

Fundamental of Computer (Computer Operator)

Computer Fundamentals

C= Commonly
O= Operated
M= Machine
P= Particularly
U= Used for
T= Trade
E= Education and
R= Research

Introduction

- Electronic data processing and calculating machine
- Accepts raw data, process them and gives out meaningful result.
- 3 tasks of a computer (task of computer in 3 steps)
Input → Process → Output

Input Unit

Input: Data and instructions given to the computer

Input Unit: Devices which give data to the computer.

E.g. of Input Devices: Mouse, Keyboard, Scanner, Microphone etc.

Processing Unit

CPU (Central Processing Unit) or Microprocessor

- Performs all the processing of computer.
- Attached on motherboard

Output Unit

Output: Result obtained from computer after the processing of data

Output Devices: Devices which give out result

E.g. of Output Devices: Monitor, Printer, Speaker, Projector etc.



Characteristics/Features of Computer

Speed:

- Computer can perform Millions Instructions Per Second (**MIPS**).
- The speed of computer is usually measured in terms of Mega Hertz (MHz) or Giga Hertz (GHz).

Accuracy:

- Computers are 100% accurate

Garbage-In Garbage-Out (GIGO): Output of computer is always correct if the input is correct. If input given to computer is wrong, then output will be wrong.

Reliability: Computer has very low failure rate and reliable results.

Storage: Computer has internal and external storage unit (Memory). Computer stores data in Byte

0 or 1 = 1 bit

8 bits = 1 Byte

1024 Bytes = 1 Kilobyte (KB)

1024 KB = 1 Megabyte (MB)

1024 MB = 1 Gigabyte (GB)

1024 GB = 1 Terabyte (TB)

Versatility: Computer can be used in various fields for different purposes.

Automation (Automatic): After instruction is given once it performs tasks automatically.

Diligence (Tirelessness): Computer can work continuously without getting tired.

Consistency: Every time computer can work with same manner.

Precision: Computer can give the accuracy (especially in calculations) upto the level user require.

History of Computer

| When | What | Who | Description |
|--------------|---------------|----------------|--|
| 2500-3000 BC | ABACUS | Chinese People | First Calculating Machine(Made up of wooden frame with beads or balls sliding on wire) |
| 1617 | Napier's Bone | John Napier | Multiplying Machine Made up of ivory bones |

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| | | | |
|---------|---------------------------------|--------------------------------------|---|
| | | | where multiplication table was engraved (also used for Dividing and taking square root) |
| 1622 | Slide Rule | William Oughtred | First analog device that works on the principle of logarithms. Uses: Multiplication, Division. Roots, Trigonometry, Logarithm, Exponentiation [not normally used for addition and subtraction] |
| 1642 | Pascaline (Pascal's calculator) | Blaise Pascal | Mechanical calculator capable for addition and subtraction (Consists of toothed metal wheels dial having number zero to nine) |
| 1821-22 | Difference Machine | Charles Babbage [father of computer] | Able to perform complex mathematical calculation with 31 digits of precision. Used to solve polynomial equations |
| 1837 | Analytical Engine | Charles Babbage | General programmable machine(Able to add, subtract, multiply and divide through the use of stored program) |

Other Important Inventions and dates

- ✓ Atanasoff Berry Computer (ABC)-1942: First electronic digital computer
- ✓ Harvard Mark-I- 1944: First automatic electromechanical computer
- ✓ ENIAC (Electronic Numerical Integrator and Calculator)-1946: First general purpose electronic computer
- ✓ EDVAC (Electronic Discrete Variable Automatic Computer)-First stored program computer
- ✓ EDSAC (Electronic Delay Storage Automatic Computer)-First practical stored-program electronic computer
- ✓ UNIVAC-I (Universal Automatic Computer): First general purpose electronic digital computer. It is also the **first commercial computer**.
- ✓ First transistor: 1947 (at BELL Lab)
- ✓ First Mainframe Computer: UNIVAC-1: 1951
- ✓ First PC- (for office use) by IBM Company in 1957
- ✓ First Mini Computer: PDP-1: 1965
- ✓ First Micro Computer: Altair-8800 by MITS: 1975
- ✓ First Super Computer: Cray-1: 1976
- ✓ First Laptop: 1979
- ✓ Microsoft Corporation: 1975
- ✓ First MS windows: 1985
- ✓ First Computer Programmer: Lady Augusta Ada Lovelace
- ✓ First Hard Disk: 1956
- ✓ Mouse-1964
- ✓ CD (Compact Disk)-1965
- ✓ Floppy Disk: 1971

