BCA SEMESTER - II

0302203
HISTORY OF COMPUTING

UNIT – 4
HISTORY OF NETWORKING

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Index

Index

- History of Databases
  - Introduction
  - Hierarchical and Network Models
  - The Relational Model
  - SQL
  - Oracle Database

History of Networking

- A computer network is a group of computers that has the potential to transmit, receive and exchange voice, data, and video traffic.
- A network connection can be set up with the help of either cable or wireless media.
- In modern times, computer networks are very important as information technology is increasing rapidly all over the world.
- The network and data communication are the essential factors to rise information technology in the world as technology's advancement is on the system, including the gadgets.
- ARPANET began the networking long ago.

History of Networking

- In 1957, when SPUTNIK Satellite was launched by Russia.
- An agency named ADVANCED RESEARCH PROJECT AGENCY (ARPA) was started by American, and its first satellite was launched within 18 months after establishment.
- Then they used ARPANET to share the information on another computer.
- America's Dr. LIED LIEDER has this all responsibility.
- Then, ARPANET came to India in 1969, and its name changed from Indian to NETWORK.

History of Networking

- For the United States Department of Defense, the funding of the design of the Advanced Research Projects
- Agency Network (ARPANET) was began by ARPA. In 1969, the network began to develop on the basis of the developed designs in the 1960s.

Single Machines

- The computers of the 1950s large, bulky, and expensive were intended for a small number of privileged users.
- Quite often, these monstrous constructions occupied entire buildings.
- Such computers were not able to serve users interactively.
- Instead, they batched jobs and delivered results later.

Single Machines

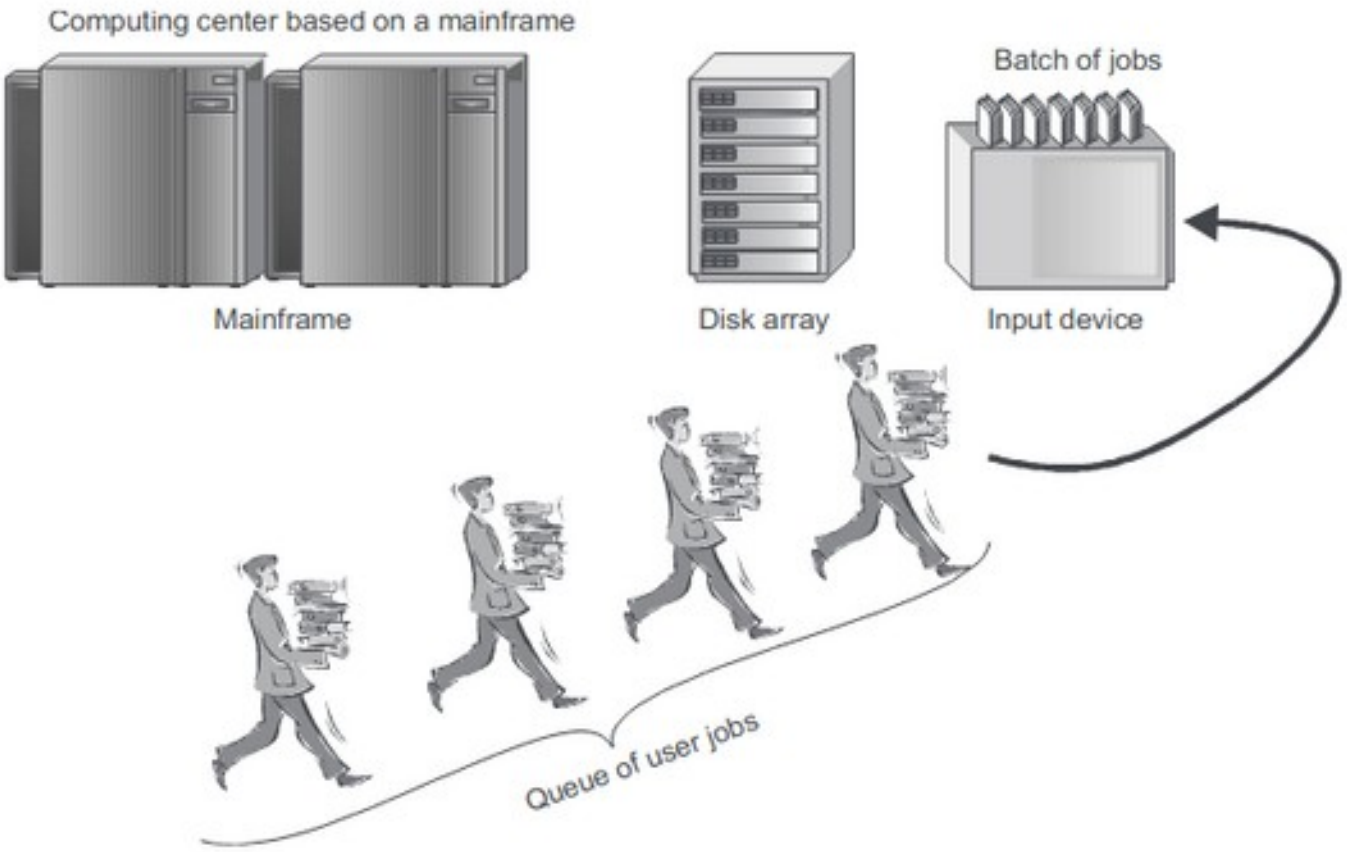


Figure 1.2 Centralized system based on a mainframe

Single Machines

- Batch-processing systems were usually based on mainframes and were powerful and reliable universal computers.
- Users would prepare punched cards containing data and program code and then would transfer these cards to the computing center.
- Operators would enter these cards into the computer, and users would receive the results a day later in the form of a printout.
- Thus, a single punch card containing an error would mean a delay of at least 24 hours.
- Obviously, from the end users point of view, an interactive mode of operating that allows them to manage the processing of their data on the fly from the terminal is more convenient.
- The interests of end users were substantially neglected at the earliest stages of the evolution of computing systems.
- The efficiency of the operation of the most expensive component of a computer the processor was regarded as of paramount importance, even at the expense of the user productivity.

Multiterminal Systems: Prototype of the Computer Network

- As processors became cheaper in the early 1960s, new methods of organizing computer processing appeared.
- These methods provided the possibility of taking end-user convenience into account.
- Thus, multiterminal systems evolved.
- In such time-sharing systems, the computer was at the disposal of several users.
- Users had their own terminals from which they could communicate with the computer.
- The response time of the computing system was short enough to mask that the computer served multiple users in parallel.

