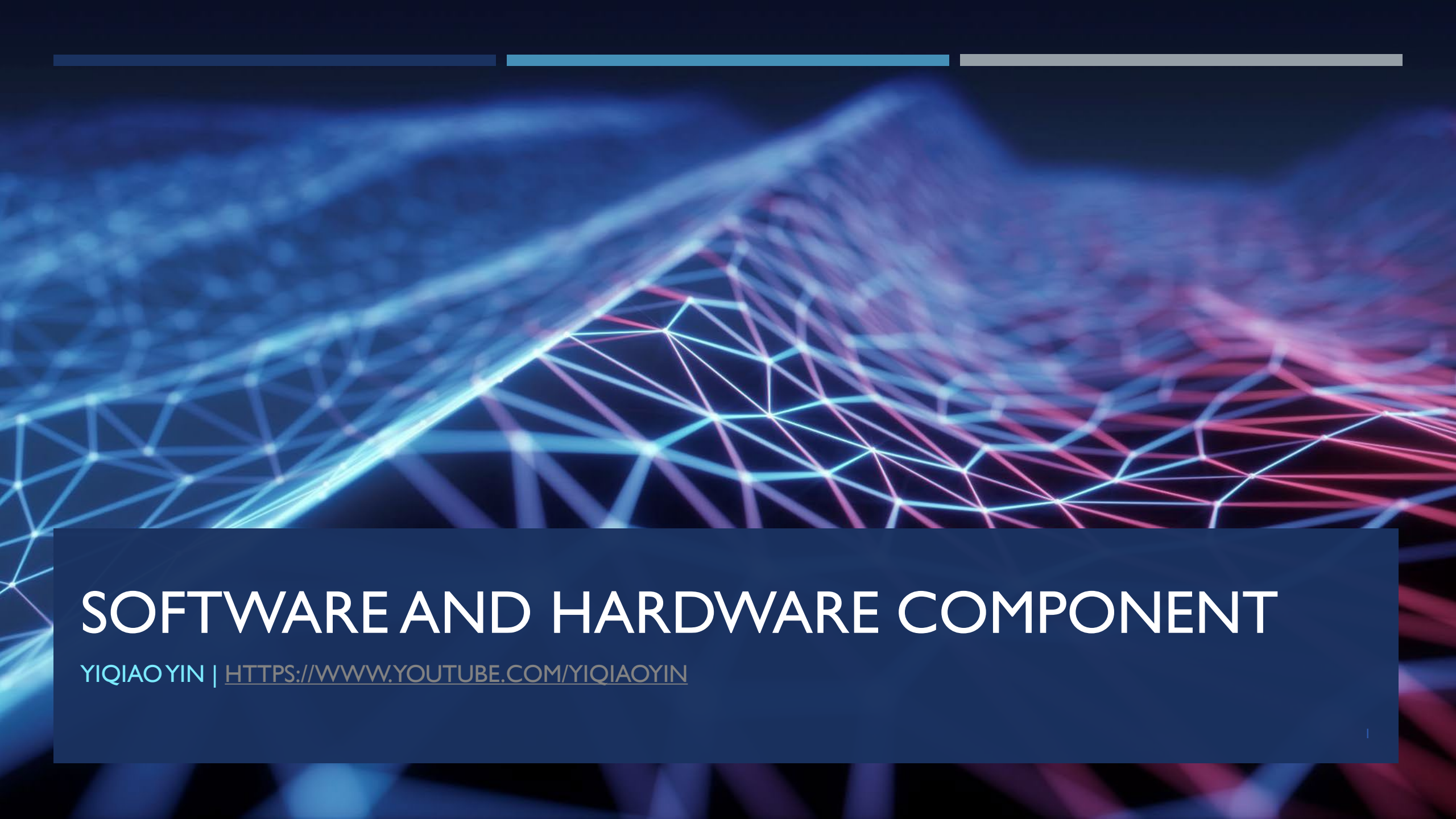


SOFTWARE AND HARDWARE COMPONENT

YIQIAO YIN | HTTPS://WWW.YOUTUBE.COM/YIQIAOYIN