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History of Computer in Nepal

| When | What |
|-----------|--|
| 2018 B.S. | Electronic calculator 'FACIT' was used for census. |
| 2028 B.S. | Second generation mainframe computer 'IBM-1401' was used for census |
| 2031 B.S. | NCC (National Computer Center) was established |
| 2038 B.S. | Second generation mainframe computer 'ICL-2950/10' was used for census |

Generation of Computer

Classification of computer in different time frame on the basis of their technological development is known as generation of computer.

First Generation Computers (1940s-1950s)

- Electronic Circuitry: Vacuum Tube
- Input: Punched card
- Output: Paper
- Storage Device: Magnetic Drums, magnetic tapes
- Size: Large, Bulky
- Speed: Very Slow
- Consumes lot of electricity
- E.g. ENIAC, EDSAC, EDVAC, UNIVAC, IBM-650, 702, 705

Second Generation Computer (1950s-1960s)

- Electronic Circuitry: Transistor
- Input: Punched Card
- Output: Paper
- Size: Smaller
- Storage Device: Magnetic core memories
- Speed: Faster (could perform task in microseconds)
- E.g. IBM 7000, ATLAS, MARK-III, Honeywell-200

Third Generation Computer (1960s-1970s)

- Electronic Circuitry: IC (Integrated Circuits)
- Input: Punched Card, Keyboard
- Output: Paper, Monitor
- Storage: Semi conductor memory, Magnetic Disk, MagneticTape

- Size: Smaller than second generation computers
- Speed: faster than second generation computer (could perform tasks in nanosecond)
- Used operating system
- E.g. IBM 360, ICL 2900

Fourth Generation Computer (1970s-Present)

- Electronic Circuitry: Microprocessor
- Input: Keyboard, Mouse, Scanner, Digitizer
- Output: Paper, Monitor, Printer, Plotter
- Storage: Semiconductor memory, Magnetic or optical disk (CD/DVD)
- Size: Small than third generation computer
- Speed: faster than third generation computer (could perform task in picoseconds)
- Versatile and diligence
- E.g. Pentium Series computers, IBM System/370, HP-3000, AMD Athelon

Fifth Generation Computer (present-beyond)

- Will be based on biochips
- Will have artificial intelligence
- Will have ability to solve problem themselves
- Will recognize voice, image etc

[Artificial Intelligence: Capability of computer to perform any task as human beings]

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Types of computer (Classification of Computer)

On the basis of work

1. Analog:

- Measures physical quantity like temperature, pressure, speed
- Operations are performed in parallel
- e.g of analog devices: speedometer, thermometer

2. Digital:

- works on the basis of digits
- operations are performed in sequence
- e.g. calculator and all modern computer

3. Hybrid

- Having the capabilities of both analog and digital computers
- E.g. ECG(Electrocardiogram), CT-Scan

On the basis of size/ processing speed

1. Microcomputer

- Single user computer known as personal computer (PC)
- Used in home, office, schools etc
- Limited speed
- Desktops and laptops

2. Minicomputer

- Multiuser computer (more than 100 users can use at a time)
- Bigger than microcomputer
- Faster than microcomputer

3. Mainframe Computer

- Multiuser computer (more than 1000 users can use at a time)
- Bigger than minicomputer
- Faster than minicomputer

- Used in centralized databases and WAN
- E.g. DEC, ICL, IBM 370

4. Super Computer

- Fastest, Most Powerful and Most Expensive
- Used for weather forecasting, , remote sensing, aircraft design, large amount of number calculation (number crunching)
- E.g. CRY XMP, CRAY2

