Network Classification and Topologies

Unit-V

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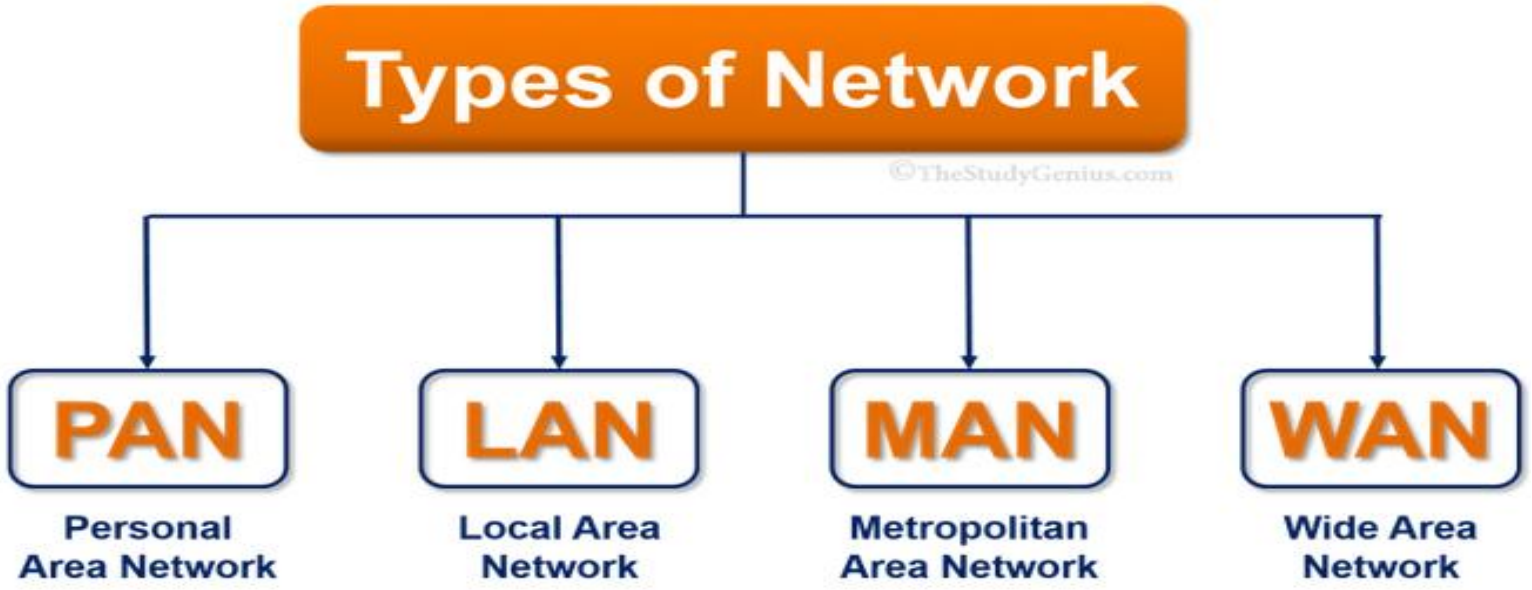
Network Types

There are many *different types of networks* available. Network is not the only internet means the internet is also a network but there are many different ways we can create a network means if we connect two computers this is also a network or if we use Bluetooth for file sharing this is also a network so, in this tutorial, we talk about many other **different types of network**.

Network can be differentiated by their size, structure, distance, and purpose.

Networks can be divide by their geographical area and number of computers. So networks are divided mainly of four types:



PAN(Personal Area Network)

