window, there is a message "Ctrl+F6 to exit CLI focus". On the right side, there are "Copy" and "Paste" buttons. At the very bottom, there is a checkbox labeled "Top".

Router 1



The screenshot shows a window titled "Router1" with tabs for "Physical", "Config", "CLI" (which is selected), and "Attributes". The main area is labeled "IOS Command Line Interface". The command-line session is as follows:

```
Router>
Router>
Router>en
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int serial 0/0/1
Router(config-if)#no sh

Router(config-if)#
%LINK-5-CHANGED: Interface Serial0/0/1, changed state to up

Router(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/1, changed state to
up
ex
Router(config)#int serial 0/1/0
Router(config-if)#no sh

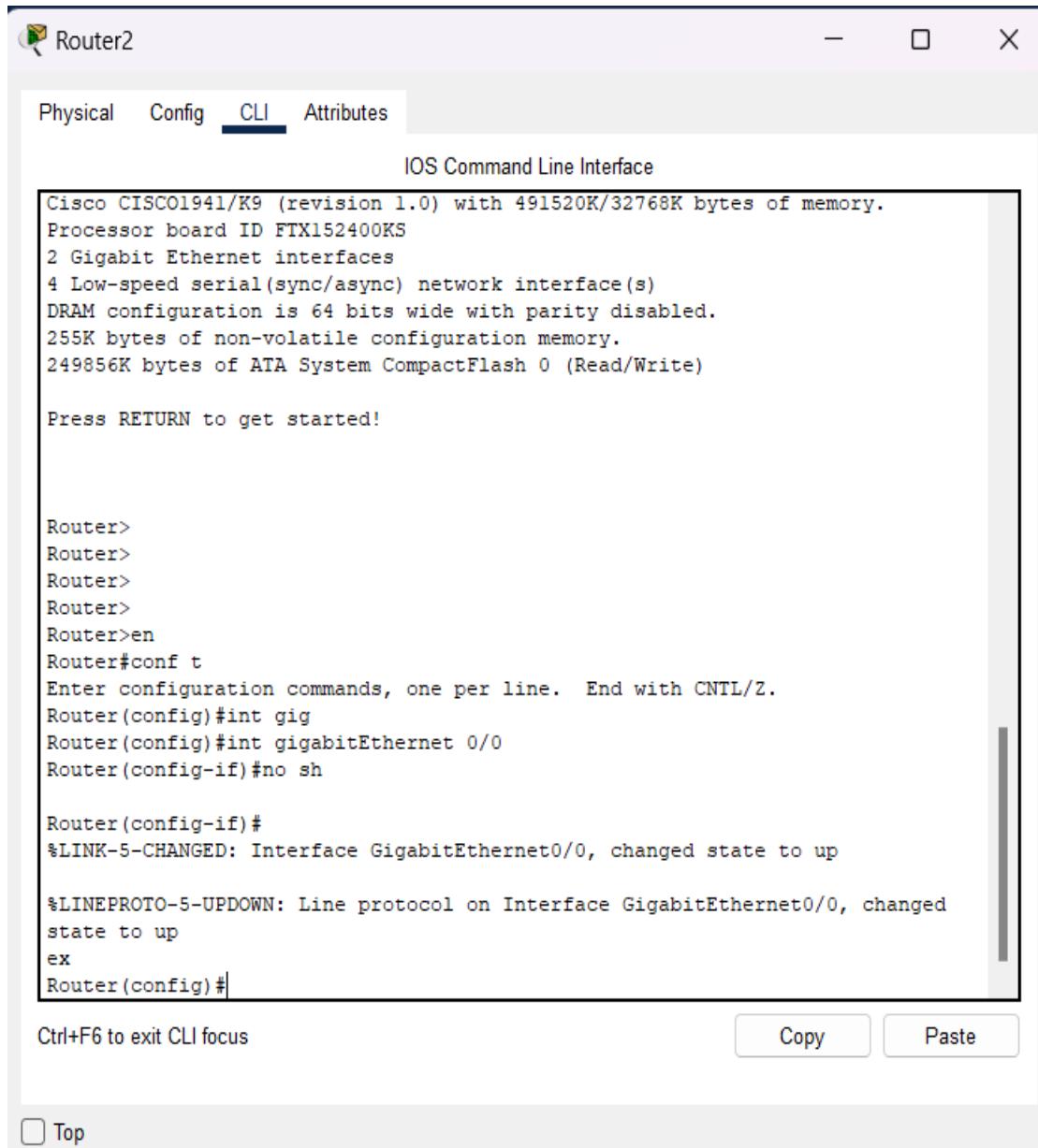
%LINK-5-CHANGED: Interface Serial0/1/0, changed state to down
Router(config-if)#ex
Router(config)#
Router(config)#
Router(config)#
Router(config)#

```

At the bottom left, it says "Ctrl+F6 to exit CLI focus". On the right, there are "Copy" and "Paste" buttons. At the bottom left of the window is a "Top" button.