INTRODUCTION

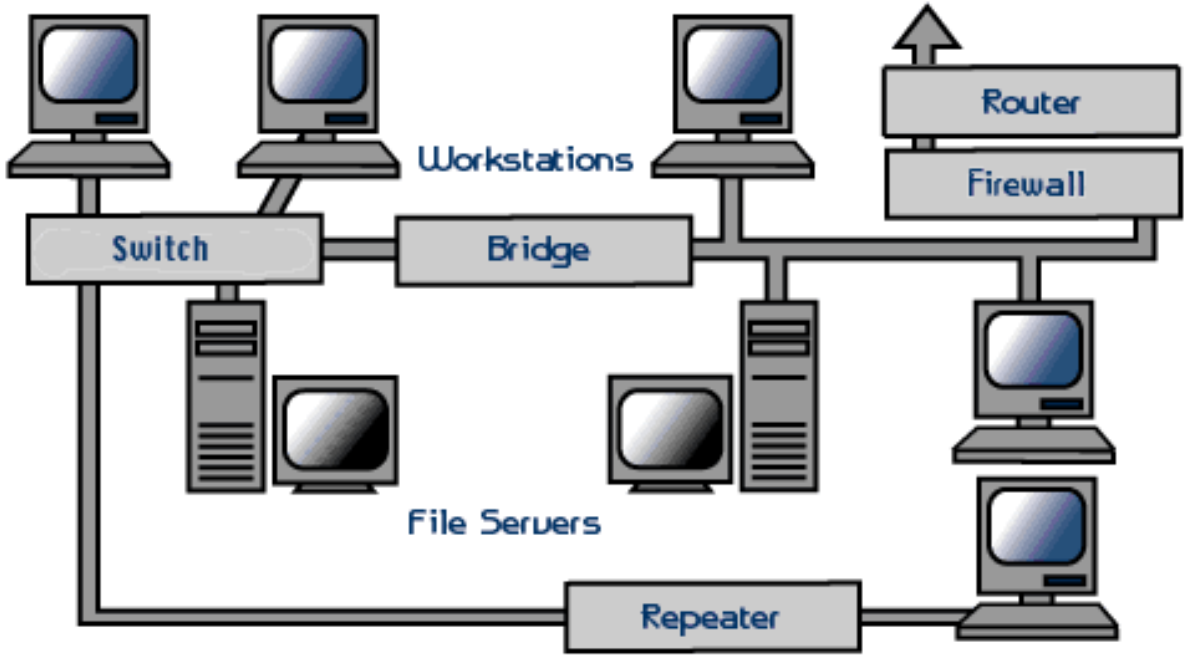
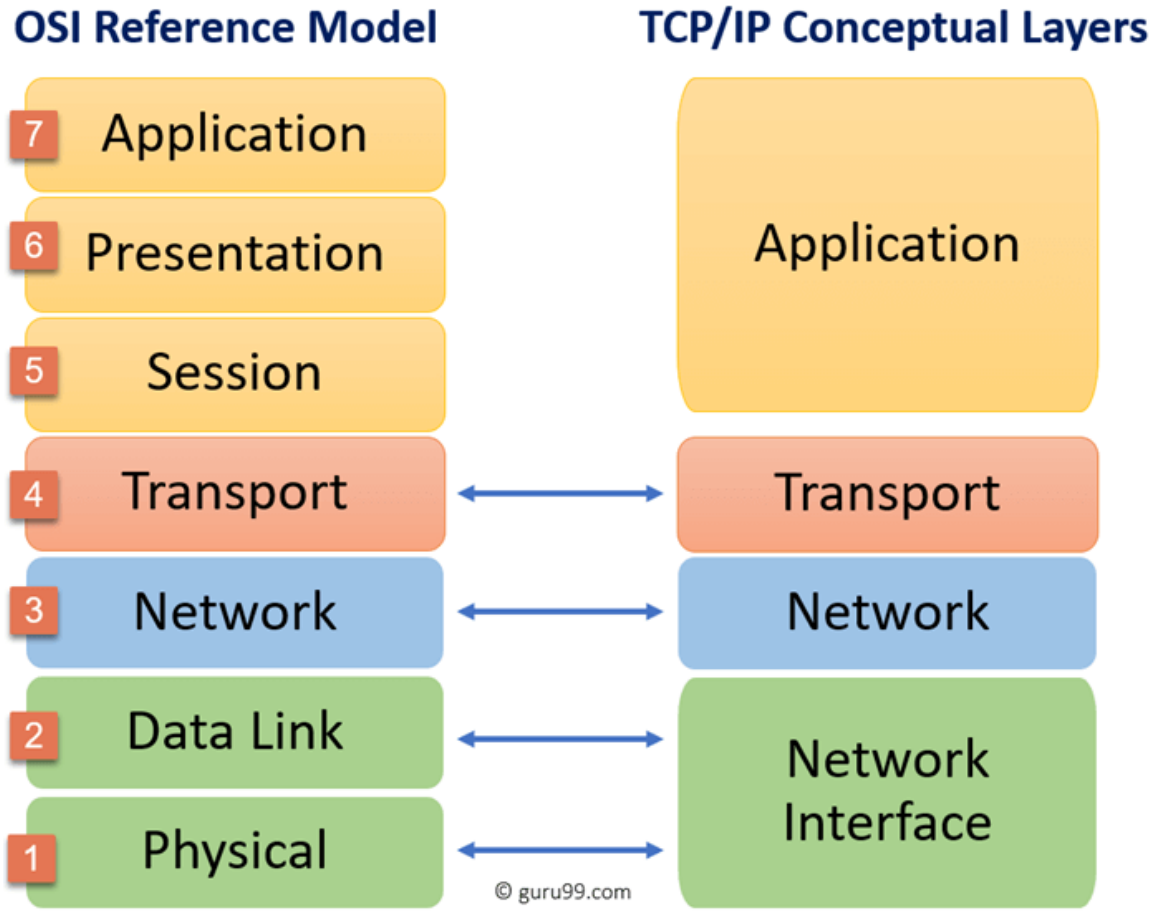


