LONDON METROPOLITAN UNIVERSITY

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(इस्लिङ्टन कलेज)

Module Code & Module Title

Level 5 – Network Operating Systems

Assessment Type

Logbook 1

Semester

2023/24 Spring/Autumn

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Assignment Due Date: Tuesday, September 26, 2023

Assignment Submission Date: Tuesday, September 26, 2023

Submitted To: Dipeshor Silwal

Word Count (Where Required): 1158

I confirm that I understand my coursework needs to be submitted online via Google Classroom under the relevant module page before the deadline in order for my assignment to be accepted and marked. I am fully aware that late submissions will be treated as non-submission and a mark of zero will be awarded.

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1. INTRODUCTION

A group of computers connected digitally using a common set of communication protocols for the exchange of resources between network nodes is referred to as a computer network (BYJU'S., 2023).Computer Network enables us to share resources like printers, scanners, and other devices. Computer Network enables data transmission and enhances communication between two computers. Based on its size, a computer network can be categorized as follows:

- LAN (Local Area Network)
- PAN (Personal Area Network)
- MAN (Metropolitan Area Network)
- WAN (Wide Area Network)

A Local Area Network (LAN) is a group of computers and associated devices that links computing devices within proximity of each other by using ethernet and Wi-Fi technology (BasuMallick, 2022). LAN encompasses computers and peripherals connected to a server within distinct geographical area such as office, schools, laboratory, and home. The data transmission speed of LANs is much higher than in other types of networks. LANs consist of various components which includes desktops, laptops, servers, hardware components such as routers, switch, access points, network components like ethernet cables and fibre optic cables, as well as software and protocols which controls communication and data sharing.

Figure 1:LAN(Local Area Network) (TutorialsMate, 2023)

2. OBJECTIVE

The primary objective of this study on local area networks (LANs) are as follows:

- To provide an in-depth overview of LANs, which involves delving into their definition, their core components, and how these components function.
- To explore the various LAN topologies and its types, also highlighting the benefits and distinctive features of each.
- To not only discuss the benefits and advantages of implementing LANs but also the potential drawbacks and limitations.
- To demonstrate how LANs are used in real-world scenarios understanding its useful applications.

3. TYPES OF LAN

LANs are of different types. Below is the most popular and widely used LANs.

Based on Network Protocol

3.1. Client-Server LAN

Multiple devices (the clients) are connected to a main server in a client/server LAN. The server controls network traffic, device access, application access, and file storage. Any connected device that runs apps or accesses the Internet qualifies as a client who can use wired or wireless connections to connect to the server (Cisco Systems, 2023).

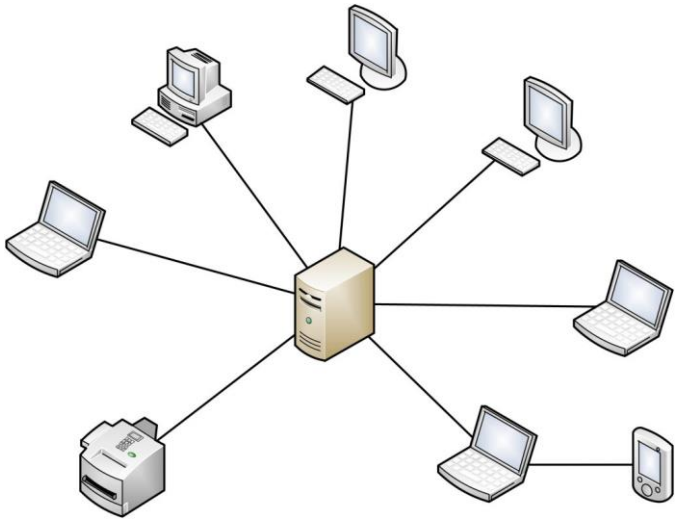

Figure 2: Client-Server LAN (HEAVY.AI, 2022)

3.2 Peer-Peer LAN

In a peer-to-peer network, all devices are equal and there is no specialized server where resources are shared among all devices, and each one can function as both a client and a server (Versitron, 2023).