Router 1

- Router 2

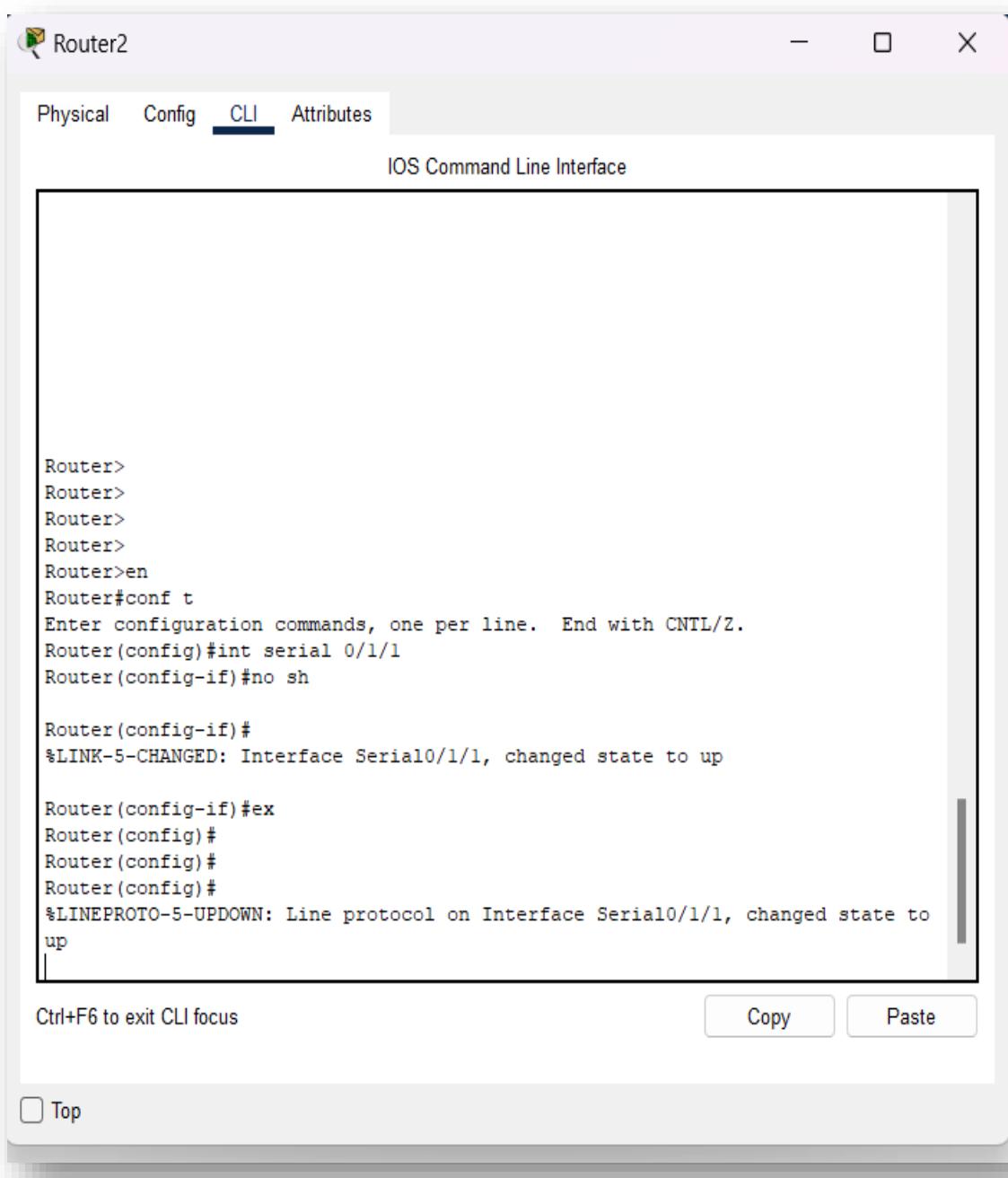


The screenshot shows a window titled "Router2" with tabs for "Physical", "Config", "CLI" (which is selected), and "Attributes". The main area displays the IOS Command Line Interface (CLI) output:

```
Cisco CISCO1941/K9 (revision 1.0) with 491520K/32768K bytes of memory.  
Processor board ID FTX152400KS  
2 Gigabit Ethernet interfaces  
4 Low-speed serial(sync/async) network interface(s)  
DRAM configuration is 64 bits wide with parity disabled.  
255K bytes of non-volatile configuration memory.  
249856K bytes of ATA System CompactFlash 0 (Read/Write)  
  
Press RETURN to get started!  
  
Router>  
Router>  
Router>  
Router>  
Router>en  
Router#conf t  
Enter configuration commands, one per line. End with CNTL/Z.  
Router(config)#int gig  
Router(config)#int gigabitEthernet 0/0  
Router(config-if)#no sh  
  
Router(config-if)#  
%LINK-5-CHANGED: Interface GigabitEthernet0/0, changed state to up  
  
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0, changed  
state to up  
ex  
Router(config)#
```

At the bottom of the CLI window, there are buttons for "Ctrl+F6 to exit CLI focus", "Copy", and "Paste".

Router 2



Router>
Router>
Router>
Router>
Router>en
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int serial 0/1/1
Router(config-if)#no sh

Router(config-if)#
%LINK-5-CHANGED: Interface Serial0/1/1, changed state to up

Router(config-if)#ex
Router(config)#
Router(config)#
Router(config)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/1/1, changed state to up

Ctrl+F6 to exit CLI focus Copy Paste

Top

Router 2(1)

The screenshot shows the Router2 configuration interface with the 'CLI' tab selected. The title bar says 'Router2'. The main area displays the following CLI session:

```
state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/1/1, changed state to
up

Router>
Router>
Router>
Router>en
Router#
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#
Router(config)#int se0/1/1 255.255.255.0
^
% Invalid input detected at '^' marker.

Router(config)#
Router(config)#int se0/1/1
Router(config-if)#ip address 192.168.20.2 255.255.255.0
Router(config-if)#ex
Router(config)#
Router(config)#do write
Building configuration...
[OK]
Router(config)#
Router(config)#
Router(config)#
Router(config)#
```

At the bottom left, it says 'Ctrl+F6 to exit CLI focus'. On the right, there are 'Copy' and 'Paste' buttons. At the very bottom left is a 'Top' button.

Router 02(2)

Router2

Physical Config **CLI** Attributes

IOS Command Line Interface

```
Router>
Router>en
Router#
Router#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#
Router(config)#int se0/1/1 255.255.255.0
           ^
% Invalid input detected at '^' marker.

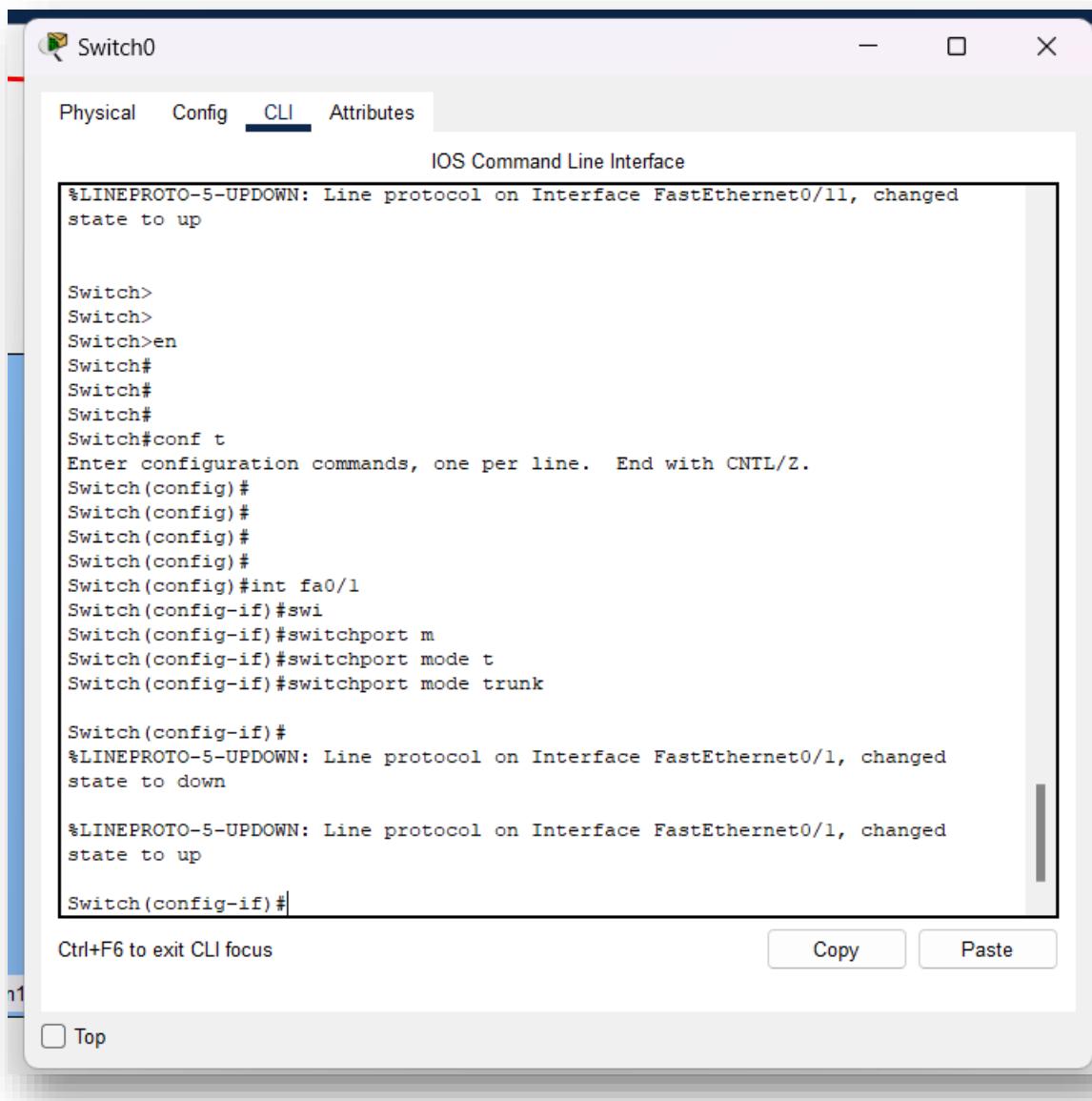
Router(config)#
Router(config)#int se0/1/1
Router(config-if)#ip address 192.168.20.2 255.255.255.0
Router(config-if)#ex
Router(config)#
Router(config)#do write
Building configuration...
[OK]
Router(config)#
Router(config)#
Router(config)#
Router(config)#int gig0/1
Router(config-if)#ip address 10.254.1.1 255.255.255.0
Router(config-if)#
Router(config-if)#ex
Router(config)#
Router(config)#do write
Building configuration...
[OK]
Router(config)#
Ctrl+F6 to exit CLI focus
```