Multiterminal Systems: Prototype of the Computer Network

- Terminals moved out of computing centers and onto desktops over entire organizations.
- Although processing power remained fully centralized, some functions, such as data input and output, became distributed.
- Such centralized, multiterminal systems looked similar to Local Area Networks (LANs).
- End users perceived working at the terminal practically the same way that most people now view working at a PC connected to a network.
- The user could access shared files and peripheral devices and maintain the illusion of using the computer in an exclusive mode, since the user could start any required program at any moment and receive the results almost immediately.

Multiterminal Systems: Prototype of the Computer Network

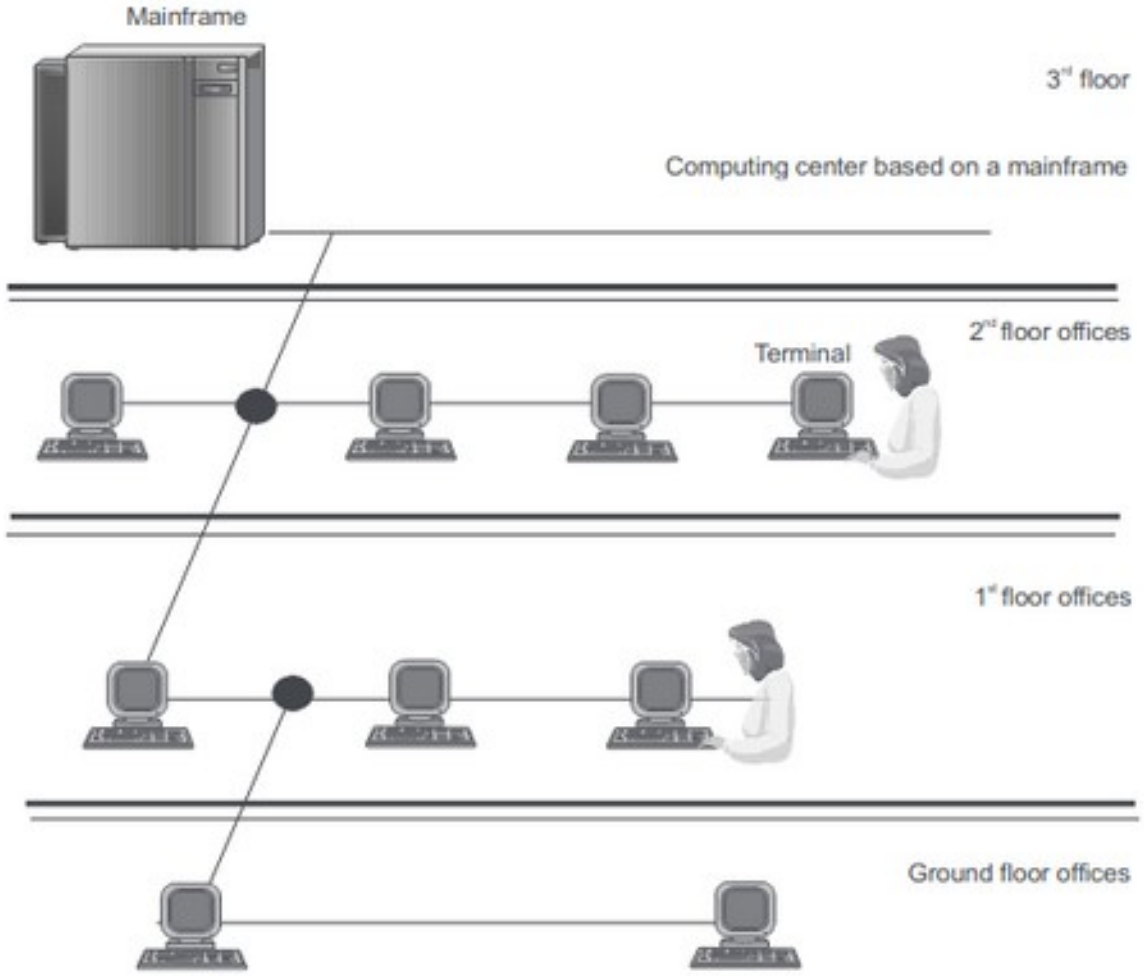


Figure 1.3 Multiterminal system as a prototype of a computer network

Multiterminal Systems: Prototype of the Computer Network

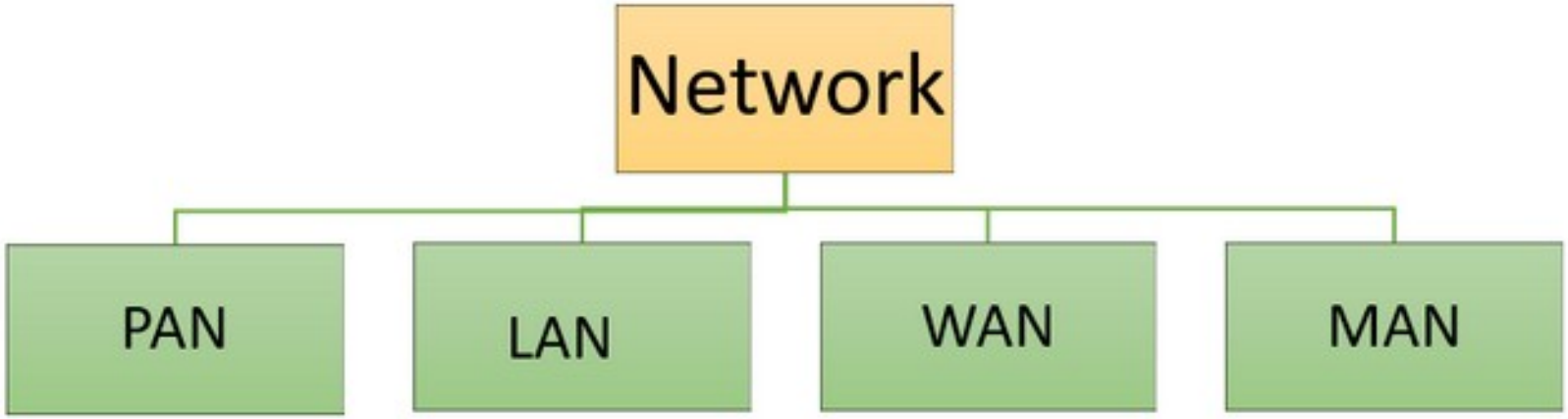
- However, the evolution still had a long way to go before LANs appeared, because multi-terminal systems retained the essential features of centralized data processing despite superficial resemblance to distributed systems.