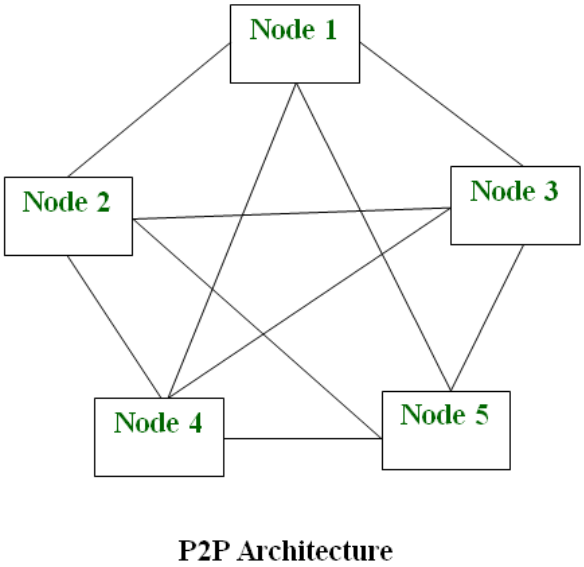

Figure 3: Peer-Peer LAN (GeeksForGeeks, 2023)

Based on physical medium

3.3. Wired LAN

Wired LAN uses physical cables like Ethernet to connect devices. Compared to wireless LANs, this sort of network LAN technology is usually faster and more dependable, but it could also be less adaptable (Versitron, 2023).

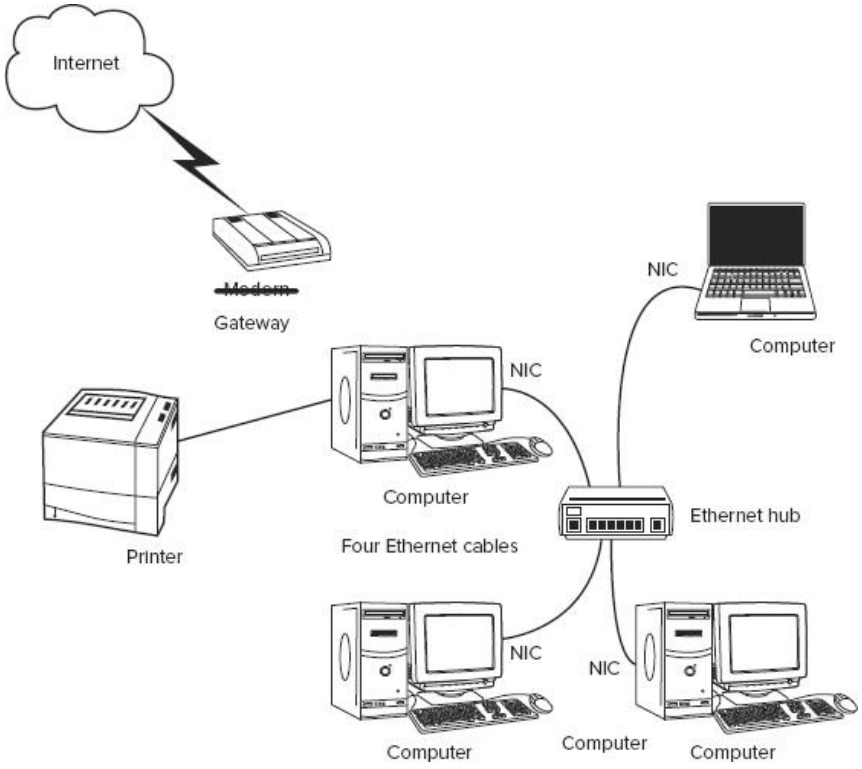

Figure 4:Wired LAN (O'Reilly Media, 2023)

3.4. Wireless LAN

Wireless LAN transmit data using radio waves which is commonly used in home environments to connect computing devices and smart appliances. It offers greater flexibility but are less reliable and slower compared to Wired LAN.

Figure 5:Wireless LAN (Wireless Excellence Limited, 2020)

4. Network Topologies

Network topology is the arrangement of a network made up of nodes and connecting lines via sender and receiver which show how devices are interconnected and information is transferred within a network (GeeksForGeeks, 2023). There are variety of logical and physical network topologies from which administrators can choose to build a secure, robust, and easily maintainable topology which are as follows:

4.1. Bus Topology

Bus Topology is designed in such a way that all the workstations are connected through a single cable known as backbone cable**.** Here, data is sent along a shared cable and only focuses on data with matching addresses.