On the basis of brand

1. IBM Personal Computer

- Computers manufactured by IBM (International Business Machine) Company

2. IBM Compatible Computer

- Computers manufactured by other companies (except APPLE Company) with the design and architecture of IBM

3. Apple/Macintosh Computer

- Computers manufactured by Apple company with own design and architecture

On the basis of model

1. XT Computer (Extended Technology):

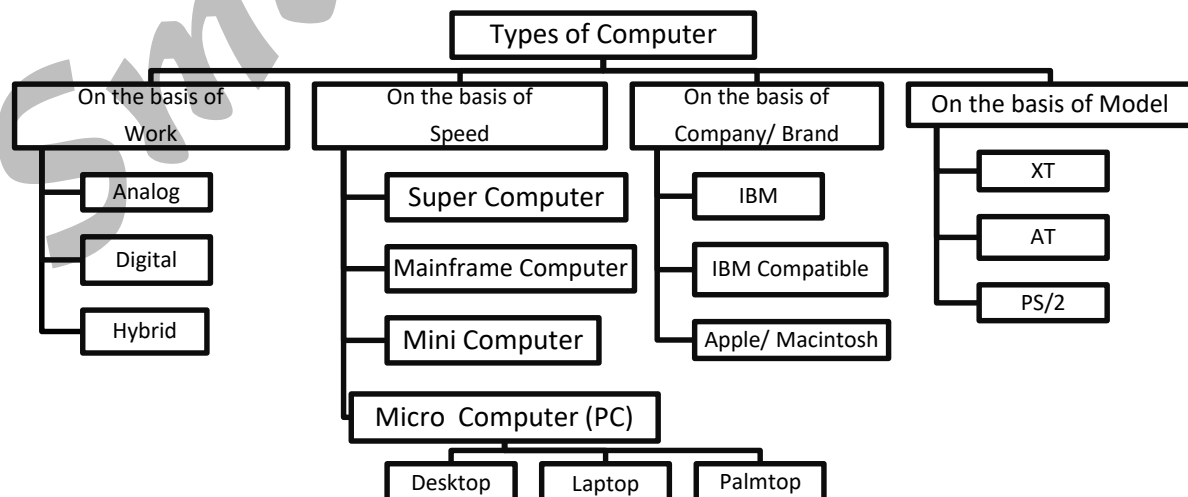
- Does not support GUI based OS
- Processing speed 4.77 Mhz
- E.g. Intel 8080, 8086, 8088