Image source: https://sites.google.com/site/itclasswebsite/home/it-systems/hardware-and-networks/networks

What is network hardware?

- Network hardware includes all the components required to process data and communicate the services from local environment to the cloud environment.
- There are the following requirements:
  - File Servers: This is the heart of a computer, which holds all the RAM and storage space.
  - Workstations: A network connected with all available users together is called a workstation.
  - Ethernet Cards: Nowadays most computers come with it although in the old days they are purchase separately. These are coaxial or pair cables that speaks with a receiver to allow internet connection.
  - Bridges: This is a device to allow users to split a large network into multiple different branches.
  - Routers: It acts as a physical bridge to translate information from one to another.
  - Cloud computing: A general term describing the system hosted services over the internet.

OSI AND TCP/IP PROTOCOL STACKS WITH EXAMPLES



TCP/IP (TCP stands for Transmission Control Protocol and IP stands for Internet Protocol) model is the central intelligence system to determine how the computer speaks with the internet. It is specially designed to provide reliable internet services.

OSI (Open System Interconnection) is the definition for logical framework to explain computer information transfer effectively. In general, OSI uses a variety of different layers.

Image source: https://www.guru99.com/difference-tcp-ip-vs-osi-model.html

MODELS (CLIENT-SERVER, PEER-TO-PEER)

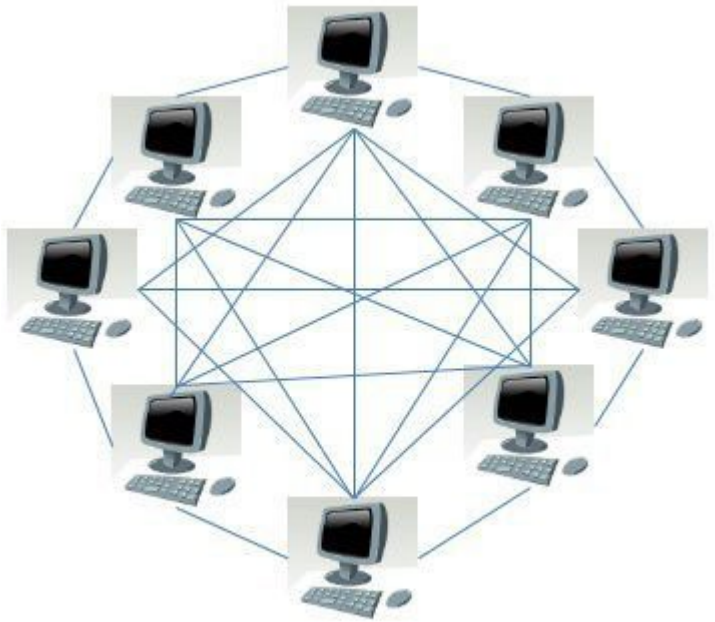
Client-Servers Network Model

Client-server has two components: client and server. A server provides centralized platform through the internet and clients request access to the server. A client can be any machine in using the internet to access the server.