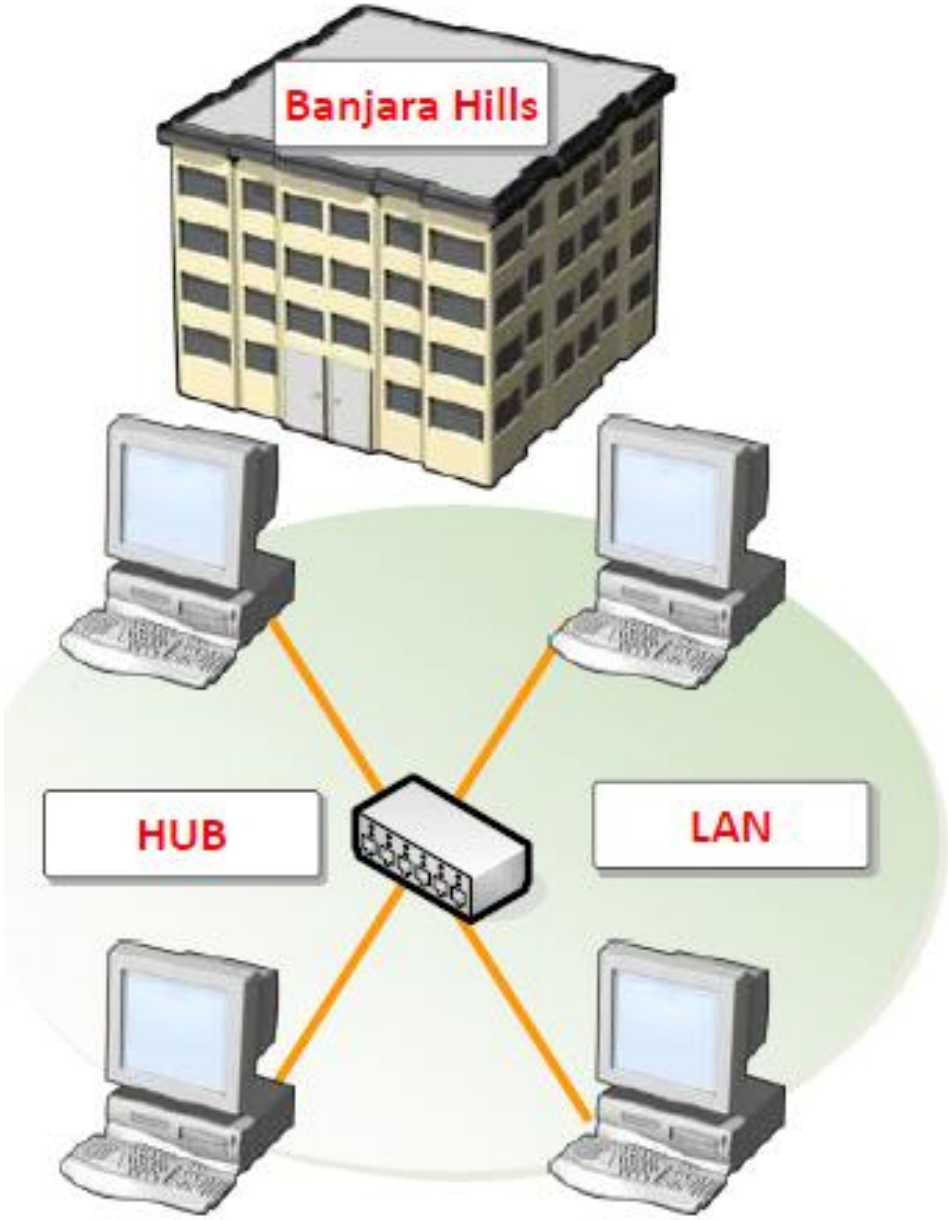
- *Personal Area Network is a network arranged within an individual person, typically within a range of **10 meters**.*
- *Personal Area Network is used for connecting the computer devices of personal use is known as Personal Area Network.*
- ***Thomas Zimmerman** was the first research scientist to bring the idea of the Personal Area Network.*
- *Personal Area Network covers an area of **30 feet**.*
- *Personal computer devices that are used to develop the personal area network are the laptop, mobile phones, media player and play stations.*

Examples Of Personal Area Network:

- ***Body Area Network:*** *Body Area Network is a network that moves with a person.* ***For example****, a mobile network moves with a person. Suppose a person establishes a network connection and then creates a connection with another device to share the information.*
- ***Offline Network:*** *An offline network can be created inside the home, so it is also known as a* ***home network****. A home network is designed to integrate the devices such as printers, computer, television but they are not connected to the internet.*
- ***Small Home Office:*** *It is used to connect a variety of devices to the internet and to a corporate network using a VPN*

LAN(Local Area Network)

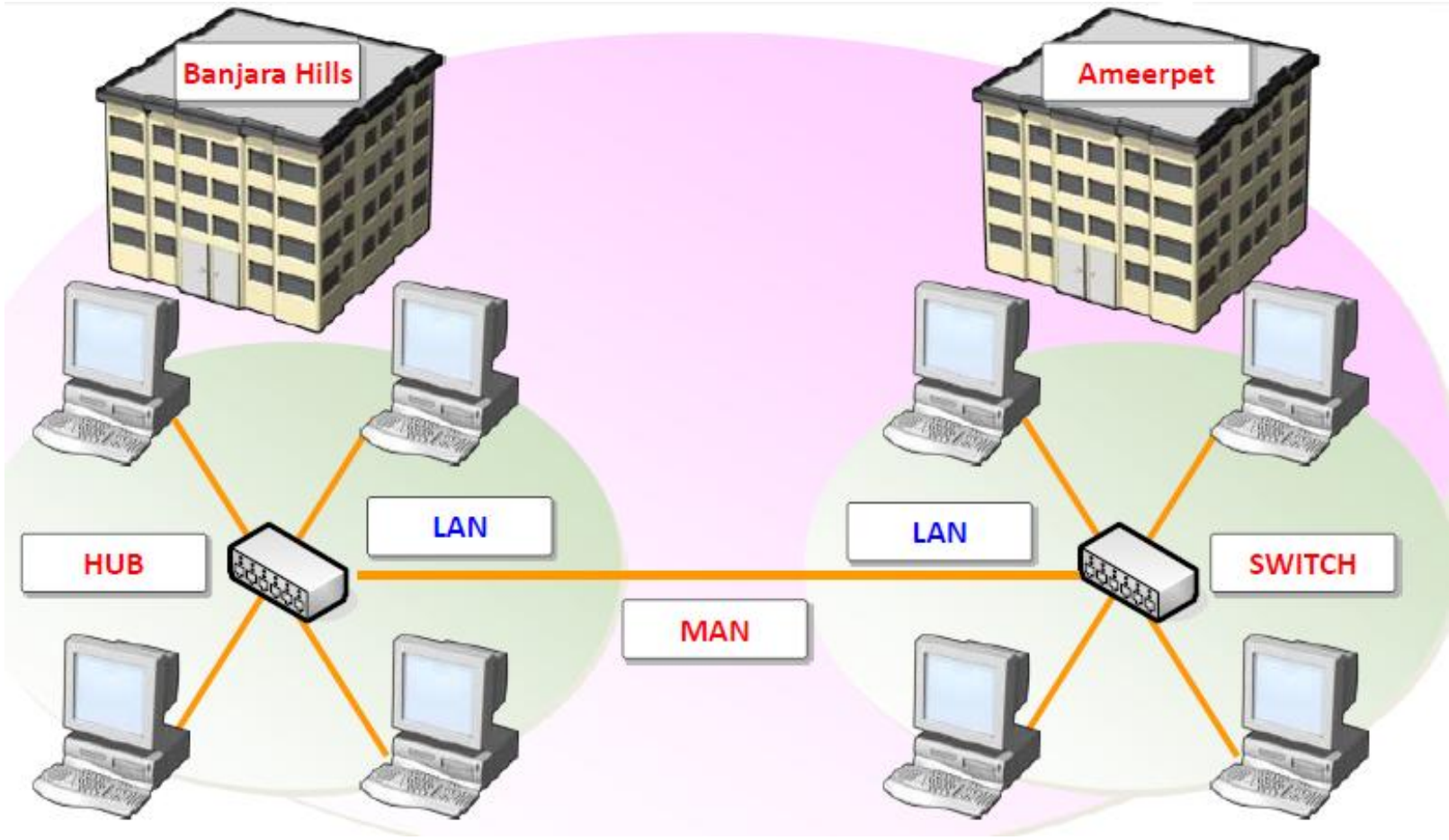
- *Local Area Network is a group of computers connected to each other in a small area such as building, office.*
- *LAN is used for connecting two or more personal computers through a communication medium such as twisted pair, coaxial cable, etc.*
- *It is less costly as it is built with inexpensive hardware such as hubs, network adapters, and ethernet cables.*
- *The data is transferred at an extremely faster rate in Local Area Network.*
- *Local Area Network provides higher security.*