Network

- There are various types of Computer Networking options available.
- The classification of network in computers can be done according to their size as well as their purpose.
- The size of a network should be expressed by the geographic area and number of computers, which are a part of their networks.
- It includes devices housed in a single room to millions of devices spread across the world.

Network

- Following are the popular types of Computer Network:



What is PAN (Personal Area Network)?

- PAN (Personal Area Network) is a computer network formed around a person. It generally consists of a computer, mobile, or personal digital assistant.
- PAN can be used for establishing communication among these personal devices for connecting to a digital network and the internet.

- Characteristics of PAN
  - It is mostly personal devices network equipped within a limited area.
  - Allows you to handle the interconnection of IT devices at the surrounding of a single user.
  - PAN includes mobile devices, tablet, and laptop.
  - It can be wirelessly connected to the internet called WPAN.
  - Appliances use for PAN: cordless mice, keyboards, and Bluetooth system.

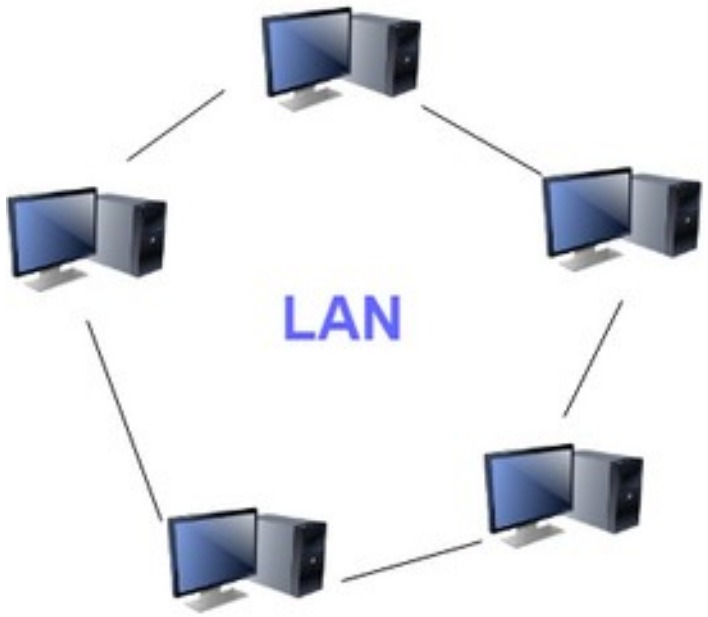
What is a LAN (Local Area Network)?

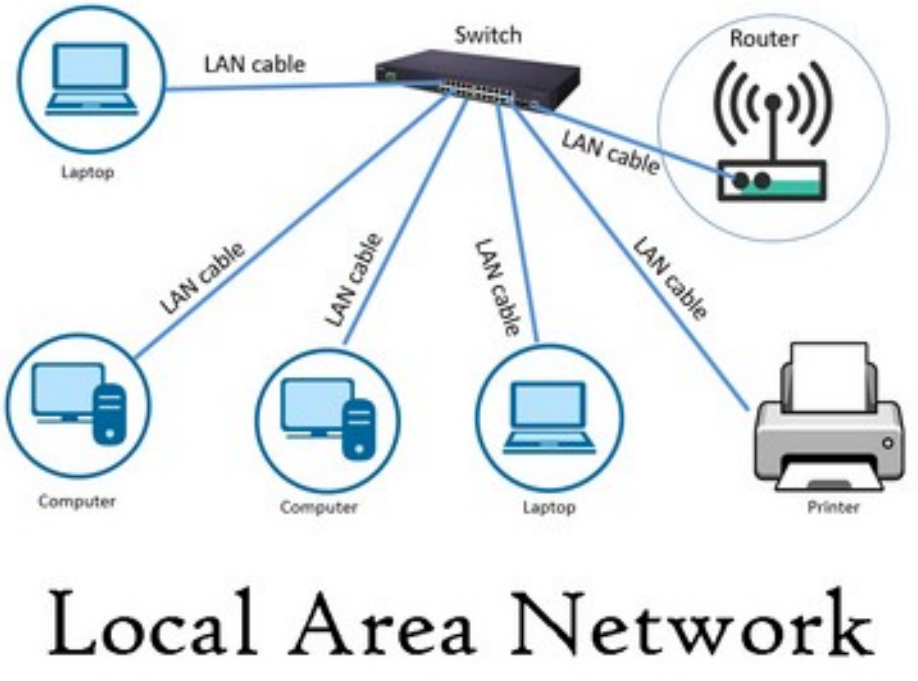
- A Local Area Network (LAN) is a group of computer and peripheral devices which are connected in a limited area such as school, laboratory, home, and office building.
- It is a widely useful network for sharing resources like files, printers, games, and other application.
- The simplest type of LAN network is to connect computers and a printer in someone’s home or office.
- In general, LAN will be used as one type of transmission medium. It is a network which consists of less than 5000 interconnected devices across several buildings.

What is a LAN (Local Area Network)?

- Characteristics of LAN
  - It is a private network, so an outside regulatory body never controls it.
  - LAN operates at a relatively higher speed compared to other WAN systems.
  - There are various kinds of media access control methods like token ring and ethernet.

What is a LAN (Local Area Network)?

