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Introduction

As an employee of Nguyen Networking Limited, the project to implement a networking environment for an educational institute to connect 200 students, 15 teachers, 12 marketing and administration staff, 5 higher managers including the head of academics and the programme manager, 3 computer network administrators , needs an important emphasis on various network types and topologies in order to establish a seamless and hassle free network environment. As for this institute using **LAN** and **WLAN** can be very helpful as **LAN** can connect more end devices in a building and **WLAN** is helpful to integrate wireless on the go connection to the network. As this network contains a considerably huge amount of end users, the band-with required has to be high and may require star topology as star is much faster to intersect and nodes have an agreed decision on which the core is. The inclusion of a network system will increase the rate at which information is shared thus increasing productivity. In order to establish networks, servers are crucial parts of the system as they are required to store and process data at speedy rates enabling the procedure of the system to be efficient. From the various network models Usually **P2P** models are faster as the end devices are the only devices required to run the networking tasks relinquishing the hassle of server queries and protocols , which can slow down the process. If the institution requires a less costly alternative , then thin client can be a better alternative, with its processing power taking place on remote servers , which reduces the cost of ownership and maintenance costs.

Task- A. Explain the need for different computer network types and models.

What is a Network?

A collection of Computers which are interconnected, as a result, as a result multiple computers are able to communicate with each other and are able to share their **Resources, Data, Applications.**

To form a Network we need to consider several types.

- **LAN**
- **WLAN**
- **MAN**
- **WAN**
- **SAN**

There are several characteristics of those Network Types.

1. **LAN(Local Area Network) -** It is a relatively inexpensive **Network** type built with **Hubs , Network Adapters and Ethernet Cables,** which can link up several PCs through a relaying medium consisted of twisted pairs , coaxial cables,e.t.c. This Network Type introduces faster data transfer speeds as it is included locally, and has higher security. **LAN** can be implemented in a building or an office.

2. **MAN(Metropolitan Area Network) - MAN** has a higher coverage than **LAN.**
   As a result, it can cover a larger Geographical Area by the help of different
   LAN networks interconnecting through a Telephone exchange line. Uses of MAN include Government Agencies to connect to Citizens and Private Industries. The most widely used protocols in **MAN** are **RS232,Frame Relay,ATM,ISDN,OC-3,ADSL,**e.t.c

3. **WAN(Wide Area Network) -** A **WAN** is more superior to a **LAN** network in range and is not limited to a particular area , but rather spreads over a large Geographical area such as States or Countries by the help of Telephone line, Fibre optics or Satellite links. Internet is an example of the greatest **WAN** in the world and is often needed in the field of Government, Business and Education.

4. **SAN -** The presentation of interconnected multiple pools of devices are known as **SAN.** They are used to access storage devices such as Disk Arrays and Tape Libraries e.t.c such that it would appear to be directly attached to the operating system.

5. **WLAN -** A wire free network that connects numerous with the help of Wireless Communication to form a **LAN** within a home , school, computer laboratory , office building e.t.c. This allows mobility while being connected to the network. **WLAN's** are based on IEEE 802.11 also known as **Wi-Fi** can include a connection to the wider **Internet** through a gateway.

<u>There are several characteristics of those network types.</u>

- **Intranet -** An **Intranet** belongs to an Organization containing a private network deemed only accessible by an Organization's Employees or members. It is based on the Internet protocol such as **Transmission Control Protocol** and **Internet Protocol** aimed to relay and resources among the Organizations employees , providing the facility to work together or teleconferences. Some examples of **Intranet** are chats, email and/or blogs.

- **Extranet -** Categorized as **MAN**, **WAN** or other computer networks, it is crucial for **Extranet** to have an external connection rather than just a **LAN.** It is only restricted to users who have login credentials and can be used for information sharing. An **EXTRANET** is the least level of internetworking.
- **Internet -** A global network of trillion of computers and other computer devices , which allows us get almost any information and communicate to anyone else in the world.
- **Cloud -** Servers that can be approached over the net, software and databases that process on those servers. Files and applications can be run on any particular devices as , computing and storage takes place in servers that are run from data centers, instead of being run locally on the user device.

<u>Network Models-</u>

- **Peer to peer -** A p2p network is said to take place between several computer systems that communicate to each other over the net. Direct file sharing occurs between two systems with the

exclusion of a Central server ,denoting that the computer systems involved in **p2p** networks becomes a server and a client as well. Common examples of **p2p** software programs are - LimeWire , Bearshare,e.t.c

- **Client / Server - Client/Server** network contains one central powerful computer recognized as a server which works as a hub and is connected to multiple less capable personal computers or workstations also known as clients. Thus, these clients can run programs and get data that are stored on the server.
- **Thin Client -** It contains no data processing power rather the power is given by the CPU, hardrive, and memory of a different server. For companies to implement Thin Client servers and terminal server farms can allow for lowered cost of ownership and reduced support requirements.

Task- B. Explain the characteristics and functions of network components.

Computer Networks is formed my mustering several Electronical Devices which connect and interact between each other for the existence of smooth transfer of data between individual devices , with the exclusion of any hitch.

- A Network Component is of two types :-
  i. **Hardware Components**
  Ii. **Software Components**

Hardware Components:

Hardware Components can be put up into numerous elements..

- **End User Devices -** Distinguishable by unique addresses , **End User Devices** canreinact being both the transmitter and receiver , vice-versa , in a network. Some examples of **End User Devices** are - PC , Mobile Phones , Tablets , Server, e.t.c.

- **Connectivity Devices** -

i. **Switch** - A Networking Device that links various devices within a Network through **Packet Switching** to receive and transmit(forward) data to the destination device, rather than broadcasting.