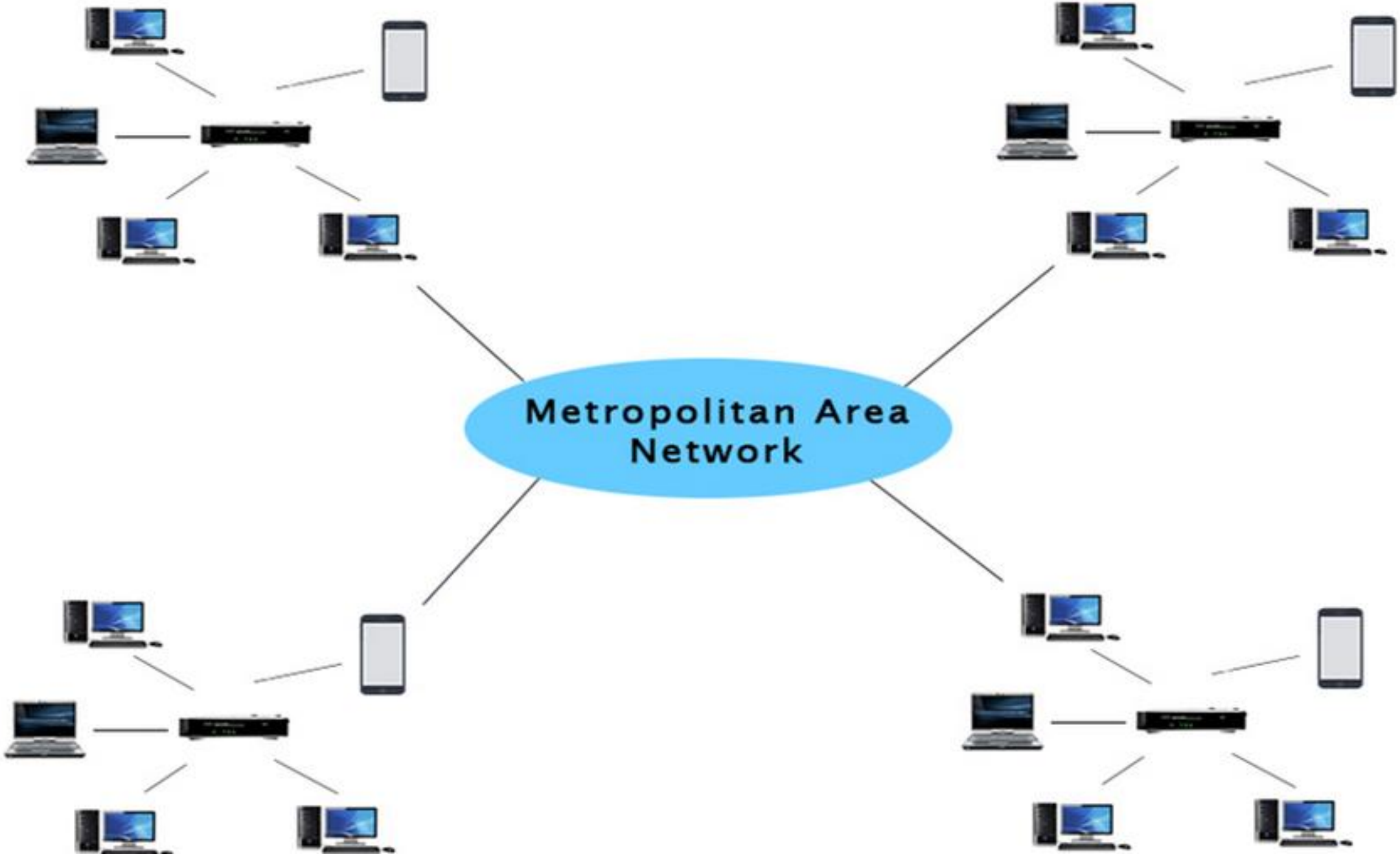



LAN

MAN(Metropoliton Area Network)

- *A metropolitan area network is a network that covers a larger geographic area by interconnecting a different LAN to form a larger network.*
- *Government agencies use MAN to connect to the citizens and private industries.*
- *In MAN, various LANs are connected to each other through a telephone exchange line.*
- *The most widely used protocols in MAN are RS-232, Frame Relay, ATM, ISDN, OC-3, ADSL, etc.*
- *It has a higher range than Local Area Network(LAN).*