Top

Copy **Paste**

Router 02(3)

4.Switch Configuration.



```
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/11, changed
state to up

Switch>
Switch>
Switch>en
Switch#
Switch#
Switch#
Switch#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#
Switch(config)#
Switch(config)#
Switch(config)#
Switch(config)#
Switch(config-if)#int fa0/1
Switch(config-if)#swi
Switch(config-if)#switchport m
Switch(config-if)#switchport mode t
Switch(config-if)#switchport mode trunk

Switch(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed
state to down

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed
state to up

Switch(config-if)#

Ctrl+F6 to exit CLI focus
```

Top

Copy Paste

Switch 0

Switch0

Physical Config **CLI** Attributes

IOS Command Line Interface

```
Switch>
Switch>
Switch>en
Switch#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#
Switch(config)#
Switch(config)#
Switch(config)#vlan 10
Switch(config-vlan)#name finance
Switch(config-vlan)#ex
Switch(config)#int range fa0/1-24
Switch(config-if-range)#swi
Switch(config-if-range)#switchport m
Switch(config-if-range)#switchport mode a
Switch(config-if-range)#switchport mode access
Switch(config-if-range)#sw
Switch(config-if-range)#switchport a
Switch(config-if-range)#switchport access v
Switch(config-if-range)#switchport access vlan 10
Switch(config-if-range)#ex
Switch(config)#do write
Building configuration...
[OK]
Switch(config)#[
```

Ctrl+F6 to exit CLI focus

Top

Copy Paste

Switch 0(1)

Switch2

Physical Config **CLI** Attributes

IOS Command Line Interface

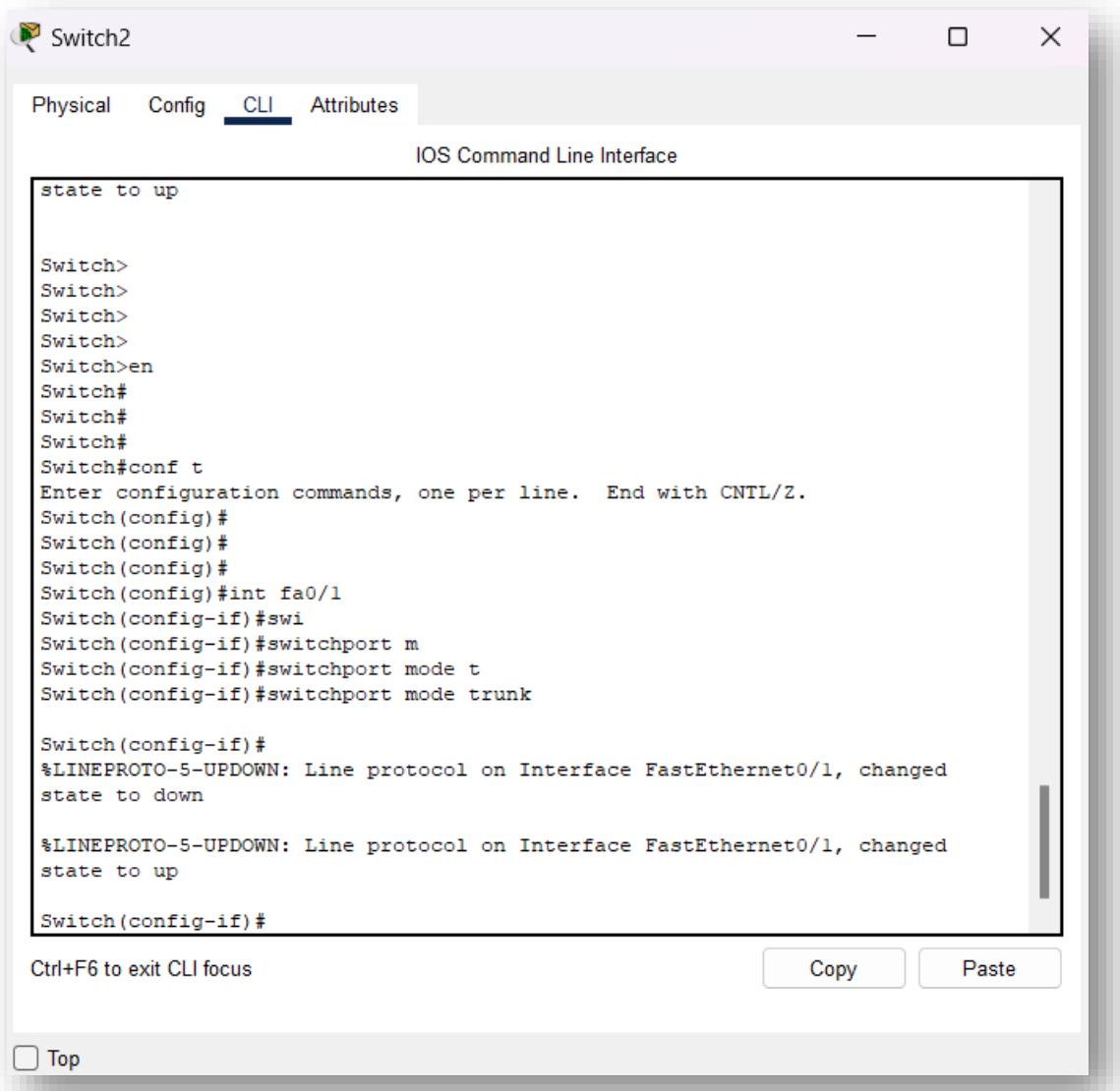
```
Switch>
Switch>
Switch>
Switch>
Switch>
Switch>en
Switch#
Switch#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#vlan 20
Switch(config-vlan)#name legal
Switch(config-vlan)#ex
Switch(config)#
Switch(config)#int range fa0/1-24
Switch(config-if-range)#sw
Switch(config-if-range)#switchport m
Switch(config-if-range)#switchport mode a
Switch(config-if-range)#switchport mode access
Switch(config-if-range)#sw
Switch(config-if-range)#switchport a
Switch(config-if-range)#switchport access v
Switch(config-if-range)#switchport access vlan 20
Switch(config-if-range)#switchport access vlan 20
Switch(config-if-range)#ex
Switch(config)#do write
Building configuration...
[OK]
Switch(config)#[
```