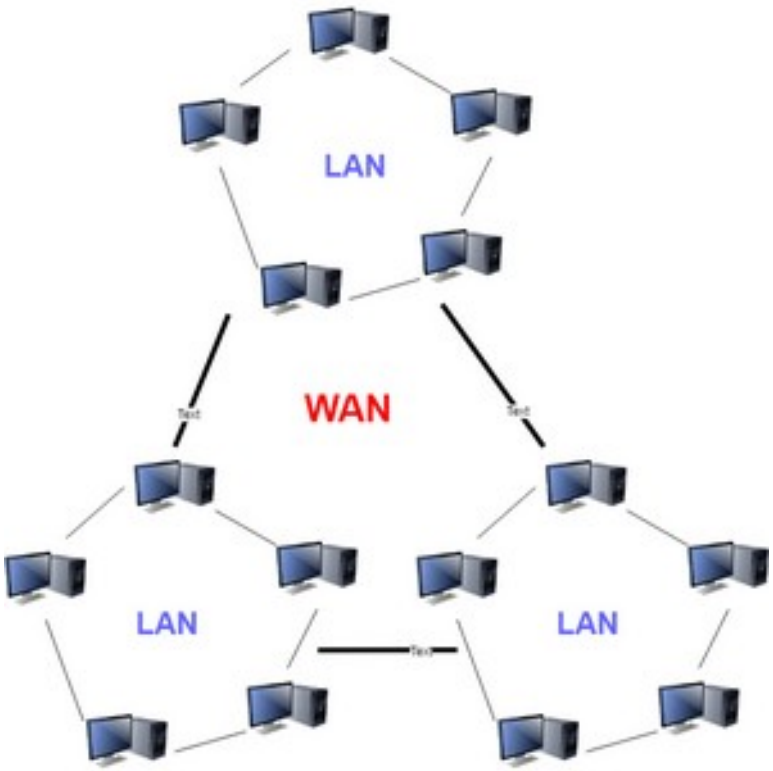


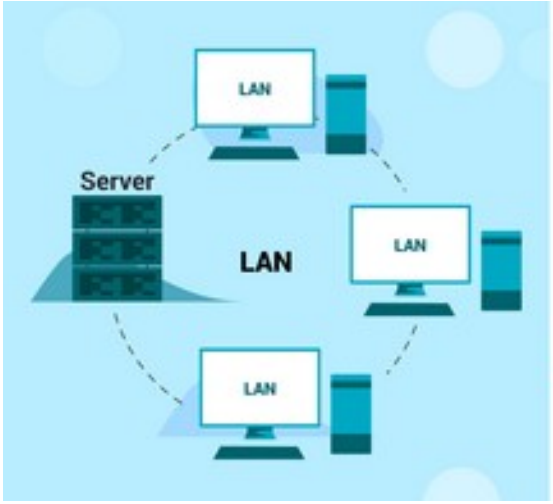


What is WAN (Wide Area Network)?

- WAN (Wide Area Network) is another important computer network that which is spread across a large geographical area.
- WAN network system could be a connection of a LAN which connects with other LAN's using telephone lines and radio waves.
- It is mostly limited to an enterprise or an organization.
- Characteristics of WAN
  - The software files will be shared among all the users; therefore, all can access to the latest files.
  - Any organization can form its global integrated network using WAN.

What is WAN (Wide Area Network)?

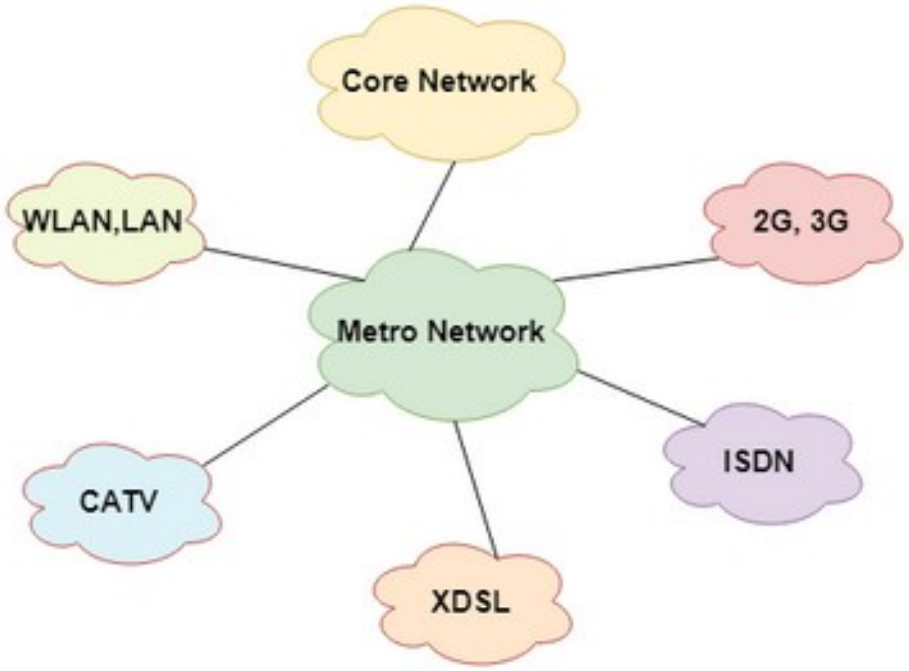


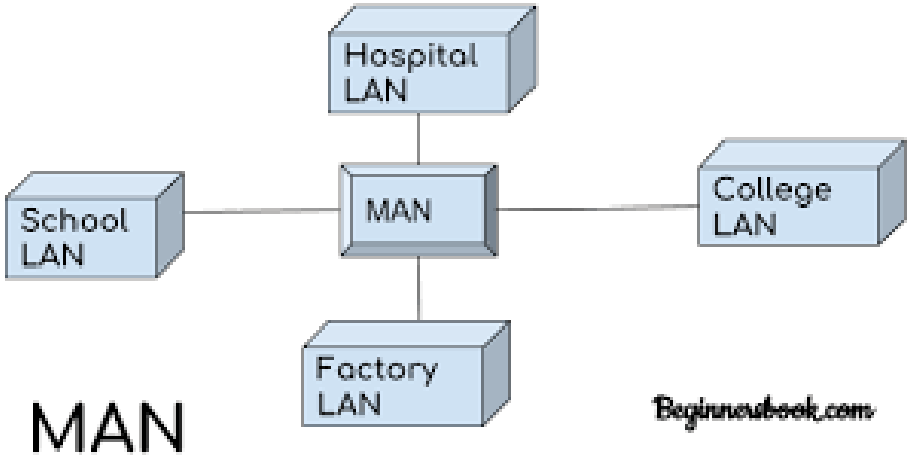


What is MAN (Metropolitan Area Network)?

- A Metropolitan Area Network or MAN is consisting of a computer network across an entire city, college campus, or a small region.
- This type of network is large than a LAN, which is mostly limited to a single building or site.
- Depending upon the type of configuration, this type of network allows you to cover an area from several miles to tens of miles.
- Characteristics of MAN
  - It mostly covers towns and cities in a maximum 50 km range
  - Mostly used medium is optical fibers, cables
  - Data rates adequate for distributed computing applications.