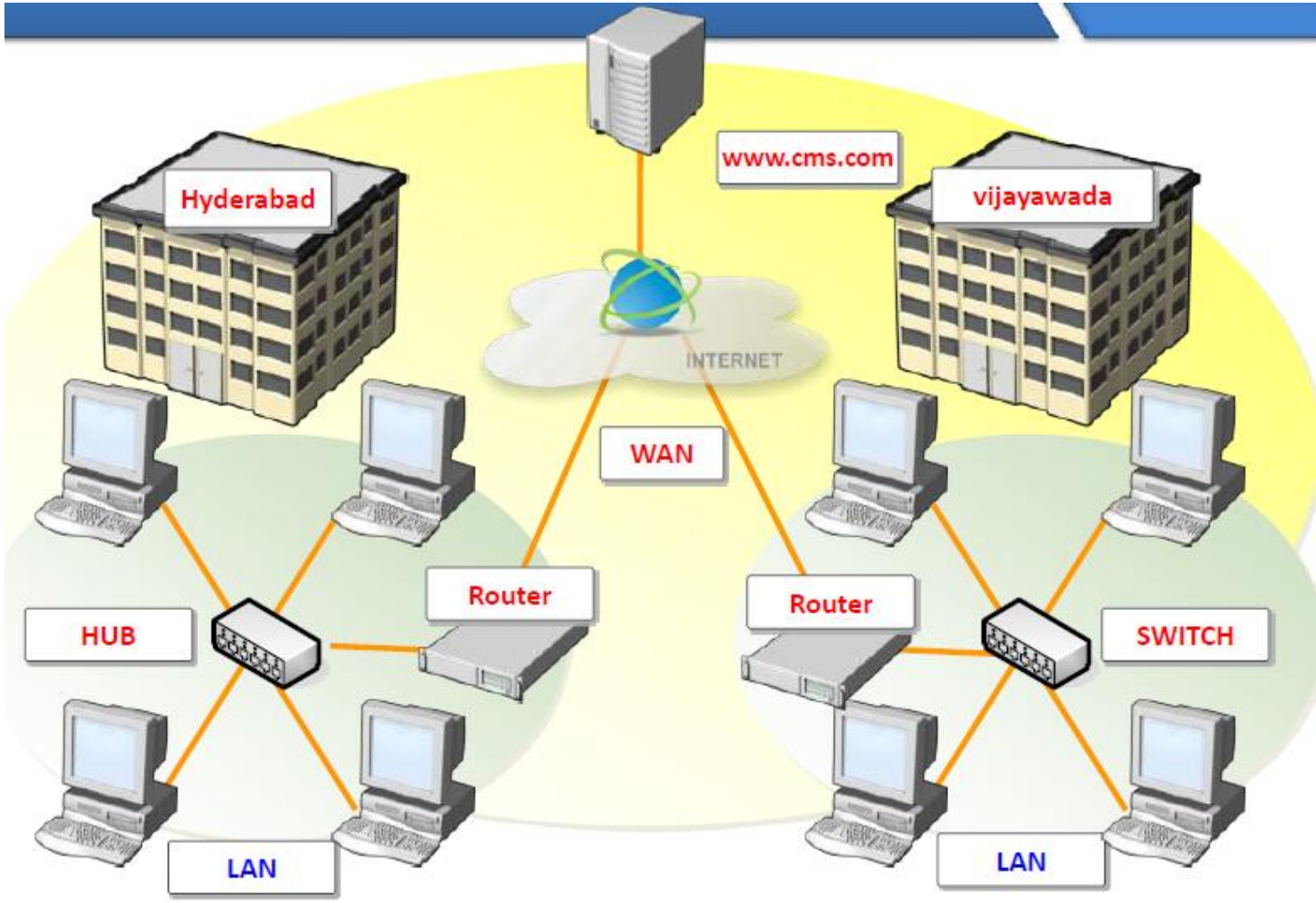

Metropolitan Area
Network

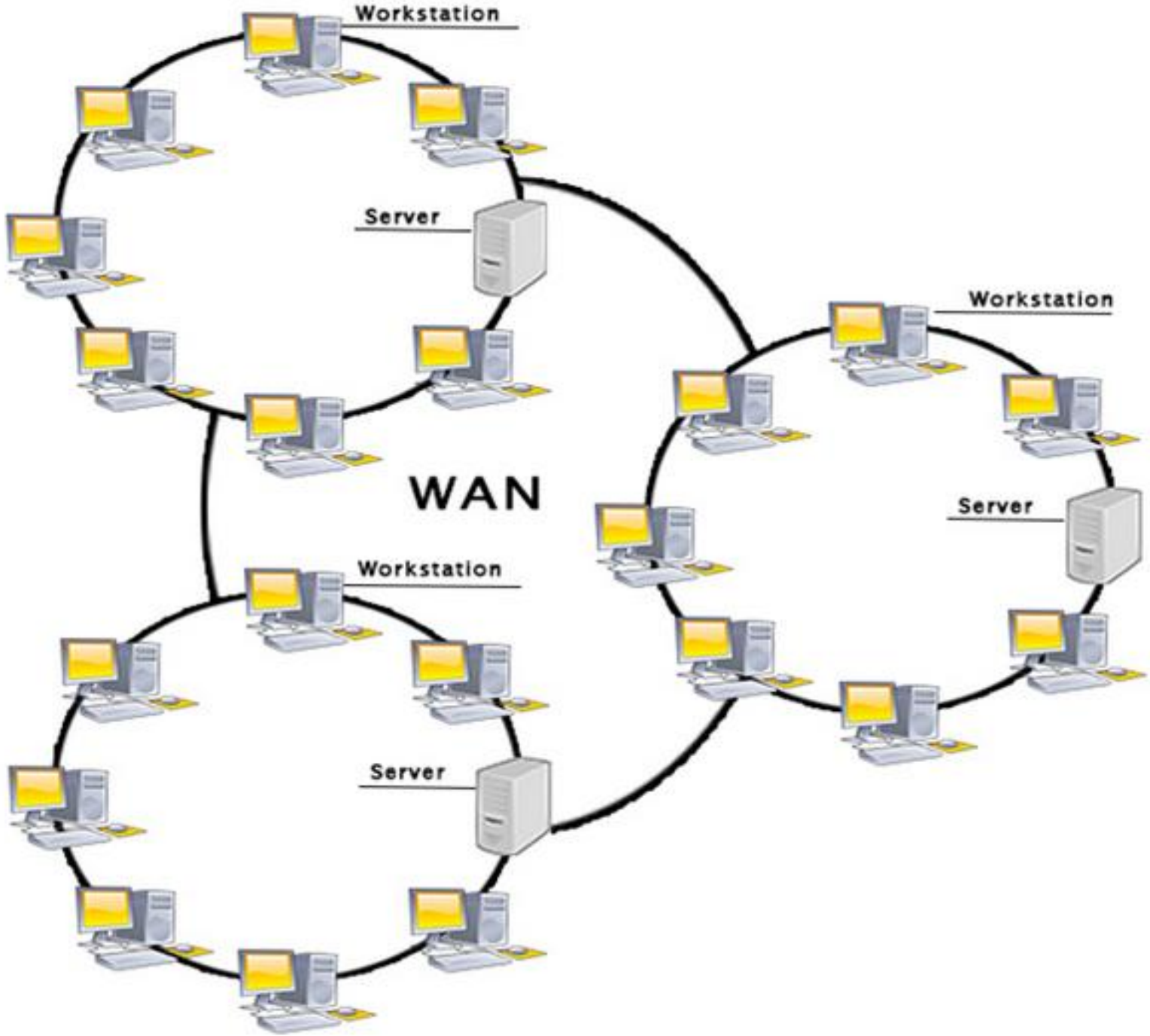
Uses Of Metropolitan Area Network:

- *MAN is used in communication between the banks in a city.*
- *It can be used in an Airline Reservation.*
- *It can be used in a college within a city.*
- *It can also be used for communication in the military.*

WAN (Wide Area Network)

- *A Wide Area Network is a network that extends over a large geographical area such as states or countries.*
- *A Wide Area Network is quite bigger network than the LAN.*
- *A Wide Area Network is not limited to a single location, but it spans over a large geographical area through a telephone line, fibre optic cable or satellite links.*
- *The internet is one of the biggest WAN in the world.*
- *A Wide Area Network is widely used in the field of Business, government, and education.*




Workstation
Server
Workstation
WAN
Server
Workstation
Server

Examples Of Wide Area Network:

- ***Mobile Broadband:*** *A 4G network is widely used across a region or country.*
- ***Last mile:*** *A telecom company is used to provide the internet services to the customers in hundreds of cities by connecting their home with fiber.*
- ***Private network:*** *A bank provides a private network that connects the 44 offices. This network is made by using the telephone leased line provided by the telecom company.*

Advantages Of Wide Area Network:

Following are the advantages of the Wide Area Network:

- ***Geographical area:*** *A Wide Area Network provides a large geographical area. Suppose if the branch of our office is in a different city then we can connect with them through WAN. The internet provides a leased line through which we can connect with another branch.*