Ctrl+F6 to exit CLI focus

Top

Copy **Paste**

Switch 2



Switch2

Physical Config **CLI** Attributes

IOS Command Line Interface

```
state to up

Switch>
Switch>
Switch>
Switch>
Switch>en
Switch#
Switch#
Switch#
Switch#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#
Switch(config)#
Switch(config)#
Switch(config)#int fa0/1
Switch(config-if)#swi
Switch(config-if)#switchport m
Switch(config-if)#switchport mode t
Switch(config-if)#switchport mode trunk

Switch(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed
state to down

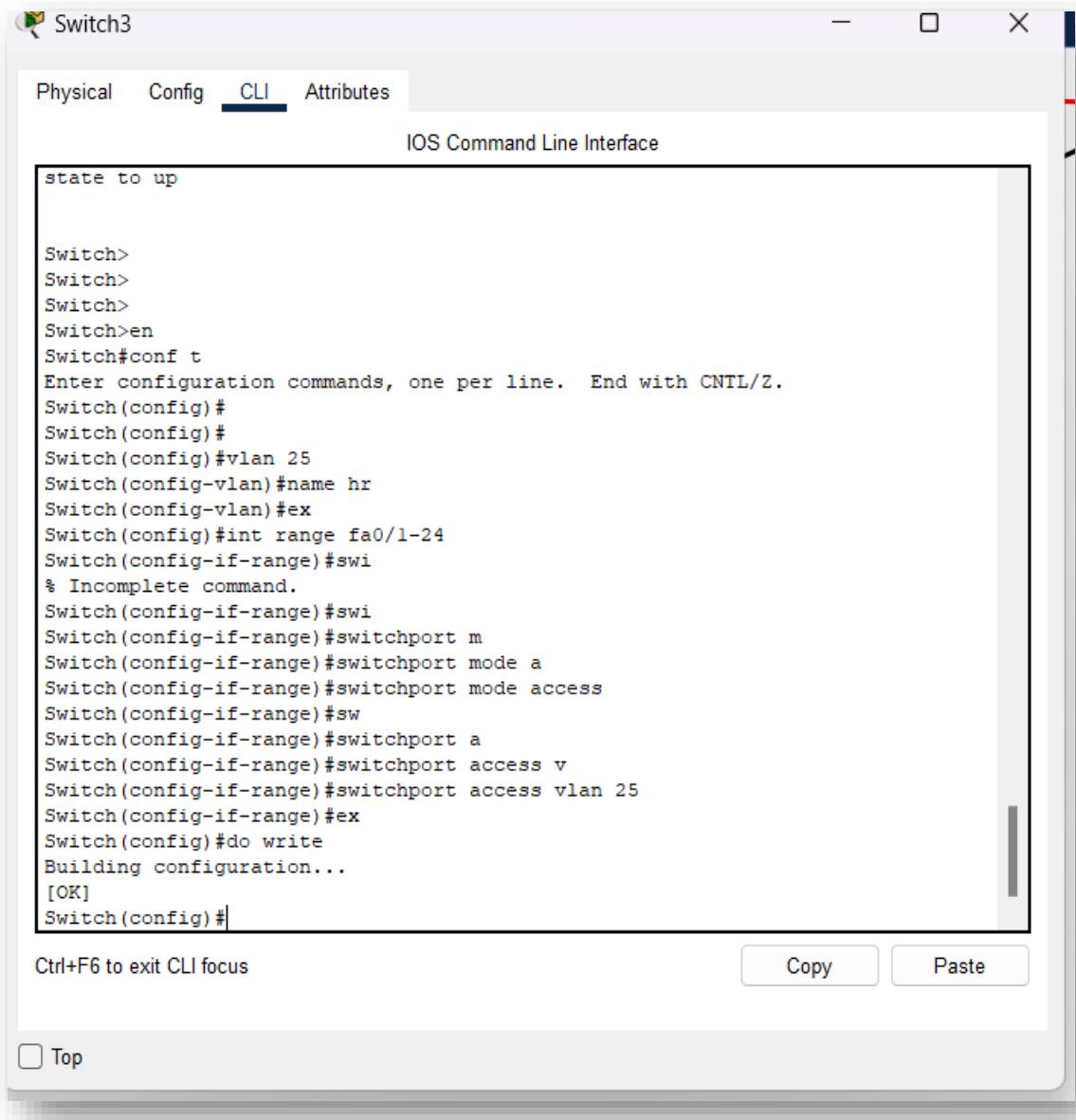
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed
state to up

Switch(config-if)#
Ctrl+F6 to exit CLI focus
```

Top

Copy Paste

Switch 2 (1)



The screenshot shows a window titled "Switch3" with tabs for "Physical", "Config", "CLI", and "Attributes". The "CLI" tab is selected, displaying the IOS Command Line Interface. The terminal window title is "IOS Command Line Interface". The command history is as follows:

```
state to up

Switch>
Switch>
Switch>
Switch>en
Switch#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#
Switch(config)#
Switch(config)#vlan 25
Switch(config-vlan)#name hr
Switch(config-vlan)#ex
Switch(config)#int range fa0/1-24
Switch(config-if-range)#swi
% Incomplete command.
Switch(config-if-range)#swi
Switch(config-if-range)#switchport m
Switch(config-if-range)#switchport mode a
Switch(config-if-range)#switchport mode access
Switch(config-if-range)#sw
Switch(config-if-range)#switchport a
Switch(config-if-range)#switchport access v
Switch(config-if-range)#switchport access vlan 25
Switch(config-if-range)#ex
Switch(config)#do write
Building configuration...
[OK]
Switch(config)#[/pre>
```

Ctrl+F6 to exit CLI focus

Copy

Paste

Top

Switch 3

Switch3

Physical Config **CLI** Attributes

IOS Command Line Interface

```
state to up
%LINK-5-CHANGED: Interface FastEthernet0/19, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/19, changed
state to up

Switch>
Switch>
Switch>
Switch>
Switch>
Switch>en
Switch#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#int fa 0/1
Switch(config-if)#swi
Switch(config-if)#switchport m
Switch(config-if)#switchport mode t
Switch(config-if)#switchport mode trunk

Switch(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed
state to down

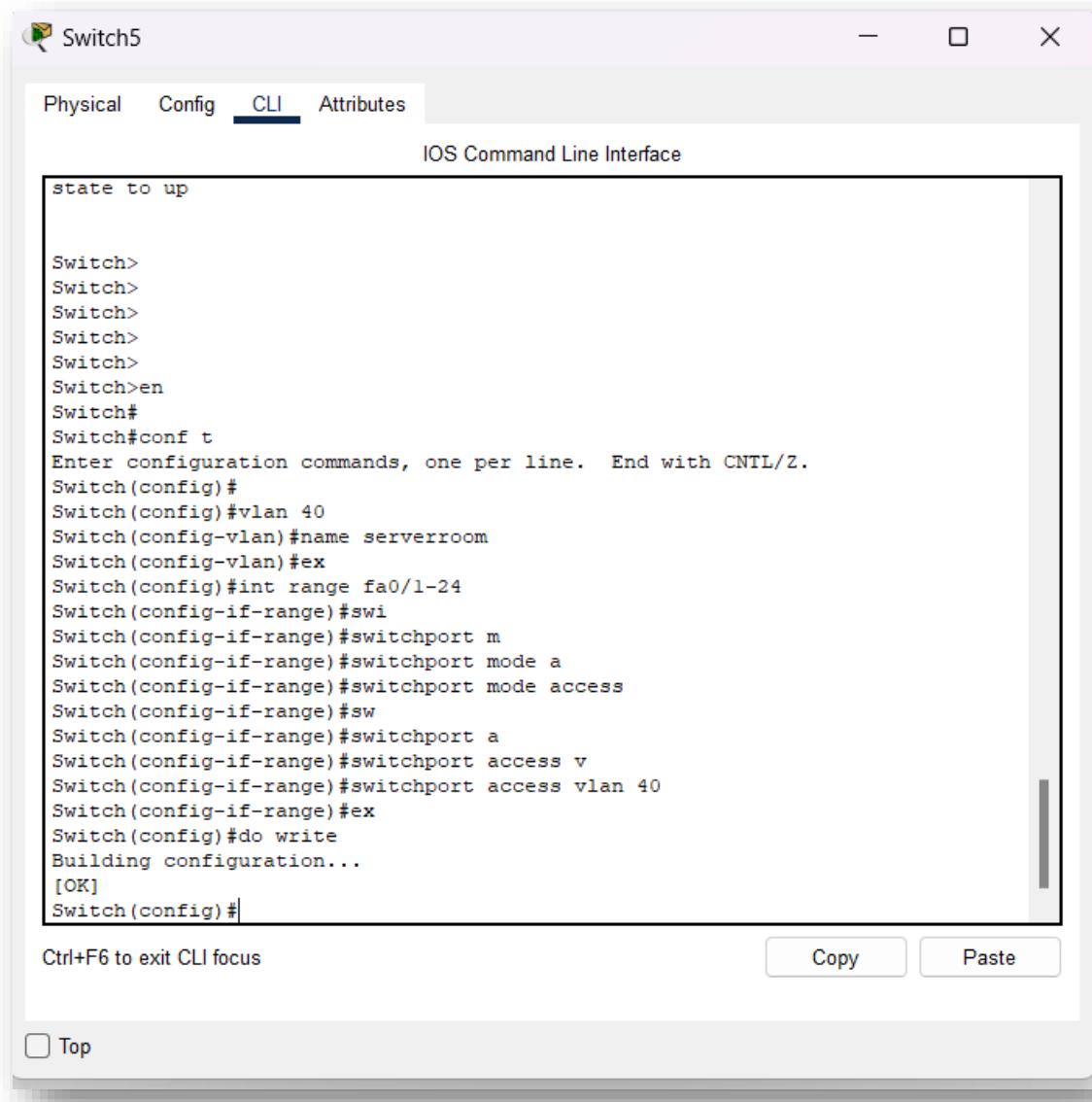
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed
state to up

Switch(config-if)#
Ctrl+F6 to exit CLI focus
```