What is MAN (Metropolitan Area Network)?

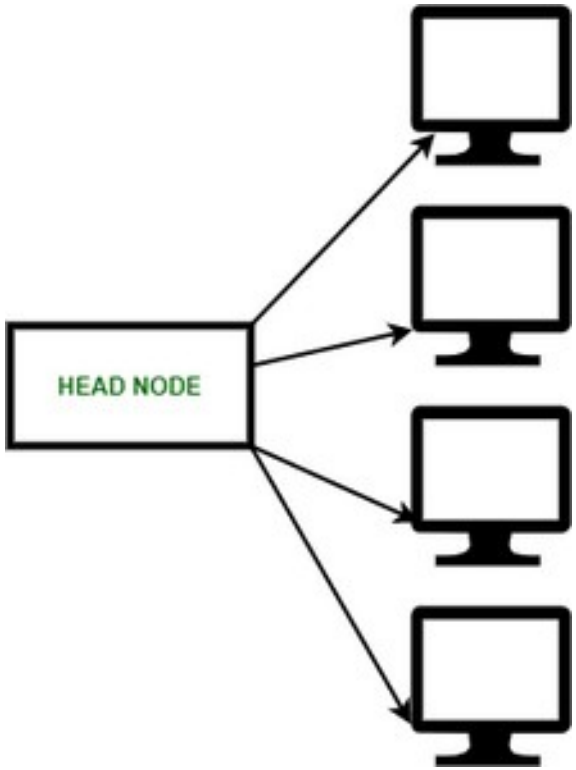


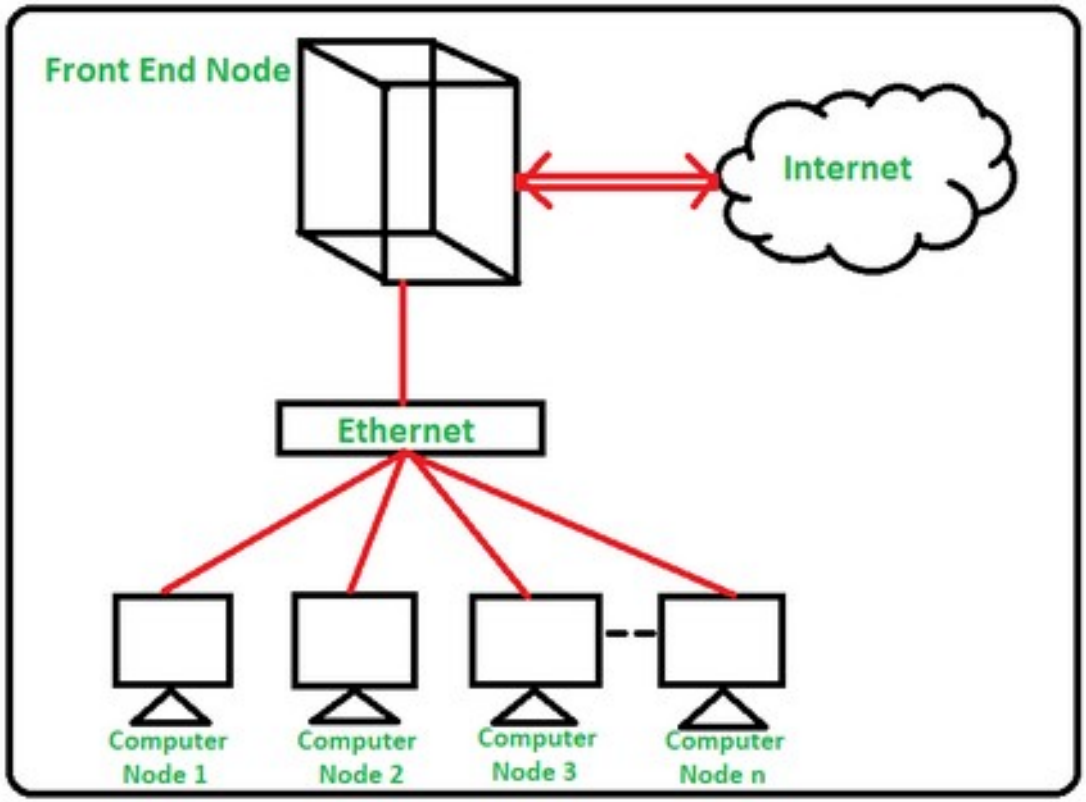


Clustering

- Cluster computing is a collection of tightly or loosely connected computers that work together so that they act as a single entity.
- The connected computers execute operations all together thus creating the idea of a single system.
- The clusters are generally connected through fast local area networks (LANs)

Clustering


HEAD NODE


Front End Node
Internet
Ethernet
Computer Node 1
Computer Node 2
Computer Node 3
Computer Node n

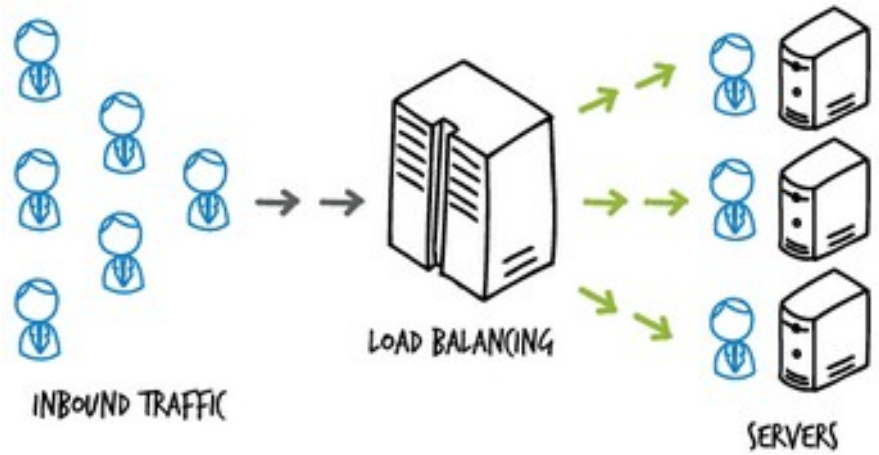
Why is Cluster Computing important?