- ***Centralized data:*** *In case of WAN network, data is centralized. Therefore, we do not need to buy the emails, files or back up servers.*
- ***Get updated files:*** *Software companies work on the live server. Therefore, the programmers get the updated files within seconds.*
- ***Exchange messages:*** *In a WAN network, messages are transmitted fast. The web application like Facebook, Whatsapp, Skype allows you to communicate with friends.*
- ***Sharing of software and resources:*** *In WAN network, we can share the software and other resources like a hard drive, RAM.*
- ***Global business:*** *We can do the business over the internet globally.*
- ***High bandwidth:*** *If we use the leased lines for our company then this gives the high bandwidth. The high bandwidth increases the data transfer rate which in turn increases the productivity of our company.*

Disadvantages of Wide Area Network:

- The following are the disadvantages of the Wide Area Network:
- **Security issue:** A WAN network has more security issues as compared to LAN and MAN network as all the technologies are combined together that creates the security problem.
- **Needs Firewall & antivirus software:** The data is transferred on the internet which can be changed or hacked by the hackers, so the firewall needs to be used. Some people can inject the virus in our system so antivirus is needed to protect from such a virus.
- **High Setup cost:** An installation cost of the WAN network is high as it involves the purchasing of routers, switches.
- **Troubleshooting problems:** It covers a large area so fixing the problem is difficult.

