Chapter 15

IT Infrastructure

IT Infrastructure

For implementing any IT application each SSA/Circle need to build up and maintain IT Infrastructure. IT Infrastructure consists of the equipment, systems, software, and services used in common across an organization, regardless of mission/program/project. IT Infrastructure also serves as the foundation upon which mission/program/project-specific systems and capabilities are built.

Clients / Users
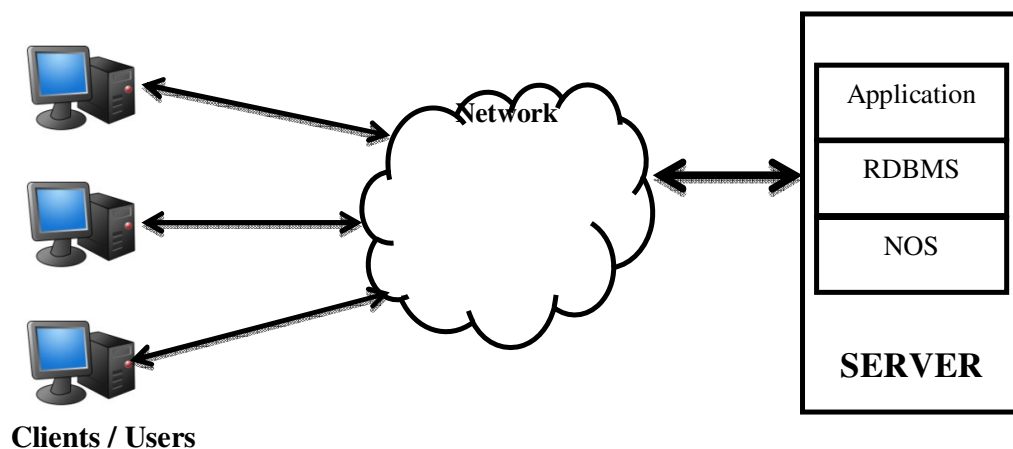
The three primary components of IT Infrastructure are

1) Servers

2) Desktop PCs and

3) Network.

Servers are different from Desktop PCs in two aspects – they have more hardware resources and they are loaded with Network Operating System.

Servers

- Servers are the computers that provide some service to the network, to be shared by the network users/ clients.

- Servers are typically powerful computers that run with network operating system.

- Servers are often specialized for a single purpose. This is not to say that a single server cannot do many jobs but more often we get a better performance if we dedicate a server to a single task.

Few Services provided by Servers are:

- DNS (Domain Name System) – It's like a directory service used to resolve URL to IP Address and vice versa

- DHCP (Dynamic Host Configuration Protocol) – It is used to allocate IP address and configure other parameters like Gateway Address, DNS address, Alternate DNS Address,dynamically on lease basis.

- Mail – Consists of different types of agents like MUA (Mail user agent), MDA (Mail Delivery agents) and MTA (Mail Transfer Agents) It sorts dispatches and delivers electronic mails.

- Web Hosting - It hosts website(s). Multiple websites can be hosted on single physical server

- Proxy – It controls and restricts outgoing and incoming traffic.

- Database – It will have some RDBMS package like Oracle, MySQL and will manage data. This data can be populated or retrieved through some application.

Requirements of Servers

- Better & Faster CPU (Xeon, Dual-Core, Core 2 Duo)

- More RAM (> 2 GB)

- Higher Bus Width & Speed (PCI)

- More CACHE (>512 K b)

- Higher Capacity Hard Disk (160 GB x 2 or so.)

- Better Hard Disk Controllers (SCSI)

- Fault Tolerance (Disk Mirroring, Duplexing or RAID)

- Backup Devices (CTDs, DATs, opticalstorage etc.)

- Better Cooling

Computer Network

A Computer Network describes two or more connected computers that can share resources such as data, a printer, an Internet connection, applications, or a combination of these.

Needof Computer Networking

- To share Hardware resources

- To share Software Resources

- To share Information or Databases

- For Communications like E-mail, e-commerce, video conferencing, chatting, etc.