Top

Copy **Paste**

Switch 3(1)



Switch5

Physical Config **CLI** Attributes

IOS Command Line Interface

```
state to up

Switch>
Switch>
Switch>
Switch>
Switch>
Switch>en
Switch#
Switch#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#
Switch(config)#vlan 40
Switch(config-vlan)#name serverroom
Switch(config-vlan)#ex
Switch(config)#int range fa0/1-24
Switch(config-if-range)#swi
Switch(config-if-range)#switchport m
Switch(config-if-range)#switchport mode a
Switch(config-if-range)#switchport mode access
Switch(config-if-range)#sw
Switch(config-if-range)#switchport a
Switch(config-if-range)#switchport access v
Switch(config-if-range)#switchport access vlan 40
Switch(config-if-range)#ex
Switch(config)#do write
Building configuration...
[OK]
Switch(config)#[
```

Ctrl+F6 to exit CLI focus

Top

Copy Paste

Switch 5

Switch5

Physical Config **CLI** Attributes

IOS Command Line Interface

```
%LINK-5-CHANGED: Interface FastEthernet0/7, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/7, changed
state to up

Switch>
Switch>
Switch>
Switch>en
Switch#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#
Switch(config)#
Switch(config)#int fa0/1
Switch(config-if)#
Switch(config-if)#
Switch(config-if)#swi
Switch(config-if)#switchport m
Switch(config-if)#switchport mode t
Switch(config-if)#switchport mode trunk

Switch(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed
state to down

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed
state to up

Switch(config-if)#

```

Ctrl+F6 to exit CLI focus

Top

Switch 5 (1)

Maintenance schedule to support the networked system.

Departement	No	Time	Frequency						Time	
			MON	TUE	WEN	THUR	FRI	SAT	SUN	
Custom Care	1	Listen and Resolve cocerns,questions of customers.	✓		✓		✓			9.00 - 12.00
	2	Open new customer accounts.		✓		✓				1.00 - 5.00
Finance	3	Prepare Balance sheet.						✓	✓	3.00 - 5.00
	4	Reconcile bank statements	✓			✓				8.00 - 10.00
	5	Record accounts payable and accounts receivable.		✓	✓	✓				1.00 - 2.00
Sales & Marketing	6	Analyse and create plan for the market.		✓				✓		8.00 - 10.00
	7	Train Other people for sellings						✓	✓	1.00 - 5.00
Legal	8	Prepare the legal documents			✓					9.00 - 11.00
HR	9	Update Policy's								10.00 - 12.00
	10	Hire Employees	✓				✓			8.00 - 9.00
Developers	11	Testing New programs	✓	✓	✓	✓	✓			8.00 - 12.00
	12	Creating quality Control process					✓		✓	9.00 - 12.00
Network Team	13	Monitor and aleart about network.	✓	✓	✓	✓				1.00 - 5.00
	14	Configure backup and secure storage					✓	✓		8.00 - 12.00
Server room	15	maintainence of Electricals	✓	✓	✓	✓	✓	✓	✓	8.00 - 5.00
	16	Note the morden communication protocols.				✓			✓	9.00 - 11.00

Figure 81 : A maintenance schedule to support the networked system.

Implementation of a network System.

Implement a networked system based on a prepared design.