Internetwork

- *An internetwork is defined as two or more computer network LANs or WAN or computer network segments are connected using devices, and they are configured by a local addressing scheme. This process is known as* ***internetworking****.*
- *An interconnection between public, private, commercial, industrial, or government computer networks can also be defined as* ***internetworking****.*
- *An internetworking uses the* ***internet protocol****.*
- *The reference model used for internetworking is* ***Open System Interconnection(OSI)****.*

Internet

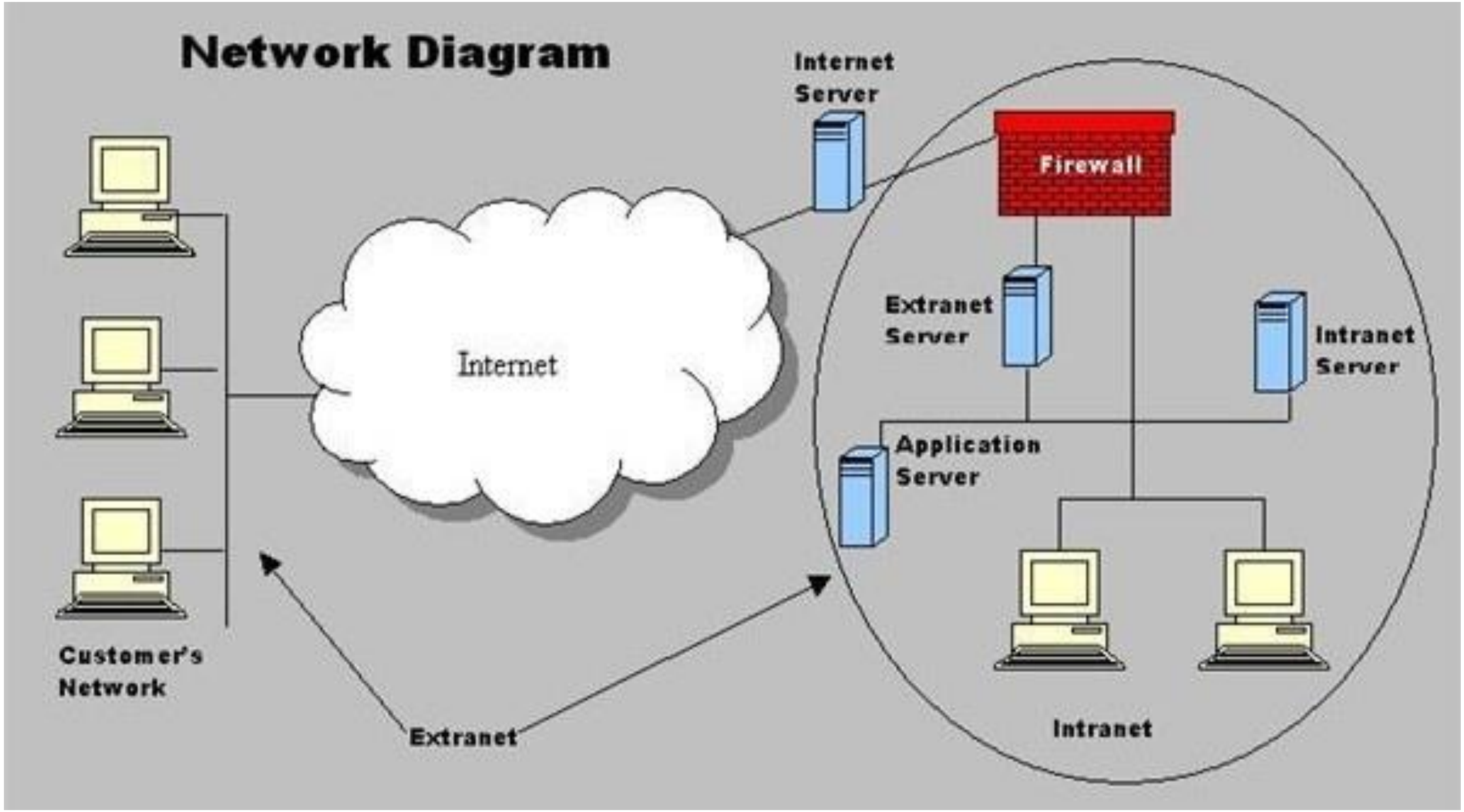
- Internet is
  - A network of networks of computer host
  - Able to seamlessly communicate
  - Usually through Internet protocol(IP) and services

Intranet

- An exclusive version of internet on an organization
- Which enables people inside the organization
- To share information easily

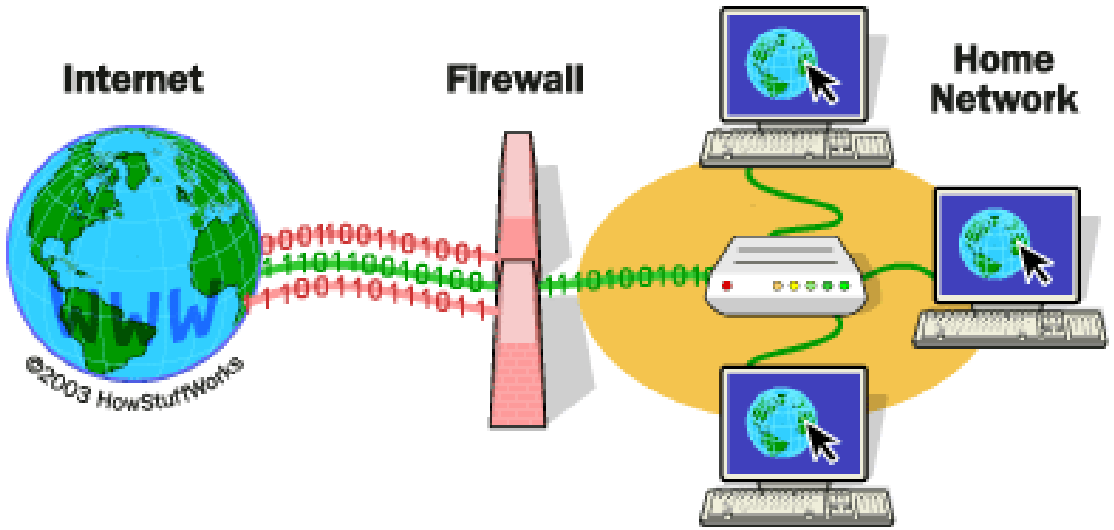
EXTRANET

- A private network
- That uses the Internet Protocol and the public telecommunication system
- To securely share part of a business information and operations
- With suppliers, vendors, partners, customers or other businesses.