Router - With the help of RJ-45 ports **Routers** are connected to the LAN and as a result can connect the various **End Devices** present on the Network to the broadband internet connection.

ii. **Hub** - A device that connects multiple Ethernet Devices , thus forming a single Network segment. It is established by holding up several input or output devices , in order input at a single port is available to each different posts.

- **Connection Media** -

The Computer Network is put in contact together with the help of- **Coaxial Cable , Twisted Pair , Fibre Optic Cable.**

To connect Hardware components through IP address we need **Network Interface Card (NIC).** An **NIC** card operates by changing the local IP address of the data sent by the End Device into a globally known IP address and transmitting data to another recipient End Device. The **NIC** card of the End Device , again transforms the IP address of the received data from a globally known IP into a locally known IP.

- **Software Components** -

i. Network System Software - In order for a Network System Software to be formed an OS(Operating System) needs to be installed both on the sender and recipient End Devices. For Example - **Windows 10 , Mac , Linux.**

ii. **Network Applications -** A Network Application is run by one host , to provide communication to to another application ran by different hosts. These can be formed through different Databases (Oracle, Microsoft SQL Server), Web based application (Facebook, Twitter, Gmail etc.)

Task- C. Analyze the functions of different network components required to construct different network types.

Networks can be formed in several types - **LAN**, MAN, WAN.

- **LAN**

A network that links up computers within a limited area, such as library , schools , office.Hardware components of **LAN** are consisted of **End devices** such as Pc/worskations and servers. **LAN** is provided through cabling and connectors , e.g. Coaxial cable and BNC connector , Unshielded twisted pair (UTP)

And RJ45 connectors. The devices are connected across the network using devices such as Hubs, Bridge, LAN switch and router, repeater. A crucial part of the hardware components is a NIC card (Network Interface Card), which allows the IP address of the sent data to be converted from local to a more recognized global IP for easier transfer of data.

Software components of **LAN** include **NIC** software drivers. Both the server and clients need to have **Network Operating System** such as Novell, Netware 4.1 client or Microsoft WIndows 95 , Mac OS. Also Network Protocol Software TCP/IP(Transmission Control Protocol/Internet Protocol). TO utilize the network many application software can be used Gmail , Internet Web Browser, Database Software , Networking Software.

- **MAN**

MAN is a network formed by joining multiple **LAN** networks to cover a larger geographic area. It makes use of the devices already present in a **LAN** netwrok. As a result the **MAN** has a higher range compared to **LAN** . It is mostly use in Government Organizations.**MAN** is transmitted through Modem and Wire/Cable.

- WAN

WAN requires also multiple **LAN** connections to work together in order to work. End devices are connected through the routers to the network. Lan provides the connection by the use of cables e.g. Coaxial cable and BNC connector , Unshielded twisted pair (UTP) and RJ45 connectors**(**Network Interface Card**)** is also contained in the network which disguises the local

IP address into a globally recognised IP address and creates a default gateway for the router to broadcast the data. The data is sent through the medium of Radio Transmission.

Task-D. Evaluate different network models and their suitability to meet different client requirements.

- **Peer-to-peer -** A server excluded server solution that enables communication of several network devices and easier sharing of resources, displaying a distributed architecture. All devices included in a **P2P** network are identified as peers , where each pair has the similar equality which induces similar rights and duties as each and every other peer. No peer is superior and resources are shared with no primary central device of a network (server) is present. Such shared resources contain processor usage, disk storage capacity, or network bandwidth

  The goal of a **P2P** network model is to establish a seamless environment and enables different computers and devices to work together in order to provide specific requests or tasks. As **P2P** networks are capable of deploying tasks such as processing power, network bandwidth, or disk storage space they are best suited for file sharing as they allow simultaneous sharing and receiving of files.

  An example of a **P2P** network is BitTorrent or any other torrent platform. The platform is comprised of multiple end devices such as PC, workstations e.t.c. The file is fetched in several pieces to ensure ease of access and speed , at the same time the parts of the files that are already downloaded on your computer is automatically seeded, in other words the PC starts sharing the bits of data to other PCs in the network establishing a seamless process, resembling a two way street.

- **Client-server Model -** Client-server model is a recount of the way in which servers share resources and serve one or more clients. Majority servers deploy a one-to-many relationship for clients providing multiple resources to a clients at one time. Examples of servers can be web servers, mail servers and file servers, whereas client devices can be desktop computers, laptops, tablets and smart phones.

  Client servers can be used differently but it is distinguished from **peer-to-peer** model by the inclusion of a central server, whereas in P2P each individual machine can act as both a client as well as the server.

  An example for the use of Client-server Model is when a Bank customer uses Online Banking to access his/her data. A request is initiated through a web browser towards the banks server. To get back data, the server accesses the database server which contains the credentials of the

customer's login information , as a client. A process brought forward by the business logic established by the bank run by an application sever interprets the returned data and displays it in the web browser. All these steps are carried out exchanging requests to a computer for placing processing requests and returning data.

- **Thin Client** - A server or a server farm is the main source of providing processing power to the unlike from a desktop consisted of CPU, memory and hard drive. Hence a **Thin Client** has no processing power of its own.**Thin Client** and **Terminal Servers** have advantages such as producing significantly lower cost of ownership(**TCO**) with reduced support requirements.

  An example of **Thin Client** is Wyse thin client which enables for Windows application to run on the cloud reducing management costs and increase security as it is a locked down environment.
  A web browser can also act as a thin client . When an applet is downloaded with the inclusion of plugins or virtual machines, as a part of the Web application , here the browser acts as a thin client as it is displaying a processing of data without any work done by the machine , rather the processing takes place in a remote server or server firm.