The system administrator is authorized to manage data on the server for the clients. With proper security approved, clients can access the data upon requests. In scenarios when the proper security is not allowed, the server will send back an alert to tell the clients that such request is not allowed.

Image source: https://techdifferences.com/difference-between-client-server-and-peer-to-peer-network.html

MODELS (CLIENT-SERVER, PEER-TO-PEER)



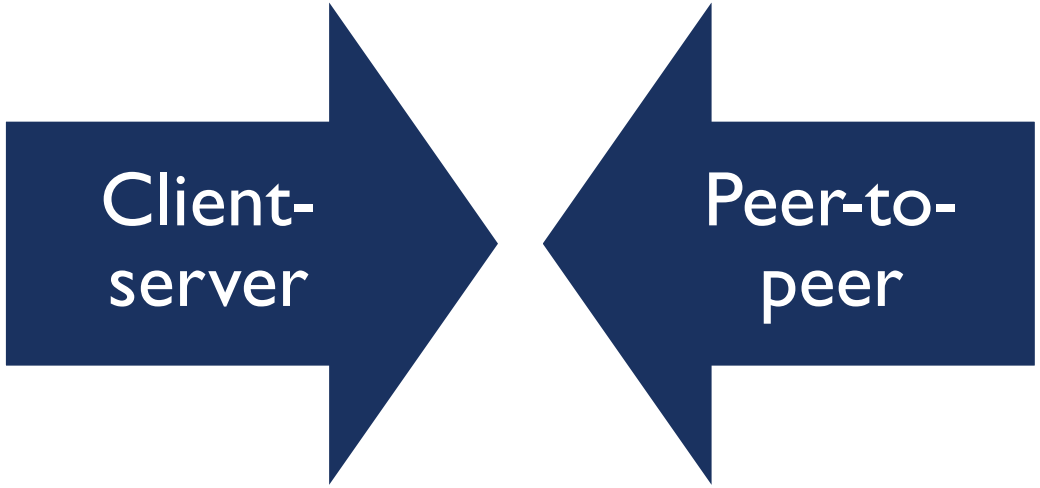
Peer-to-Peer Network Model

Peer-to-peer (P2P) is commonly used in school or organizations where users are using nodes to access services.

A registration protocol is required when a node first joins the network model. The model broadcast services and data across the network and the nodes access these data upon will with the proper authorization. Each node can then have its own data and applications.

Image source: https://techdifferences.com/difference-between-client-server-and-peer-to-peer-network.html

MODELS (CLIENT-SERVER, PEER-TO-PEER)



Client-server and Peer-to-peer (P2P) are two popular computer network models that are used in every day's life. Client-server has data management platform centralized whereas P2P has data platform set up for each user.

Regarding the service side, client-server is tailored on an individual level whereas P2P provides nodes that can provide services upon requests.

Since client-server is centralized, data is also centralized. However, P2P is set up with many nodes and hence each node has its own data.

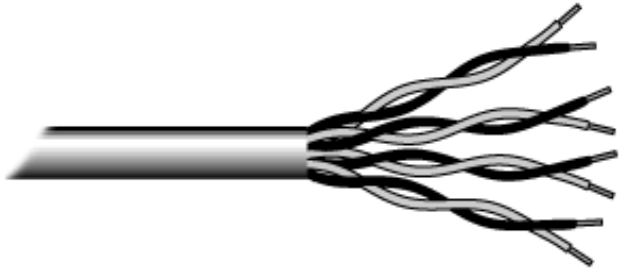
Image source: https://techdifferences.com/difference-between-client-server-and-peer-to-peer-network.html

MEDIA (CABLING, WIRELESS)

Information needs to move from one network to another and this is where cabling appears.