Network Diagram
Internet Server
Firewall
Internet
Extranet Server
Intranet Server
Application Server
Customer's Network
Extranet
Intranet

Firewall

- *A firewall is a network security device, either hardware or software-based, which monitors all incoming and outgoing traffic and based on a defined set of security rules it accepts, rejects or drops that specific traffic.*
- ***firewalls work** like a filter between your computer/network and the Internet*
- ***Accept :** allow the traffic*
  ***Reject :** block the traffic but reply with an "unreachable error"*
  ***Drop :** block the traffic with no reply*
- *A firewall establishes a barrier between secured internal networks and outside untrusted network, such as the Internet.*



Functional Classification of Networks

- Networks can also be classified according to their respective functions and structure hierarchy.
- There are two types network based on the functionality of network shared.
  - Client-Server Network
  - Peer-to-Peer Network

Client-Server Network

- ***Client-Server Networks*** *are those in which certain computers have special dedicated tasks, hence providing services to other computers (in the network).*
- *The client–server model of computing is a distributed application structure that partitions tasks or workloads between the providers of a resource or service, called servers, and service requesters, called clients.*
- *A server host runs one or more server programs which share their resources with clients.*
- *A client does not share any of its resources, but requests a server's content or service function.*
- *Clients therefore initiate communication sessions with servers which await incoming requests.*
- *Examples of computer applications that use the client–server model are Email, network printing, and the World Wide Web.*

Client Server Network

- A Computer networking model where one or more powerful computers (servers) provide the different computer network services and all other user'of computer network (clients) access those services to perform user's tasks is known as client/server computer networking model.

  • In such networks, there exists a central controller called server. A server is a specialized computer that controls the network resources and provides services to other computers in the network.

  • All other computers in the network are called clients. A client computer receives the requested services from a server.

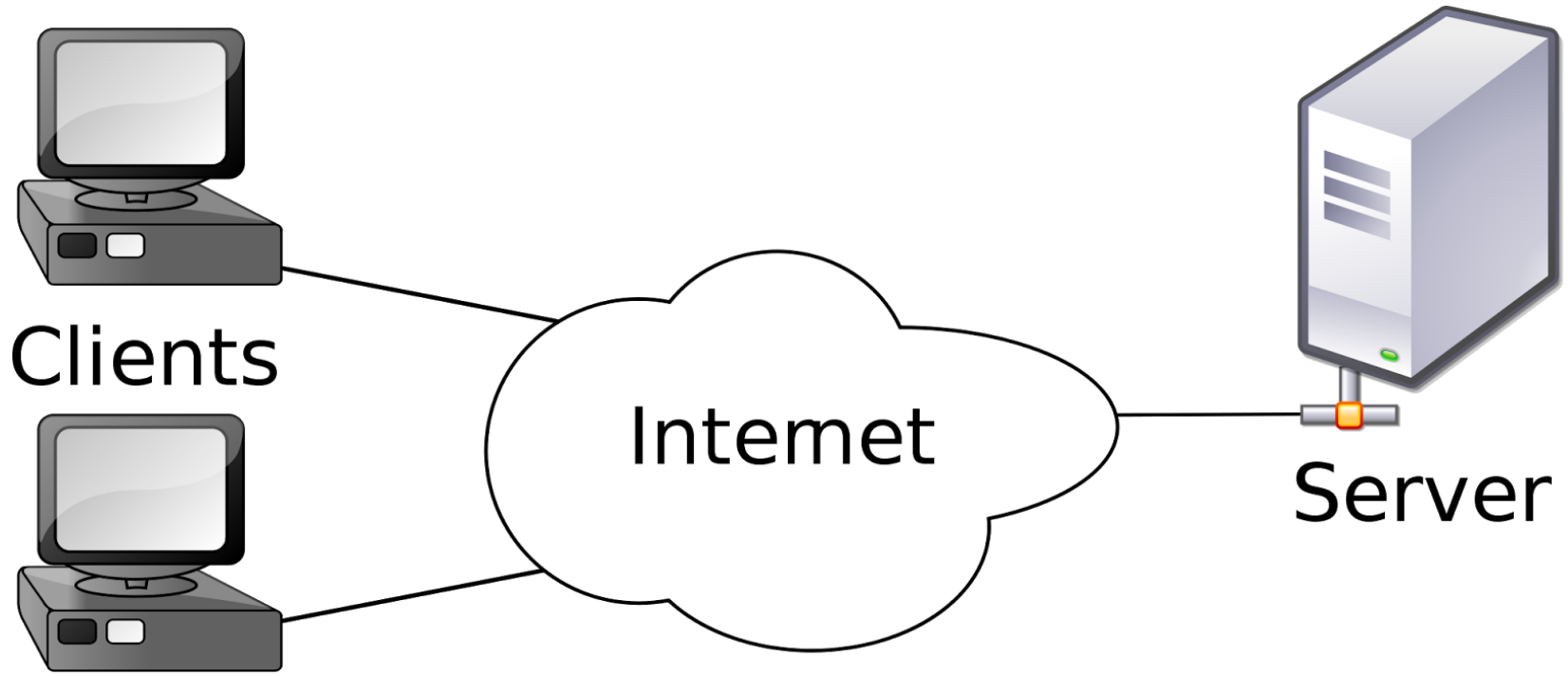
  • A server performs all the major operations like security and network management.
  • All the clients communicate with each other via centralized server.