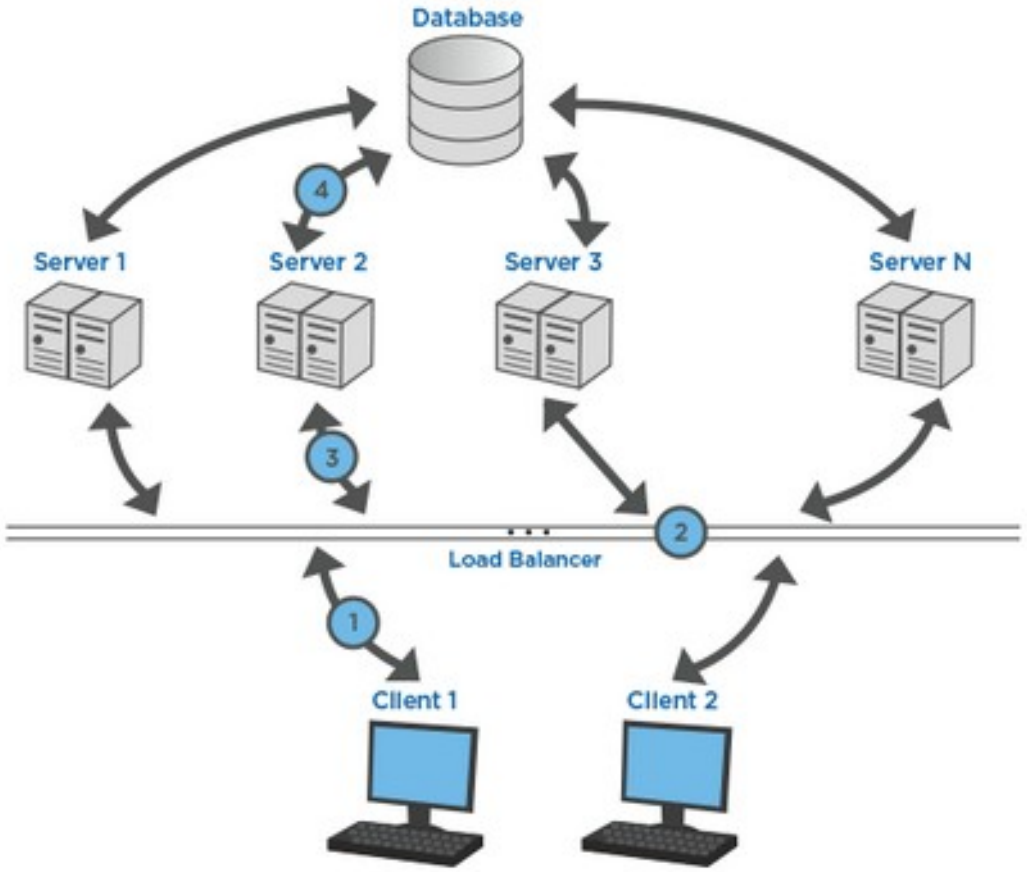
- Cluster computing gives a relatively inexpensive, unconventional to the large server or mainframe computer solutions.
- It resolves the demand for content criticality and process services in a faster way.
- Many organizations and IT companies are implementing cluster computing to augment their scalability, availability, processing speed and resource management at economic prices.
- It ensures that computational power is always available.
- It provides a single general strategy for the implementation and application of parallel high-performance systems independent of certain hardware vendors and their product decisions.

Load Balancing

- Load balancing refers to efficiently distributing incoming network traffic across a group of backend servers, also known as a server farm or server pool.
- Modern high-traffic websites must serve hundreds of thousands, if not millions, of concurrent requests from users or clients and return the correct text, images, video, or application data, all in a fast and reliable manner.
- To cost-effectively scale to meet these high volumes, modern computing best practice generally requires adding more servers.
- A load balancer acts as the “traffic cop” sitting in front of your servers and routing client requests across all servers capable of fulfilling those requests in a manner that maximizes speed and capacity utilization and ensures that no one server is overworked, which could degrade performance.
- If a single server goes down, the load balancer redirects traffic to the remaining online servers.