1. Network Design

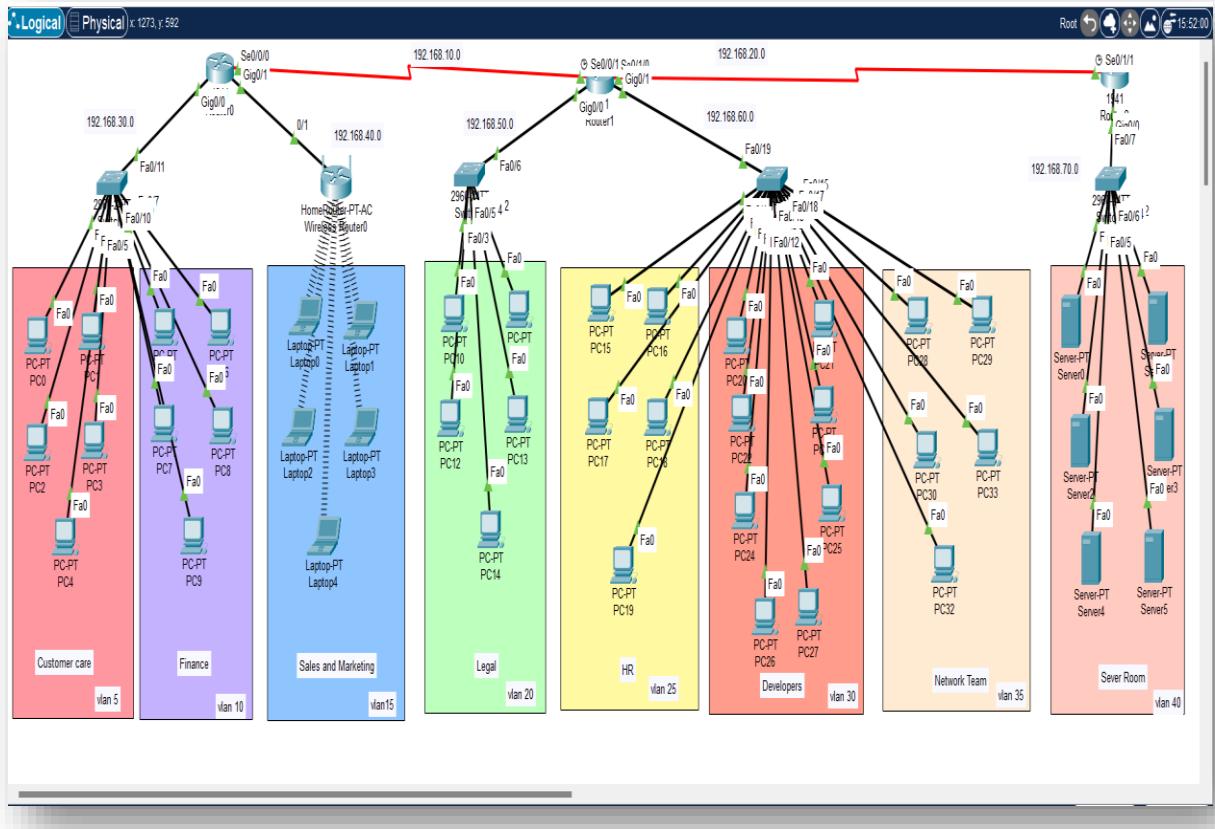


Figure 82 : networked system based on a prepared design

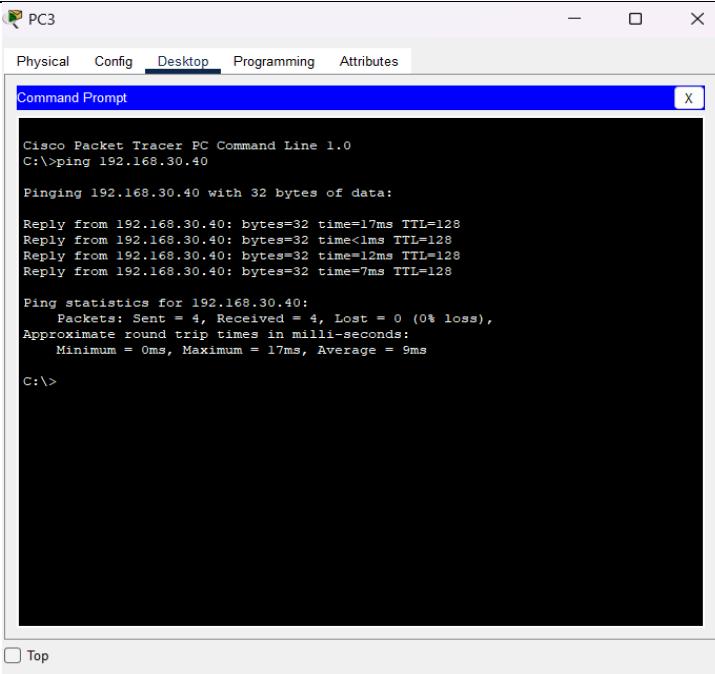
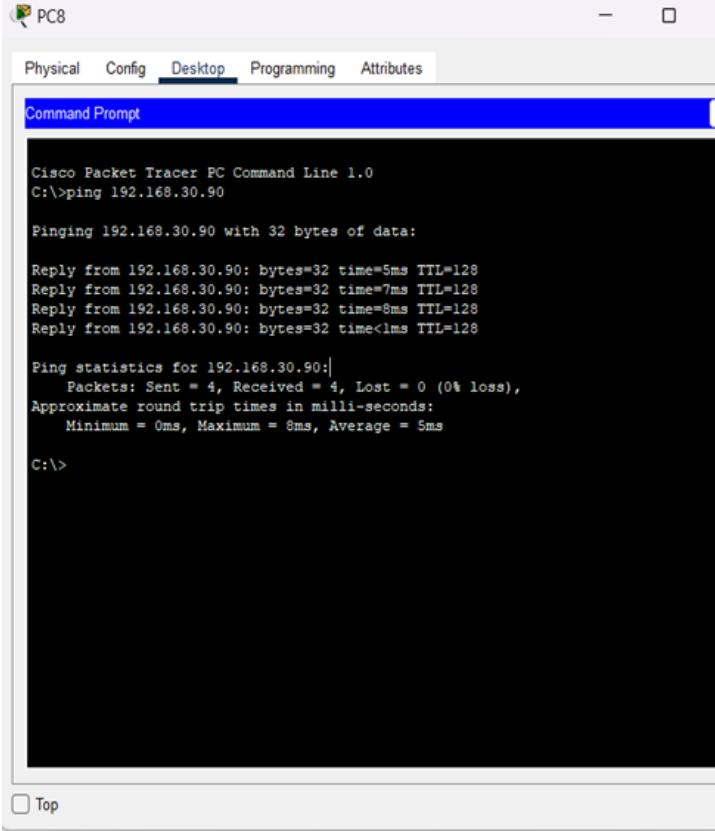
The above screenshot can see the network design that user design for the Syntax Solution Company. In this Design there are 8 departments there are known as Custom care, Finance, Sales and Marketing, Legal, HR, Developers, Network team and Server room. And each depart has pc and there are servers in server room. To sales and Marketing Department user implement Wi-Fi for that department. And Each department has a Vlan.

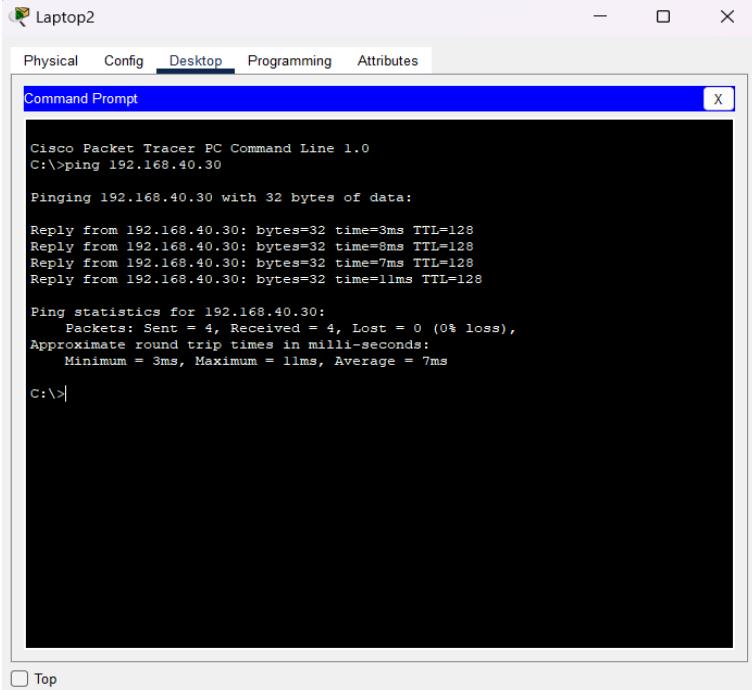
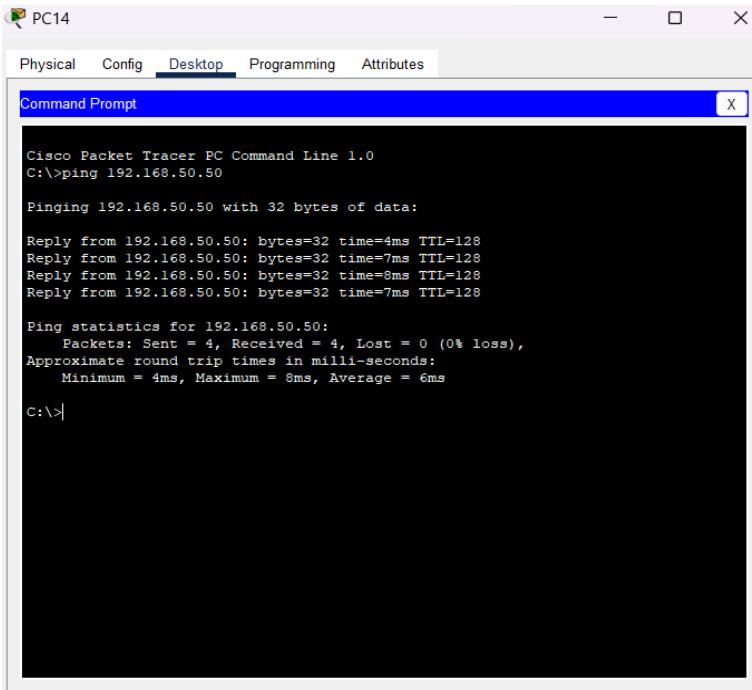
2. IP Address Table