Types of Computer Network

I.   Depending on Geographical Coverage of Inter-connected Computers:

- LAN   - Local Area Network

- MAN - Metropolitan Area Network

- WAN - Wide Area Network

II.   Depending on the architecture of the network:
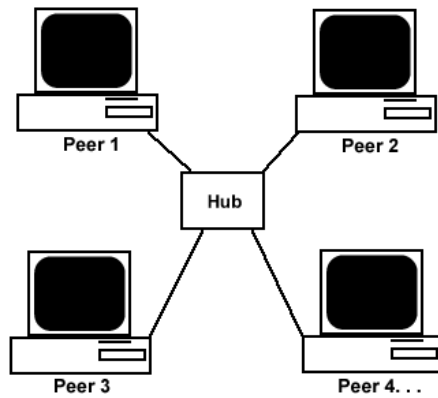
- Peer to peer (Workgroup)

- Client – Server
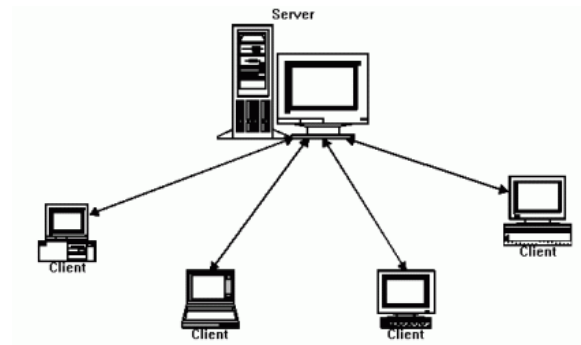
- Domain

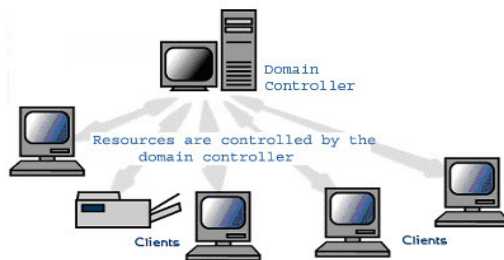**Figure 1: Peer to Peer**

Figure 2: Client Server

Figure 3: Domain Model

Components of Computer Network

A network has three types of components

- DTE - Data Terminal Equipment

- DCE - Data Communication Equipment and

- Media.

DTE (Data Terminal Equipment's):- DTE are the devices like PCs, Servers, and Printers etc. which are either source or destination of information or data. DTEs must have an interface like Network Interface Card (NIC) to be connected to DCEs.

Network Interface Card (NIC):

- DTE are linked to DCEs with NICs.

- NIC implements the MAC Protocol which determines how workstations/servers share access to network. The MAC (media access control) address is a 48 bit (6 bytes) unique hard coded address.

- NIC has memory for buffering in and outgoing data packets.

DCE (Data Communication Equipment):- DCE are devices which help us to connect different DTEs and they themselves are neither the source nor destination of information. Commonly used DCEs are Modems, Switches, and Routers etc.

DCEs are themselves of two types:–

  i. Intra-Networking Devices like Modems, Hub, Switch

  ii. Inter-Networking Devices like Routers, Gateways etc.

Media: - Media is the path by which traffic is flowing from source to destination. It can be Cu cable (Ethernet cable, DSL tech etc.), OFC Cable and Wireless media.

Networking Devices:-

1. Hub
2. LAN Switches
3. Routers

Hub: Hub is active central element of the star layout. When a single station transmits, the hub repeats the signal on the outgoing line to each station. Hub physically a star topology but logically a bus topology. Hubs can be cascaded in a hierarchical configuration. These days hubs are obsolete and are replaced with switches.
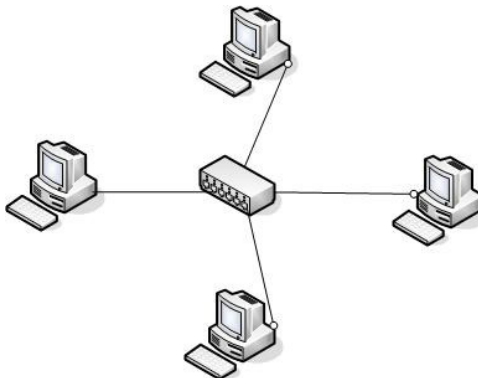
Figure 4: Hub connected network

LAN Switches: LAN switches maintains a switch table in which entries like MAC Address, Interfaces, etc. are maintained.
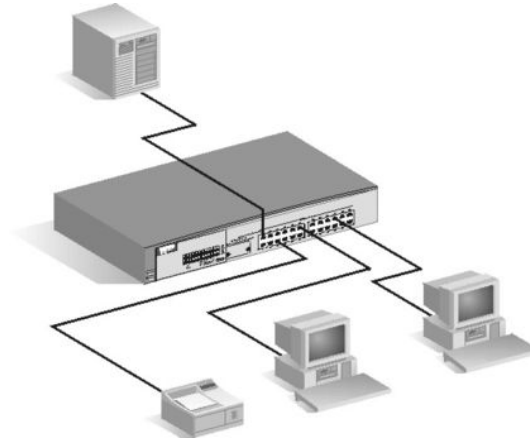