Load Balancing





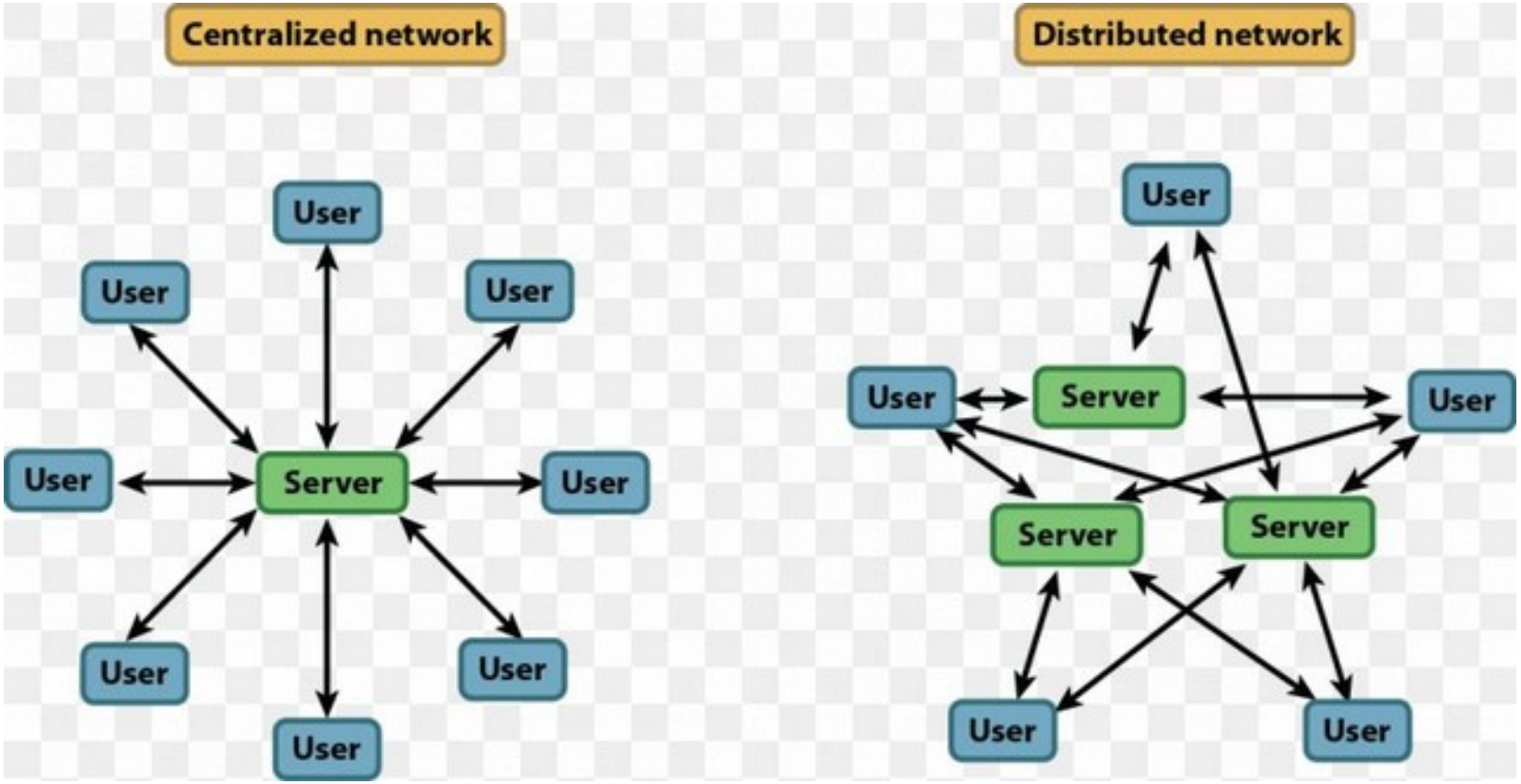
Distributed Systems

- A distributed network is a type of computer network that is spread over different networks.
- This provides a single data communication network, which can be managed jointly or separately by each network.
- Besides shared communication within the network, a distributed network often also distributes processing.
- These devices split up the work, coordinating their efforts to complete the job more efficiently than if a single device had been responsible for the task.

Distributed Systems

- Distributed computing is a field of computer science that studies distributed systems.
- A distributed system is a system whose components are located on different networked computers, which communicate and coordinate their actions by passing messages to one another from any system.

Distributed Systems



Interface Message Processor - IMP Protocols

- The interface message processor (IMP) was the first packet-router.
- It was part of the ARPANET, the the precursor to today's Internet.
- IMPs monitored network status and gathered statistics.
- They were also the heart of the ARPANET from its launch until it was decommissioned in 1989.
- They also represent the first generation of the gateways that are now known as routers.

Interface Message Processor - IMP Protocols

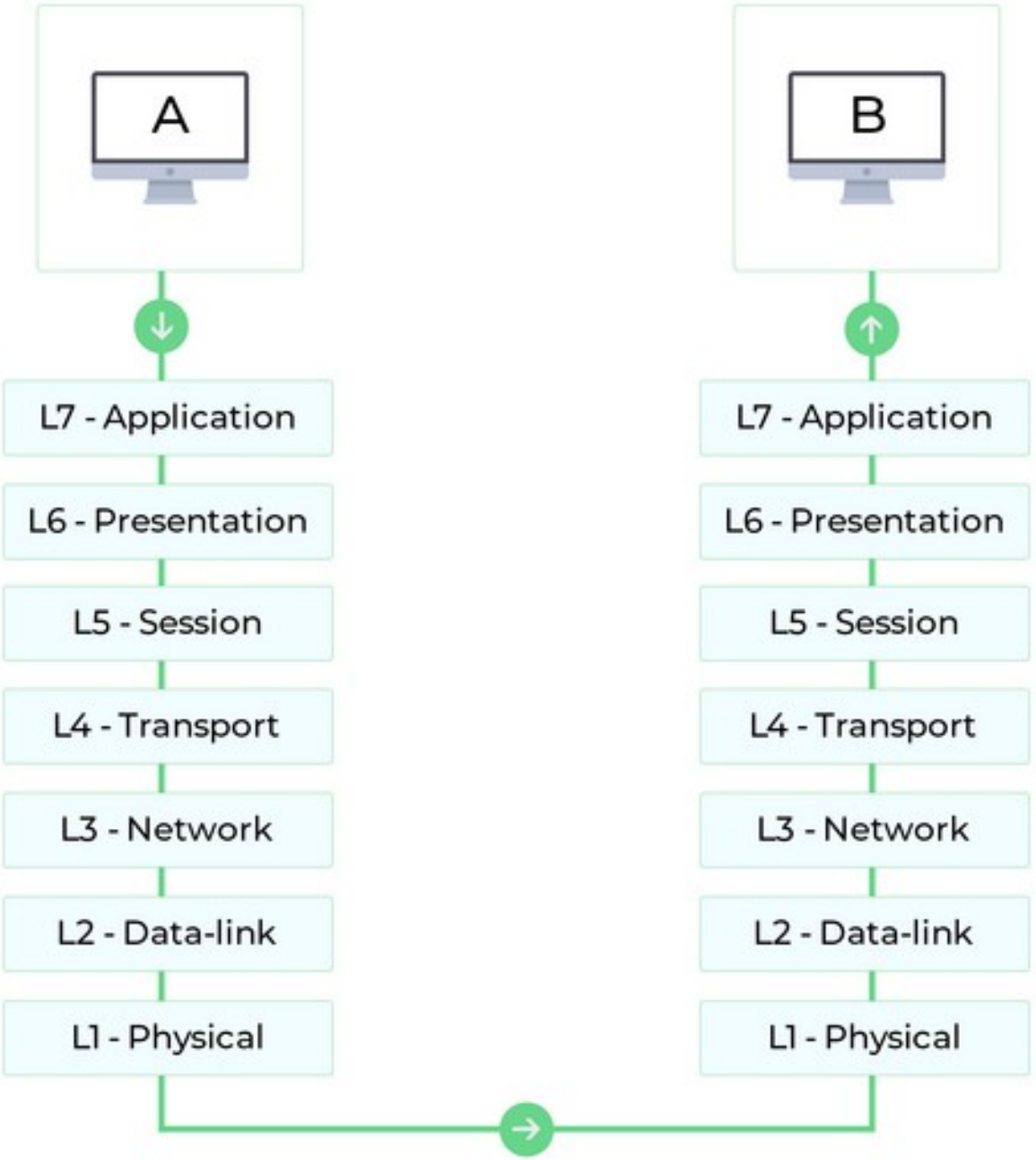
- A contract for the development of IMP was awarded to consulting company Bolt Baranek and Newman in 1968.
- What they developed essentially consisted of long-distance leased telephone circuits between pairs of IMPs.
- Host computers were connected to the IMP at the host site and network users were connected to their local host.
- A set of protocols specified the conventions for communication between hosts connected to different IMPs.