A concept might be familiar is called LAN and it stands for "local area network" which refers to network connection that is limited to certain local areas such as offices, schools, buildings, and so on.

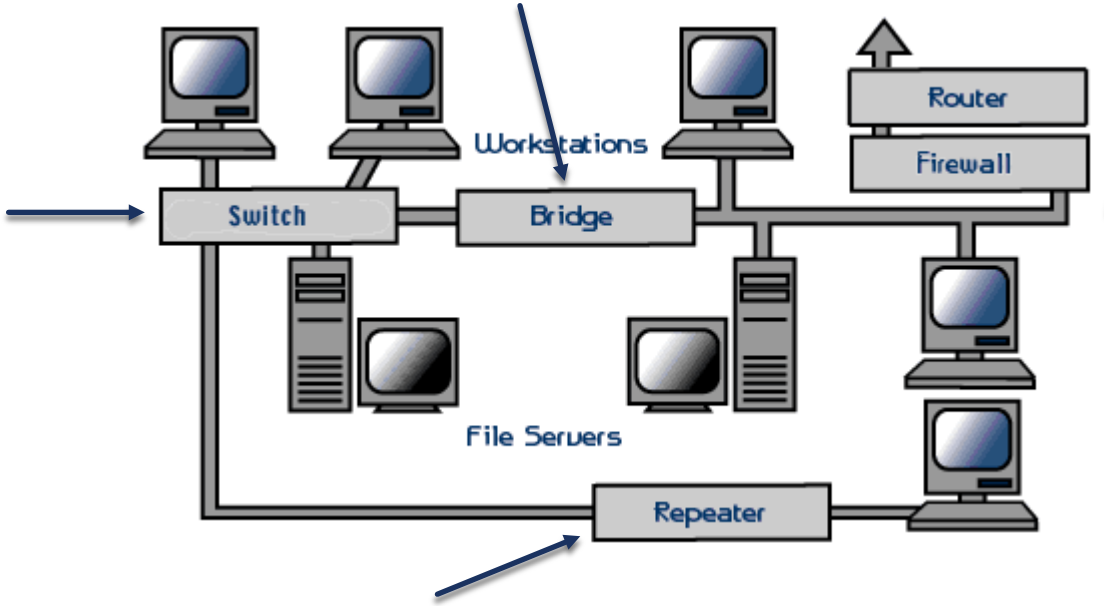
Though unpopular right now, LAN forms the foundations of ethernet to allow users to have wired internet connection.



DEVICES (ROUTERS, BRIDGES, HUBS, REPEATERS, GATEWAYS, SWITCHES) WITH ASSOCIATED OSI LAYER

Bridge allows users to establish segmentation of a large volume of network into multiple segments.

A switch controls the central connection for cables from workstations.

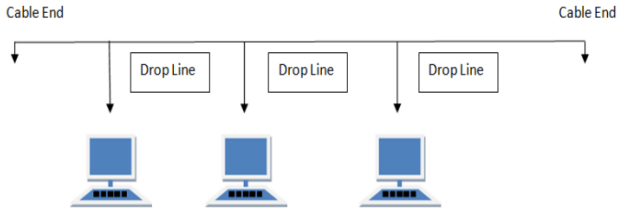


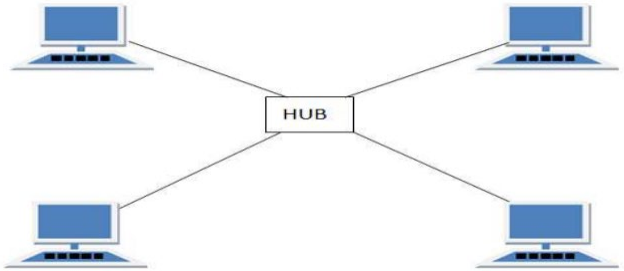
Router directs the traffic of the global internet and allow stream of data to be appropriately transferred as internet signals.

Firewall is installed at the entrance of LAN, which here is the location of the router. It provides separation of private and public network.

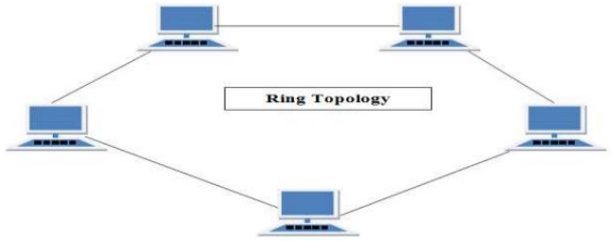
A repeater boosts the signals to strengthen what is lost during data transferring. The signal is electronically amplified.