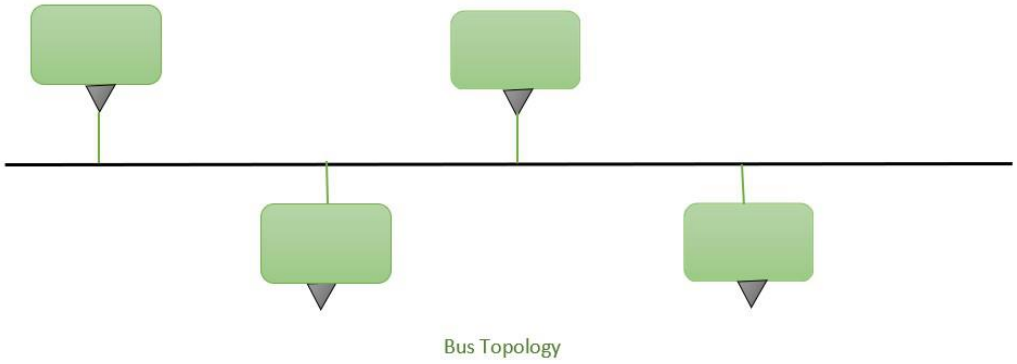

Figure 6: Bus Topology (GeeksForGeeks, 2022).

Advantages

- It is comparatively easy, scalable, and cheaper to install.

Disadvantages

- There is a chance of collision of data and if the backbone cable crashes every workstation gets crashed.
- It is less efficient and has low security.

4.2. Ring Topology

Ring topology is designed in a such a way that all the workstations are connected to form a circular loop and uses repeaters to prevent loss of data. Data travels one-way in a unidirectional ring, but it can be bidirectional with dual connections, forming a Dual Ring Topology (GeeksForGeeks, 2022).

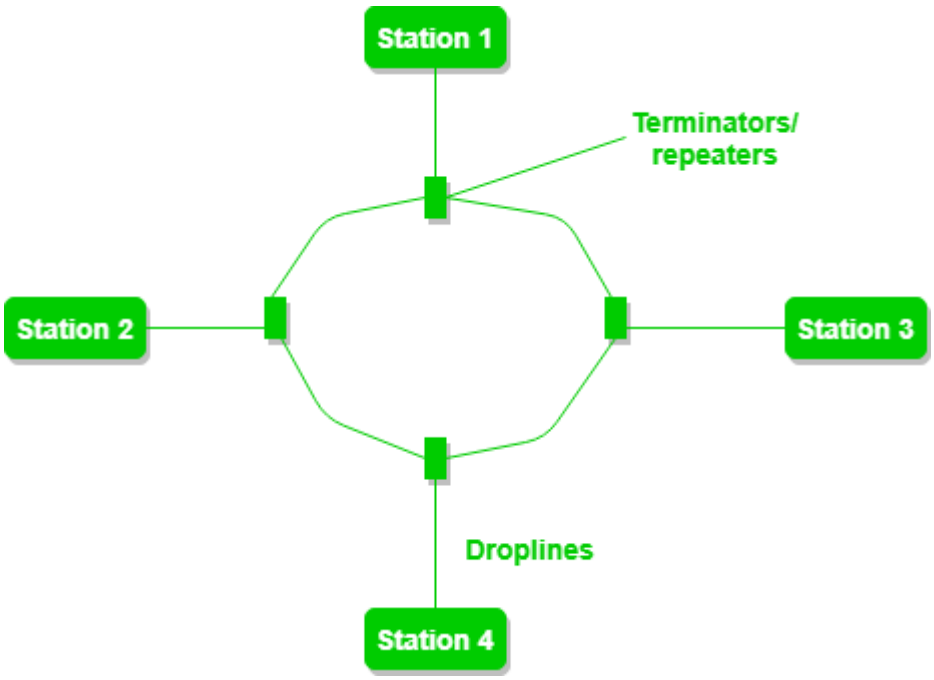

Figure 7:Ring Topology (GeeksForGeeks, 2022)

Advantages

- Each device on a network gets same access time.
- It is easy to install, cost effective and has low chance of data collision.

Disadvantages

- It is difficult to scale, and one node failure affects all the other nodes.
- It is slower than bus topology and is costly.

4.3. Star Topology

Star topology is designed in a such a way that all the workstations are connected to a centralized hub which acts as a middleware between the nodes (AfterAcademy, 2020) . Here, Data is sent to hubs and hubs sends data to intended devices.