Network Protocol

- A network protocol is an established set of rules that determine how data is transmitted between different devices in the same network.
- Essentially, it allows connected devices to communicate with each other, regardless of any differences in their internal processes, structure or design.
- Network protocols are the reason you can easily communicate with people all over the world, and thus play a critical role in modern digital communications.

Network Protocol

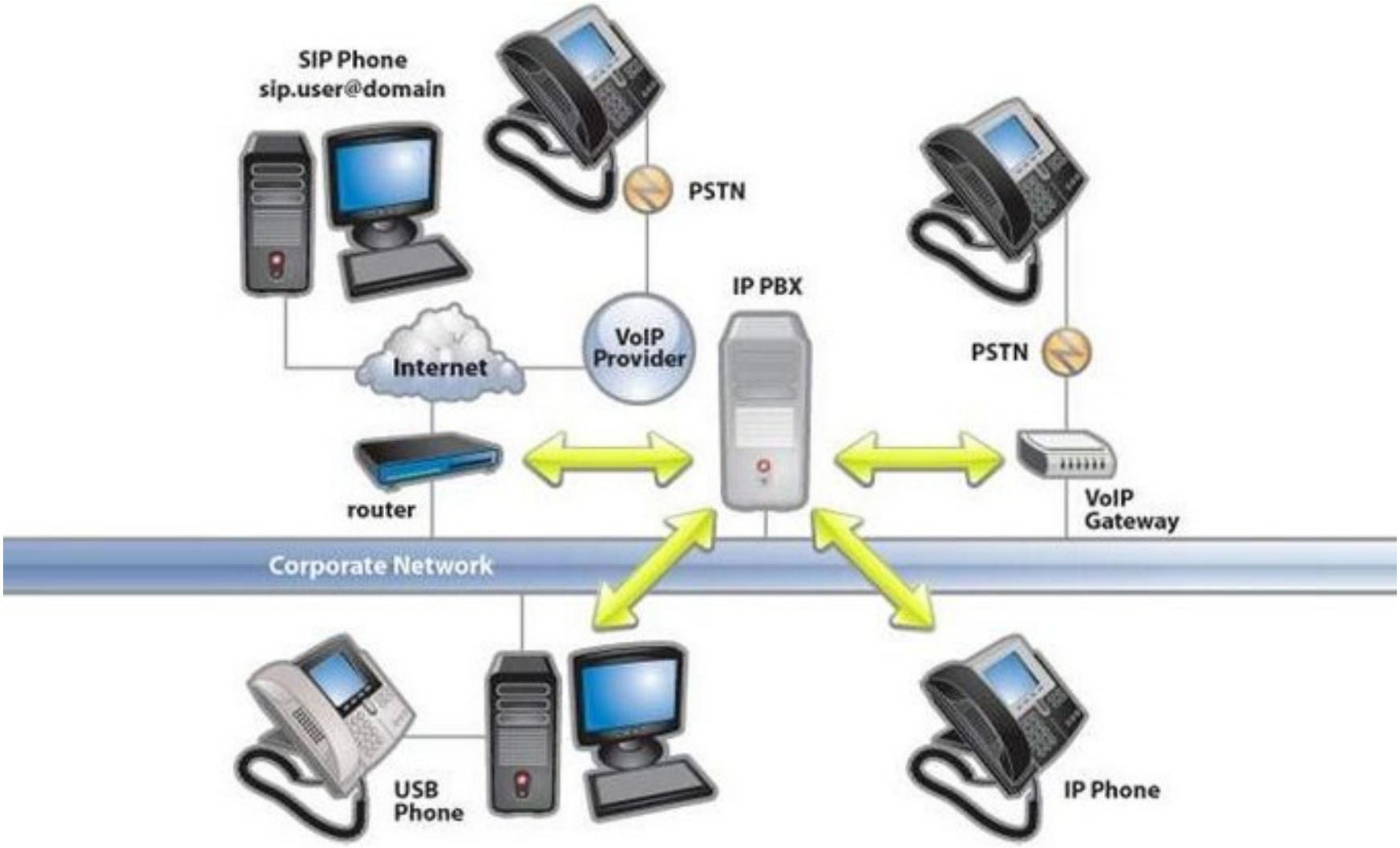
- Network protocols are a set of rules, conventions, and data structures that dictate how devices exchange data across networks.
- In other words, network protocols can be equated to languages that two devices must understand for seamless communication of information, regardless of their infrastructure and design disparities.


A
B
L7 - Application
L6 - Presentation
L5 - Session
L4 - Transport
L3 - Network
L2 - Data-link
L1 - Physical
L7 - Application
L6 - Presentation
L5 - Session
L4 - Transport
L3 - Network
L2 - Data-link
L1 - Physical

Voice over Internet Protocol

- Voice over Internet Protocol (VoIP), is a technology that allowing you to make voice calls over a broadband Internet connection instead of an analog (regular) phone line.
- Some VoIP services allow you to call people using the same service, but others may allow you to call anyone.
- They can have a telephone number – including local, long-distance, mobile, and international numbers or not.
- Some VoIP services only work over your computer or a special VoIP phone while other services allow you to use a traditional phone connected to a VoIP adapter.

Voice over Internet Protocol



Dial Up Internet Protocol

- The two most common protocols for making dial-up connections to the Internet (or other TCP/IP network) are Point-to-Point Protocol (PPP) and Serial Line Internet Protocol (SLIP). Of the two, PPP is more popular and more reliable.
- Dial-up Internet access is a form of Internet access that uses the facilities of the public switched telephone network (PSTN) to establish a connection to an Internet service provider (ISP) by dialing a telephone number on a conventional telephone line.
- Dial-up connections use modems to decode audio signals into data to send to a router or computer, and to encode signals from the latter two devices to send to another modem.

Dial Up Internet Protocol

- In 1979, Tom Truscott and Jim Ellis, graduates of Duke University, created an early predecessor to dial-up Internet access called the USENET.
- The USENET was a UNIX based system that used a dial-up connection to transfer data through telephone modems

Dial Up Internet Protocol