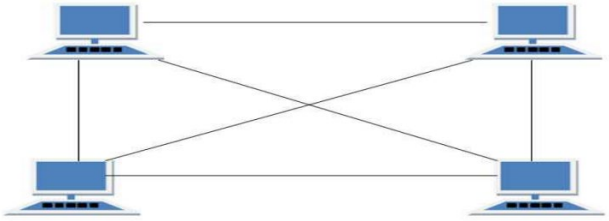
NETWORK TOPOLOGIES AND THEIR ADVANTAGES/DISADVANTAGES

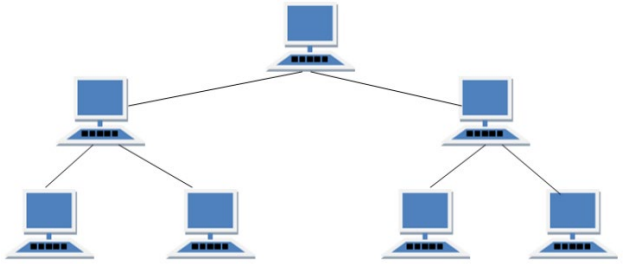




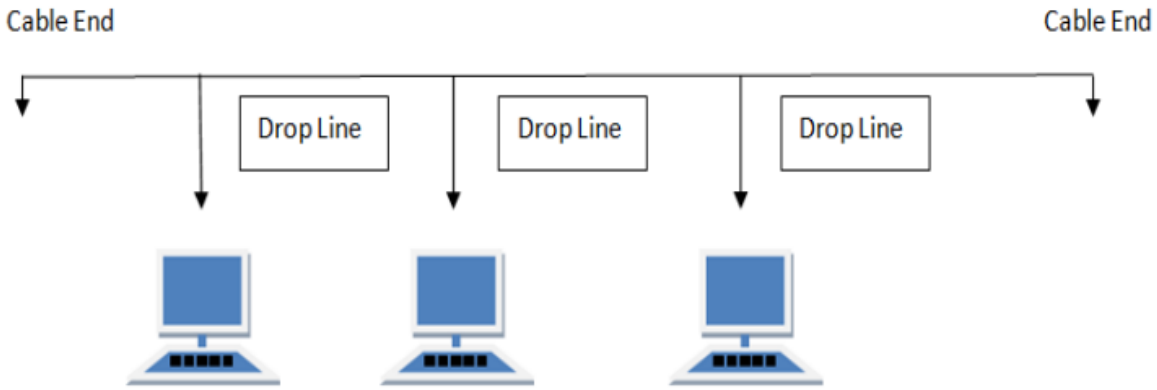
A computer network links more than one users need to have certain network topology defined. Many basic types are worth our notices.







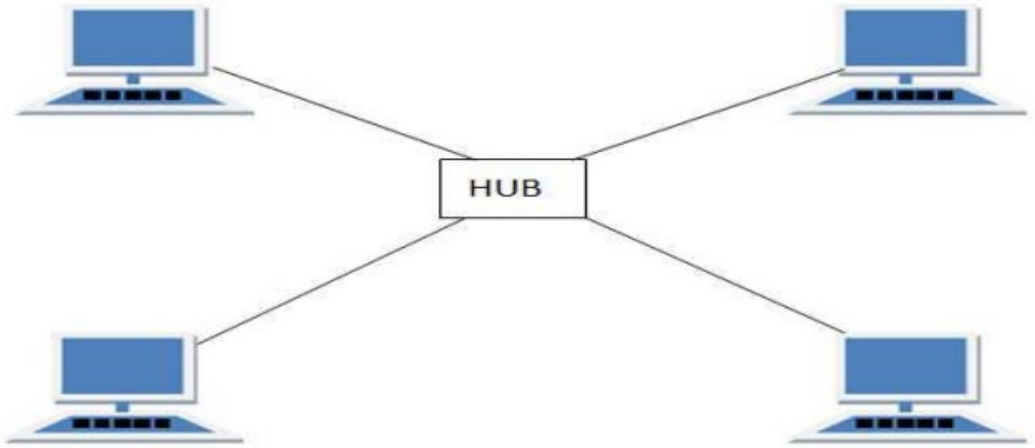
NETWORK TOPOLOGIES AND THEIR ADVANTAGES/DISADVANTAGES



The most foundational structure is the "bus topology". There is one main cable from the beginning to the end where each machine is dropped out as a branch.