Figure 5: Switch connected network

Routers: - Number of LANs can be connected with the help of some inter Networking Devices like Routers.These helps in routing the traffic from one network to another.
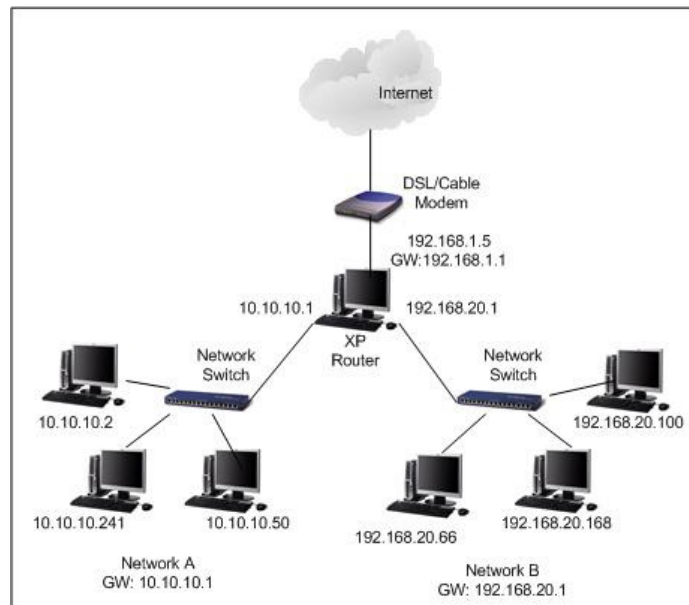

Figure 6: Two networks are interconnected with thehelp of router

LAN is basically a numbers of DTEs and DCEs which are connected together with the help of Intra Networking DCEs like switches. Information is exchanged between different DTEs in a LAN by sending packets, which are called Ethernet

packet. Individual Computers in a LAN are identified by a unique address associated with each NIC. This address is 48 bit unique binary number hardwired in every NIC and this known as MAC (Media Access Control) or Physical address.

Software:

- System Software: Operating Systems, Device Drivers, Utilities etc.

- Application Software: Word-Processor, Spread-sheet, Database, Presentation, Graphic, Multimedia etc.

Operating Systems:

- Desktop Operating System: MS Windows XP, Vista, Windows 7, Macintosh etc.

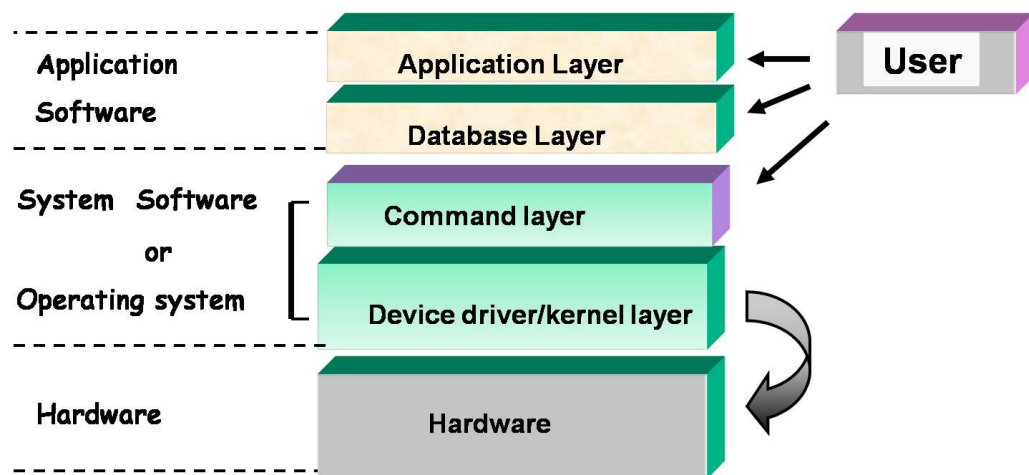- Network Operating System: MS Windows Server, UNIX, Linux, Sun-Solaris etc.

Figure 7: Computer System Organization

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