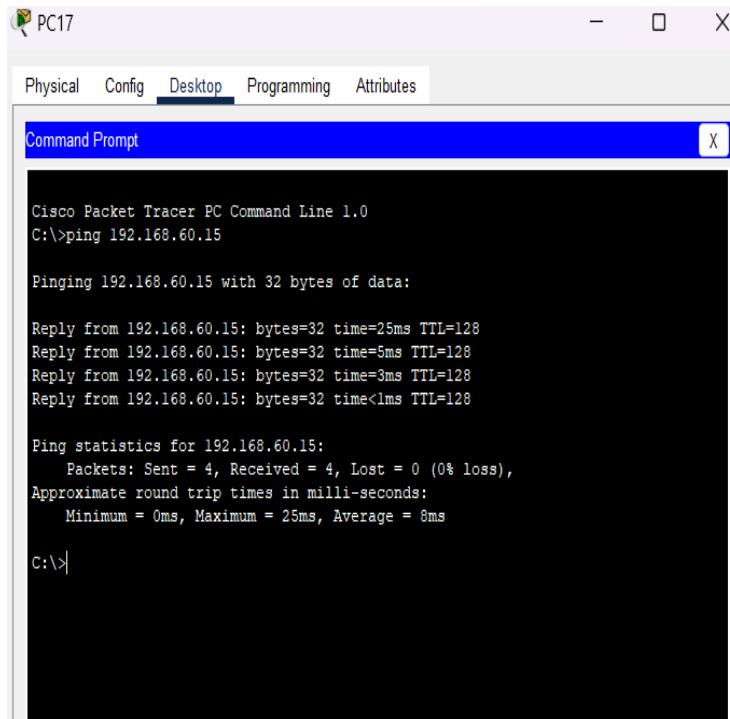
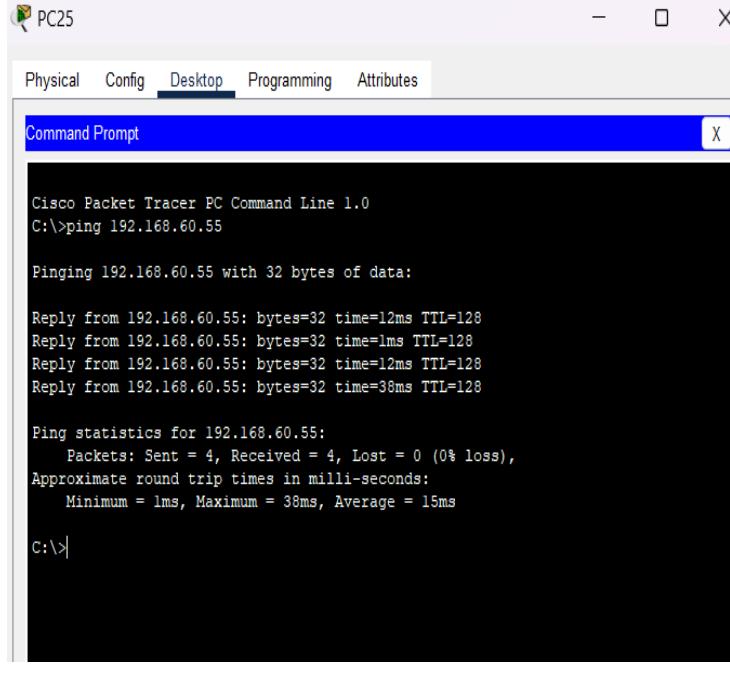
DEPARTEMENT	VLAN ID	PC	IP ADDRESS	SUBNET MASK	DEFAULT GATEWAY
Customer care	Vlan 5	PC0	192.168.30.10	255.255.255.0	192.168.30.1
		PC1	192.168.30.20	255.255.255.0	
		PC2	192.168.30.30	255.255.255.0	
		PC3	192.168.30.40	255.255.255.0	
		PC4	192.168.30.50	255.255.255.0	
Finance	Vlan 10	PC5	192.168.30.60	255.255.255.0	192.168.30.1
		PC6	192.168.30.70	255.255.255.0	
		PC7	192.168.30.80	255.255.255.0	
		PC8	192.168.30.90	255.255.255.0	
		PC9	192.168.30.100	255.255.255.0	
Sales and Marketing	Vlan 15	LAP 0	192.168.40.10	255.255.255.0	192.168.40.1
		LAP 1	192.168.40.20	255.255.255.0	
		LAP 2	192.168.40.30	255.255.255.0	
		LAP 3	192.168.40.40	255.255.255.0	
		LAP 4	192.168.40.50	255.255.255.0	
Legal	Vlan 20	PC10	192.168.50.10	255.255.255.0	192.168.50.1
		PC11	192.168.50.20	255.255.255.0	
		PC12	192.168.50.30	255.255.255.0	
		PC13	192.168.50.40	255.255.255.0	
		PC14	192.168.50.50	255.255.255.0	
HR	Vlan 25	PC15	192.168.60.5	255.255.255.0	192.168.60.1
		PC16	192.168.60.10	255.255.255.0	
		PC17	192.168.60.15	255.255.255.0	
		PC18	192.168.60.20	255.255.255.0	
		PC19	192.168.60.25	255.255.255.0	
Developers	Vlan 30	PC20	192.168.60.30	255.255.255.0	192.168.60.1
		PC21	192.168.60.35	255.255.255.0	
		PC22	192.168.60.40	255.255.255.0	
		PC23	192.168.60.45	255.255.255.0	
		PC24	192.168.60.50	255.255.255.0	
		PC26	192.168.60.55	255.255.255.0	
		PC27	192.168.60.60	255.255.255.0	
Network Team	Vlan 35	PC28	192.168.60.65	255.255.255.0	192.168.60.1
		PC29	192.168.60.70	255.255.255.0	
		PC30	192.168.60.75	255.255.255.0	
		PC32	192.168.60.80	255.255.255.0	
		PC33	192.168.60.85	255.255.255.0	

Figure 83 : IP Address Table

Documentation and the analysing test of the results against expected results.

Department	Expected results	Result	Test results
Customer care	Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),	 A screenshot of the Cisco Packet Tracer Command Line interface for PC3. The window title is "Command Prompt". The command entered is "ping 192.168.30.40". The output shows four successful replies from the target IP address with TTL=128 and round trip times between 7ms and 17ms. No losses are reported. Cisco Packet Tracer PC Command Line 1.0 C:\>ping 192.168.30.40 Pinging 192.168.30.40 with 32 bytes of data: Reply from 192.168.30.40: bytes=32 time=17ms TTL=128 Reply from 192.168.30.40: bytes=32 time<1ms TTL=128 Reply from 192.168.30.40: bytes=32 time=12ms TTL=128 Reply from 192.168.30.40: bytes=32 time=7ms TTL=128 Ping statistics for 192.168.30.40: Packets: Sent = 4, Received = 4, Lost = 0 (0% loss), Approximate round trip times in milli-seconds: Minimum = 0ms, Maximum = 17ms, Average = 9ms C:\>	Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Finance	Packets: Sent = 4, Received = 4, Lost = 0 (0% loss)	 A screenshot of the Cisco Packet Tracer Command Line interface for PC8. The window title is "Command Prompt". The command entered is "ping 192.168.30.90". The output shows four successful replies from the target IP address with TTL=128 and round trip times between 5ms and 8ms. No losses are reported. Cisco Packet Tracer PC Command Line 1.0 C:\>ping 192.168.30.90 Pinging 192.168.30.90 with 32 bytes of data: Reply from 192.168.30.90: bytes=32 time=5ms TTL=128 Reply from 192.168.30.90: bytes=32 time=7ms TTL=128 Reply from 192.168.30.90: bytes=32 time=8ms TTL=128 Reply from 192.168.30.90: bytes=32 time<1ms TTL=128 Ping statistics for 192.168.30.90: Packets: Sent = 4, Received = 4, Lost = 0 (0% loss), Approximate round trip times in milli-seconds: Minimum = 0ms, Maximum = 8ms, Average = 5ms C:\>	Packets: Sent = 4, Received = 4, Lost = 0 (0% loss)

Sales and Marketing	Packets: Sent = 4, Received = 4, Lost = 0 (0% loss)		Packets: Sent = 4, Received = 4, Lost = 0 (0% loss)
Legal	Packets: Sent = 4, Received = 4, Lost = 0 (0% loss)		Packets: Sent = 4, Received = 4, Lost = 0 (0% loss)