It's easy to implement but it can be extremely slow.

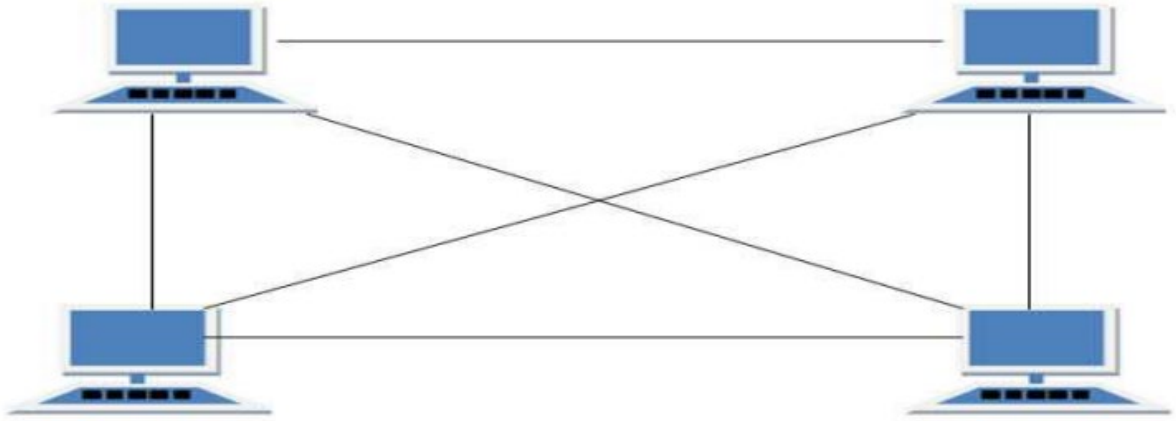
NETWORK TOPOLOGIES AND THEIR ADVANTAGES/DISADVANTAGES



To allow direct data traffic between the hub and the machine, a "star topology" is proposed to handle this structure.

Due to the one-to-one connection, it's easy to diagnosis errors and bugs. However, each node is expensive to install.

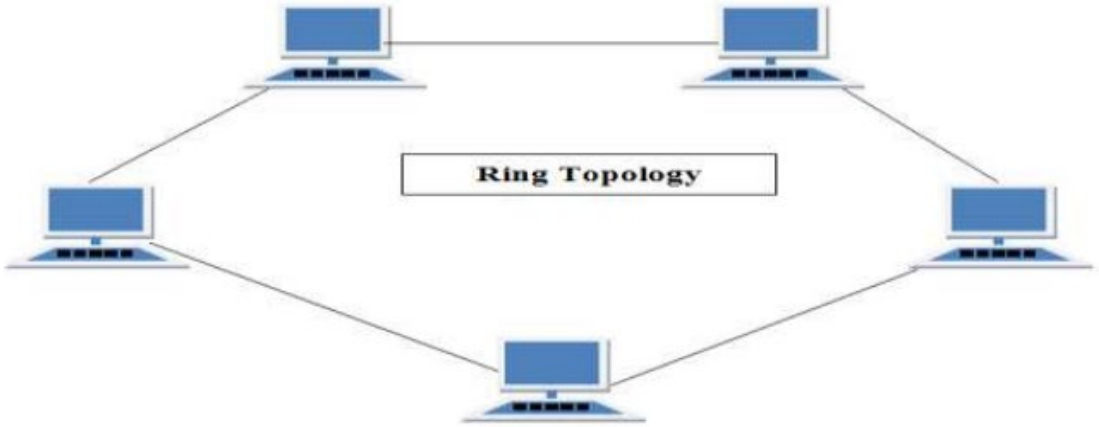
NETWORK TOPOLOGIES AND THEIR ADVANTAGES/DISADVANTAGES



The third candidate is the "mesh topology" which links one machine with another.