- If client 1 wants to send data to client 2, it first sends request to server to seek permission for it. The server then sends a signal to client 1 allowing it to initiate the communication.

- A server is also responsible for managing all the network resources such as files, directories, applications & shared devices like printer etc.

- If any of the clients wants to access these services, it first seeks permission from the server by sending a request.

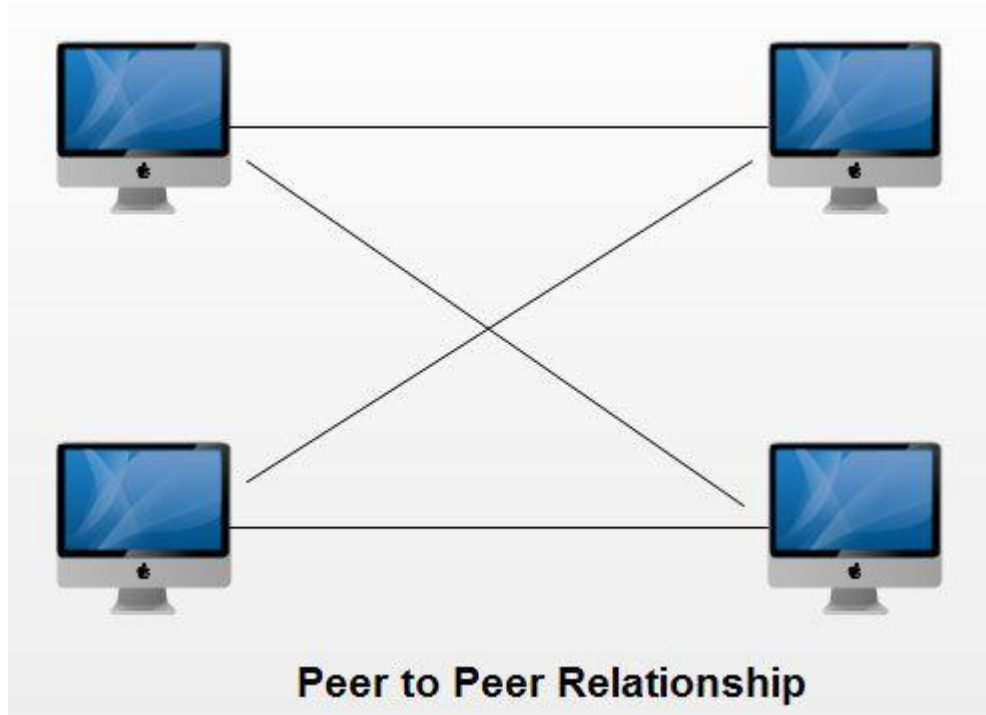
- Most Local Area Networks are based on client server relationship.


Clients
Intemet
Server

- **Advantages of Client Server Networks**
- 1. Centralized back up is possible.
- 2. Use of dedicated server improves the performance of whole system.
- 3. Security is better in these networks as all the shared resources are centrally administered.
- 4. Use of dedicated servers also increases the speed of sharing resources.
- **Disadvantages of Client Server Networks**
- 1. It requires specialized servers with large memory and secondary storage. This leads to increase in the cost.
- 2. The cost of network operating system that manages the various clients is also high.
- 3. It requires dedicated network administrator.

Peer to Peer Network(P2P)

- *In the peer to peer computer network model we simply use the same Workgroup for all the computers and a unique name for each computer in a computer network.*
- *There is no master or controller or central server in this computer network and computers join hands to share files, printers and Internet access.*
- *It is practical for workgroups of a dozen or less computers making it common environments, where each PC acts as an independent workstation and maintaining its own security that stores data on its own disk but which can share it with all other PCs on the network.*
- *Software for peer-to-peer network is included with most modern desktop operating systems such as Windows and Mac OS.*
- *Peer to peer relationship is suitable for small networks having less than 10 computers on a single LAN.*
- *In a peer to peer network each computer can not act as both a server and a client.*


Peer to Peer Relationship

Advantages of Peer to Peer Networks

Peer to peer networks have following advantages:

- 1. Such networks are easy to set up and maintain as each computer manages itself.
- 2. It eliminates extra cost required in setting up the server.
- 3. Since each device is master of its own, they an: not dependent on other computers for their operations.

Disadvantages of Peer to Peer Networks

- 1. In peer-to-peer network, the absence of centralized server make it difficult to backup data as data is located on different workstations.
- 2. Security is weak as each system manages itself only.
- 3. There is no central point of data storage for file archiving.

4 . _____ is the technology that connects the machines and people within a site in a small area

A. LAN
B. MAN
C. WAN
D. None of these

5 . _____ is a network that covers geographic areas that are larger, such as districts or cities

A. LAN
B. MAN
C. WAN
D. None of these

6 . _____ is a network that this technology connects sites that are in diverse locations

A. LAN
B. MAN
C. WAN
D. None of these

7 . _____ is a collection of point-to-point links that may form a circle

A. LAN

B. MAN

C. WAN

D. Ring topology

3 . If single computer network is divided into segments and router are added between them it forms an

A. Internet

B. Internetwork

C. Network

D. Internetworking

Questions

- Differentiate Data and Signal.
- Differentiate internet, intranet, extranet.
- Write down the advantages of using LAN.