HR	Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),	 <pre> Cisco Packet Tracer PC Command Line 1.0 C:\>ping 192.168.60.15 Pinging 192.168.60.15 with 32 bytes of data: Reply from 192.168.60.15: bytes=32 time=25ms TTL=128 Reply from 192.168.60.15: bytes=32 time=5ms TTL=128 Reply from 192.168.60.15: bytes=32 time=3ms TTL=128 Reply from 192.168.60.15: bytes=32 time<1ms TTL=128 Ping statistics for 192.168.60.15: Packets: Sent = 4, Received = 4, Lost = 0 (0% loss), Approximate round trip times in milli-seconds: Minimum = 0ms, Maximum = 25ms, Average = 8ms C:\> </pre>	Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Developers	Packets: Sent = 4, Received = 4, Lost = 0 (0% loss)	 <pre> Cisco Packet Tracer PC Command Line 1.0 C:\>ping 192.168.60.55 Pinging 192.168.60.55 with 32 bytes of data: Reply from 192.168.60.55: bytes=32 time=12ms TTL=128 Reply from 192.168.60.55: bytes=32 time=1ms TTL=128 Reply from 192.168.60.55: bytes=32 time=12ms TTL=128 Reply from 192.168.60.55: bytes=32 time=38ms TTL=128 Ping statistics for 192.168.60.55: Packets: Sent = 4, Received = 4, Lost = 0 (0% loss), Approximate round trip times in milli-seconds: Minimum = 1ms, Maximum = 38ms, Average = 15ms C:\> </pre>	Packets: Sent = 4, Received = 4, Lost = 0 (0% loss)

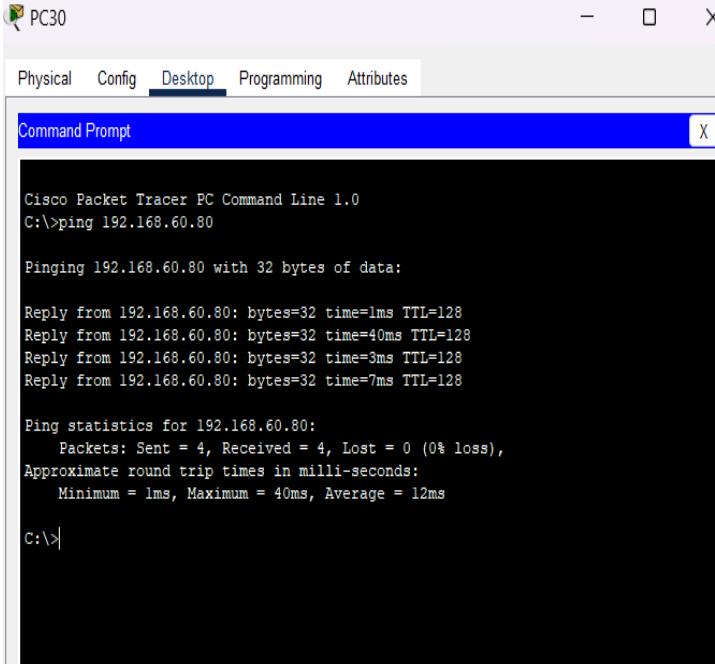
Network Team	Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),	 <pre> Cisco Packet Tracer PC Command Line 1.0 C:\>ping 192.168.60.80 Pinging 192.168.60.80 with 32 bytes of data: Reply from 192.168.60.80: bytes=32 time=1ms TTL=128 Reply from 192.168.60.80: bytes=32 time=40ms TTL=128 Reply from 192.168.60.80: bytes=32 time=3ms TTL=128 Reply from 192.168.60.80: bytes=32 time=7ms TTL=128 Ping statistics for 192.168.60.80: Packets: Sent = 4, Received = 4, Lost = 0 (0% loss), Approximate round trip times in milli-seconds: Minimum = 1ms, Maximum = 40ms, Average = 12ms C:\> </pre>	Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
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Table 15 : Documentation and the analysing test of the results against expected results.

Potential enhancements for the networked systems.

A network should always update and developed for the future is very important. However, in a network system how to potential enhancement for the network systems. Now author explains how to enhancement a network system.

1. User should configure the network daily.

This means that configure should be always checked and it should be reconfigured because it is not configured then it might be caused for the networking system. Configure can't be done by installing or updating a network it should reconfigure.

(Advanced Network Professionals, 2022)

2. Check for the viruses and system defectors.

When a network is not performing well it may be have a viruses such as malware and that are caused many troubles for system so daily workers should check the systems. (Advanced Network Professionals, 2022)

3. Upgrade and Update Firmware and Software

For each devise in a company or a system should update or upgrade the firmware and software because may be the devices can slow when user do not update it. It is very important that when the softwares and firmware are updated it is easy to work and control the system.

(Advanced Network Professionals, 2022)

4. Using Virtual Local Area Network

Using vlan make network easy because network can divide into categories. For an example A company that has many departments can use vlan to divide the network. (Advanced Network Professionals, 2022)

5. Scalability and Effectiveness

By using load balancing strategies, network traffic is split evenly among several servers, guaranteeing effective resource use and avoiding server overload.

utilizing content delivery networks (CDNs) to cache data in several geographic locations in order to provide content to users more quickly.putting cloud computing services into practice to improve the network's scalability and flexibility so that it can more easily handle surges in traffic and higher workloads.

6.Enhancements to the Quality of Service (QoS)

By putting QoS standards into practice, important apps and services are given priority and are given enough bandwidth and network resources.keeping an eye on and improving network performance to reduce packet loss and delay and improve user experience overall.

7.Integration of IoT

incorporating Internet of Things (IoT) devices into the network to gather and evaluate data from multiple sources, facilitating process automation and improved decision-making.putting in place IoT security mechanisms, such encryption and device authentication, to protect the network from any threats brought on by linked devices.

8.SDN, or software-defined networking

implementing SDN to streamline network configuration and management, enabling centralized management and programmable network architecture.allowing for the dynamic provisioning of network resources in response to shifting demands and traffic patterns, which will increase network agility.

9.Integration of AI and Data Analytics

Utilizing AI and data analytics tools to examine network data and spot trends, allowing proactive troubleshooting and predictive maintenance to avert possible network problems. utilizing AI-driven security solutions to improve the network's overall security posture by quickly identifying and mitigating cyber threats.

10.Using Blockchain to Protect Networks

putting blockchain technology into practice to improve data exchanges' security and transparency. Blockchain technology is being used in the network for safe peer-to-peer communication, identity management, and data integrity verification.

D3: Critical reflection of the Authors work and justification of the valid conclusions.

For the Company of syntax solutions author had to design a network design for This company to work more efficiently. However, it is not easy to make a network Design because author should always update the new technologies that use nowadays. So firstly, as a network consultant author make a blueprint network designed for get a idea that how to make an efficient network system. Then as a network consultant author thinks that what should the best topology for this company and how it works. Then author designed and make a efficient network designed for the company. Author had more difficulties when this network system is designing but author managed to complete it once at a time.

- Conclusion

In this project author faced many issues when designing the network system and when searching information about the topics. So firstly, author decide for this network project because it is very helpful when ever makes wrong thigs it will help to correct the mistakes. So, then author search more information and gathered them that might be important and finally then author designed the network design and completed the project. It was very interesting to do such a project. So, by this Project author learn new things and thank you.

References

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Grading Rubric

Grading Criteria	Achieved	Feedback
LO1 : Examine networking principles and their protocols.		
P1 Discuss the benefits and constraints of different network types and standards.		
P2 Explain the impact of network topology, communication, and bandwidth requirements.		
M1 Compare common networking principles and how protocols enable the effectiveness of networked systems.		
LO2 : Explain networking devices and operations		
P3 Discuss the operating principles of networking devices and server types.		
P4		

Discuss the inter-dependence of workstation hardware with relevant networking software.		
M2 Explore a range of server types and justify the selection of a server, considering a given scenario regarding cost and performance optimization.		
	LO 1 & LO2	
D1 Critically evaluate the topology protocol selected for a given scenario to demonstrate the efficient utilization of a networking system.		
LO3 : Design efficient networked systems		
P5 Design a networked system to meet a given specification.		
P6 Test and evaluate the design to meet the requirements and analyze user feedback.		
M3 Install and configure network services and applications on your choice.		

D2 Design a maintenance schedule to support the networked system.		
LO4 : Implement and diagnose networked systems		
P7 Implement a networked system based on a prepared design.		
P8 Document and analyze test results against expected results.		
M4 Recommend potential enhancements for the networked systems.		
D3 Use critical reflection to evaluate own work and justify valid conclusions.		