2. AT Computer (Advanced Technology)

- Supports GUI based OS
- Processing speed 2 Ghz
- E.g. Intel Pentium series

3. PS/2 Computer

- Refinement of AT computers
- Mostly used in Laptops

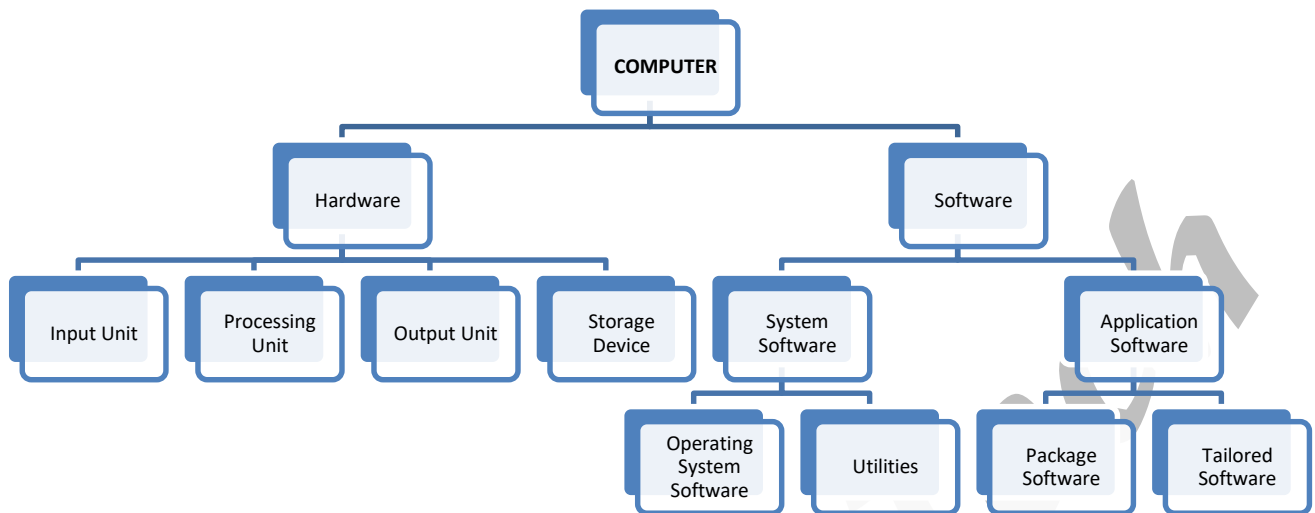


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COMPUTER SYSTEM



HARDWARE

All the physical parts of computer which can be touched, seen and felt are known as hardware.

Input Unit

E.g. Keyboard, Mouse, Joystick, Scanner, Microphone

Processing Unit

CPU (Central Processing Unit) and its components

Output Unit

E.g. Printer, Speaker, Monitor, Plotter, Projector

Storage Unit

Storage unit saves or stores data for future use. Hard disk is the main storage device in computer. Pen driver, CD, DVD are examples of external Storage devices.

SOFTWARE

A set of instructions given to computer to perform a certain task is known as a program while a set of programs is known as software

- System Software

The software Related to compute system

- a. Operating System Software

The software needed to load or operate computer is known as operating system software. It works as a mediator between user and computer hardware. Eg: DOS, windows 98, windows xp, windows vista etc.

Types (Based on Interface):

- CLI (Command Line Interface): Work with commands
- GUI (Graphic User Interface): Windows with graphic and symbols

Types (Based on User):

- Single User: Windows
- Multiuser: Unix, Linux

Types (Based on operation)

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- Single Task: DOS
- Multitask: Windows

b. Utilities Software

The software to check and maintain the system, Eg: Disk Defragmenter and Antivirus programs

- **Application Software**

Software used for performing various tasks

a. Package Software

Software developed by any company for public use

- **Word Processing Package:**

- Type, Design
- Eg. MS-Word, NotePad, WordPad, Pagemaker

- **Spreadsheet Package**

- Data tabulation
- Calculation
- Ascending and descending order
- Filter
- Eg. MS-Excel, MS Access

- **Graphics Package**

- Eg. Photoshop, Freehand, Corel Draw

b. Tailored Software

Software developed by any company or person for their personal use. For example: Software used by Nepal Telecom for billing.

Some terminologies

Firmware: Software stored in computer's ROM or computer's circuitry

Liveware (humanware): users and persons related to computer.

Shareware: programs available for trial

Freeware: programs available completely free

Netware: Networking software

Open Source: Software code available freely

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Computer Architecture

Digital computer can be divided into 3 major sections: CPU (Central Processing Unit), MU (Memory Unit), I-O Unit (Input-Output Unit).

Processor (CPU): It is the heart of computer that receives data from input devices, process them, stores them in memory and sends to output devices. **Three** sections of CPU are:

Control Unit (CU): It receives instructions from input devices and sends to output devices. It sends and receives control signals from various peripheral devices.

Arithmetic Logic Unit (ALU): It carries out all arithmetic and logical operations

Registers: They are special storage location of CPU that temporarily stores data currently being used. They accept, store and transfer data very fast.

TYPES OF REGISTER

MAR stand for Memory Address Register:

This register holds the memory addresses of data and instructions currently being processed. This register is used to access data and instructions from memory during the execution phase of an instruction.

Program Counter:

The **program counter (PC)**, commonly called the **instruction pointer (IP)** in Intel x86 microprocessors, and sometimes called the **instruction address register**, or just part of the instruction sequencer in some computers, is a processor register

In other words, it holds the address of the memory location of the next instruction when the current instruction is executed by the microprocessor.