For small group of nodes, the system can be work well and diagnosis of faulty system is also operational. However, the cabling cost is high.

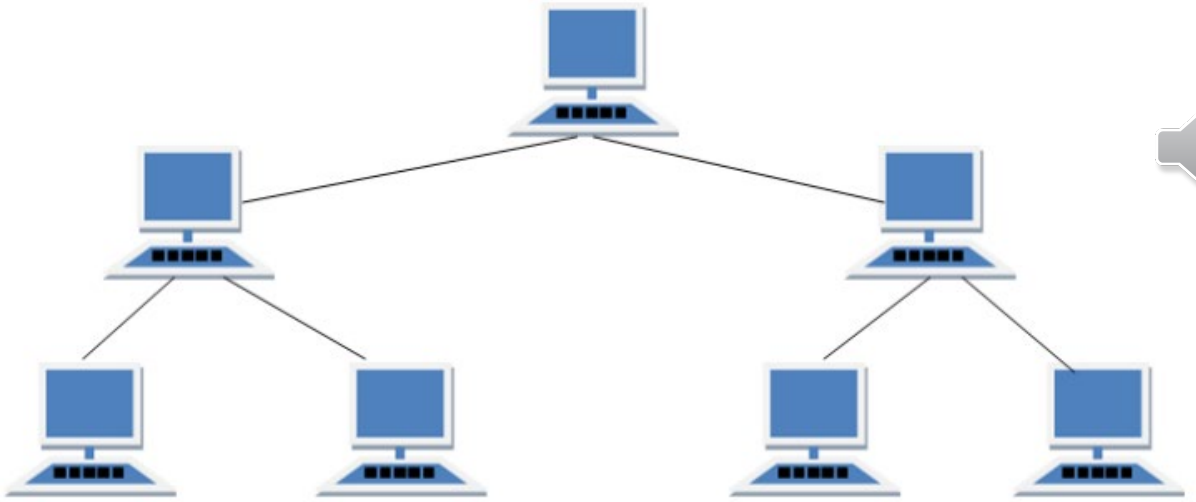
NETWORK TOPOLOGIES AND THEIR ADVANTAGES/DISADVANTAGES



The third candidate is the "ring topology" which links one machine with another.

For small group of nodes, the system can be high performance and efficient. However, an error in one machine or a removal of a machine can cause the entire system to malfunction.

NETWORK TOPOLOGIES AND THEIR ADVANTAGES/DISADVANTAGES



A hierarchical platform can be another famous contender which is called “tree topology”.

The system works efficiently and diagnosis well. However, the cable cost is extremely high.

NETWORK TOPOLOGIES AND THEIR ADVANTAGES/DISADVANTAGES

Parameters	BUS	STAR	RING	MESH	TREE
Installation	easy	easy	difficult	difficult	easy
Cost	inexpensive	expensive	moderate	expensive	less
Flexible	yes	yes	no	no	yes
Reliability	moderate	high	high	high	moderate
Extension	easy	easy	easy	poor	easy
Robust	no	yes	no	yes	no

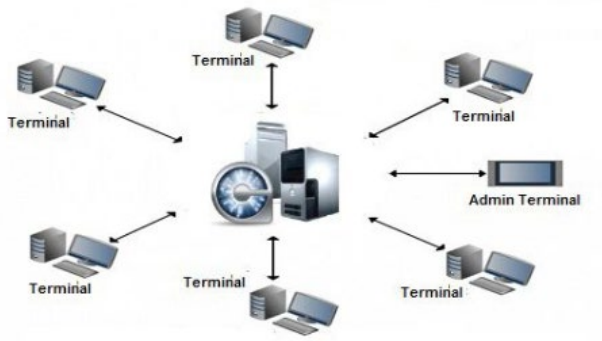
Source of the table: Bisht (2015)

NETWORK OPERATING SYSTEM

Network Operating System (NOS) is an operating system designed to support the database management, computation, workstations, application support and so on.

Some of the popular features support protocols, network IDs, firewalls, multiprocessing computation, and so on.

The common tasks involved with NOS is designed to allow user and administrators to carry on a variety of different tasks from opening a window, drawing a graph on plot, opening a document, going on internet and so on.



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