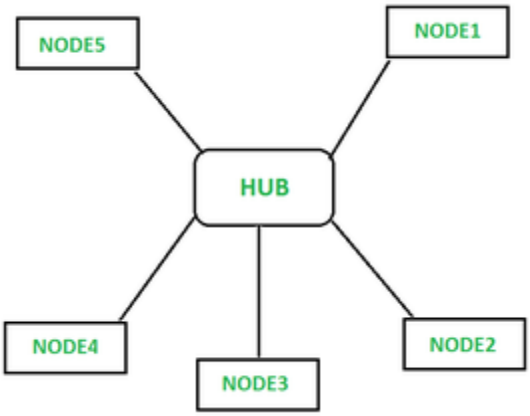

Figure 8:Star Topology (GeeksForGeeks, 2022)

Advantages

- It has centralized control, good fault tolerance and easy to scale.
- It is highly reliable, robust, and has efficient cable setup.

Disadvantages

- It has limited nodes, and if the central device fails, the network will fail.

4.4. Tree Topology

Tree topology is a combination of Bus and Star topology which is designed in a such a way that computers relate to each other in hierarchical fashion (JavaTpoint, 2021). The node which is located at the top is called root node. Here, data flows either top to bottom or bottom to top in a hierarchical form.

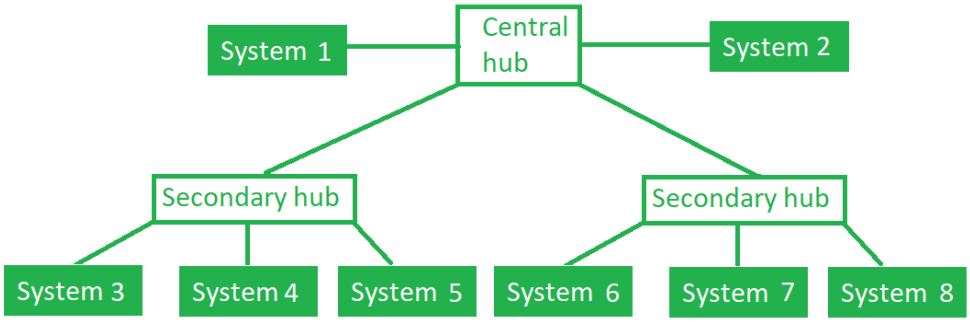

Figure 9: Tree Topology (GeeksForGeeks, 2023)

Advantages

- It covers the large distance and fault finding is easy and there is no or minimal data loss.

Disadvantages

- It is costly and high maintenance**.**

4.5. Mesh Topology

Mesh topology is designed in a such a way that all the workstations are connected to each other through various redundant connections.

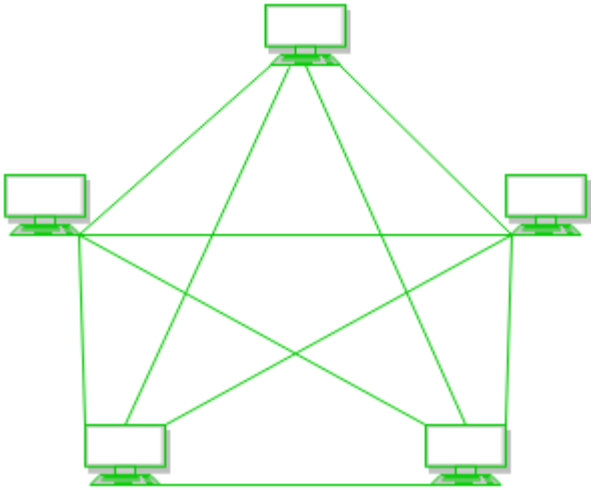

Figure 10: Mesh Topology (GeeksForGeeks, 2023)

Advantages

- It has a very fast communication and good fault tolerance due to dedicated path for each node (AfterAcademy, 2020).
- It has a good privacy and security and there are alternatives in case of node failure.

Disadvantages

- It is costly and takes large space for instalments.

5. CONCLUSION

LANs have revolutionized the way we connect and communicate in both personal and professional contexts. Some of the real-world scenario of implementing LANs are industry networks where industrial controllers, sensors and robots all are connected via LAN. Similarly, office with one thousand plus computers are all connected to each other through various switches and hubs which forms a LAN as well. Hence, LANs are the backbone of modern computing, enabling efficient data sharing, convenient communication, centralized management, and improved security. However, LANs also come with challenges which includes limited geographical coverage, weak protection of data, easy malware penetration, and need of high maintenance. LANs have not only made it easier for people to share resources and communicate locally, but they have also been crucial in connecting the world together globally. The connected and digitally driven society we live in today has greatly benefited from their continual evolution and adaptability to new technology, which has shaped the way we work, study, communicate, and innovate.

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