Accumulator Register:

This Register is used for storing the Results those are produced by the System. When the CPU will generate Some Results after the Processing then all the Results will be Stored into the **AC Register**.

Memory Data Register (MDR):

MDR is the register of a computer's control unit that contains the **data to be stored in the computer storage** (e.g. RAM), or the **data after a fetch from the computer storage**. It acts **like a buffer** and holds anything that is copied from the memory ready for the processor to use it. **MDR hold the information before it goes to the decoder.**

Index Register

A hardware element which holds a number that can be added to (or, in some cases, subtracted from) the address portion of a computer instruction to form an effective address. Also known as **base register**. An index register in a computer's CPU is a processor register used for modifying **operand** addresses during the run of a program.

Memory Buffer Register

MBR stand for **Memory Buffer Register**. This register holds the contents of data or instruction read from, or written in memory. It means that this register is used to store data/instruction coming from the memory or going to the memory.

Data Register

A register used in microcomputers to temporarily store data being transmitted to or from a peripheral device.

Link Register

Computations, sometimes result in 'carry over'. This is stored in the link register.

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BUS

A bus is a communication pathway over which information and signal are transferred between several components of computer and CPU.

Data Bus: Communicates data between CPU and other internal units of computer system. It is bi-directional.

Control Bus: Ensures the proper timing as it receives control signals. It is bi-directional.

Address Bus: Carries address signals to address data in different location in computer memory. It is uni-directional.

CPU Machine Cycle

Stepwise process from getting an instruction back to getting the next instructions is called the machine cycle of CPU. Steps involved in CPU machine cycle are:

Fetch: get an instructions from main memory

Decode: translate it into computer commands

Execute: actually process the commands

Store: write the result to main memory

Integrated Circuit (IC)

IC is semiconductor electronic circuit used in modern computers. It is called Integrated Circuit as hundreds of thousands of electronic circuits are fabricated within a single silicon chip. Each of these electronic circuit is called a **bit cell**. Different semiconductor technologies are:

SSI (Small Scale Integration): It have less than 100 components (about 10 gates)

MSI (Medium Scale Integration): It contains less than 500 components or have more than 10 but less than 100 gates

LSI (Large Scale Integration): Here number of components is between 500 and 300000 or have more than 100 gates.

VLSI (Very Large Scale Integration): It contains more than 300000 components per chip

ULSI (Ultra Large Scale Integration): It contains more than 1500000 components per chip.

Affecting factors of CPU Speed

System Clock Rate: Also known as processor speed, rate of electronic pulse used to synchronize processing. Measured in MHz (1 Mhz= 1million cycles per second)

[Bigger the number: faster processing]

Bus width: Amount of data that can be transferred at a time to memory and to input and output devices. An 8-bit bus moves 8 bits of data at a time. Bus width can be 8, 16, 32, 64, 128 and so far.

[Bigger the number: Faster data transfer]

Word size (Length): Amount of data that can be processed by the CPU at a time. An 8-bit processor can manipulate 8 bits at a time. Processors can be 8, 16, 32, 64, 128-bits and so far.

[Bigger the number=faster processing]

Computer Memory

Basically all the computer use the following types of memories:

1. Internal / Main / Primary Memory

Internal Memory or storage is the holding area in which instructions and data are kept.

Common types of internal memory are: **magnetic core, semiconductor and bubble.**

Semiconductor Storage (Silicon Chip)

Semiconductor memory consists of hundreds of thousands of tiny electronic circuits etched on a silicon chip. Each of these electronic circuits is called a **bit cell**. These bit cells present in semiconductor memory chips are known as Integrated Circuits (ICs). The memory basically comes in two forms:

- a. ROM (Read Only Memory)
- b. RAM (Random Access Memory)
- c.

ROM (Read Only Memory)

It is major type of **non-volatile** memory. These are inflexible, so generally used for static programs. ROM contains **BIOS** (Basic Input Output System) program known as ROM-BIOS, which performs **POST** (Power OnSelf Test) and startup process. Different Types of ROM are:

- a. **Programmable Read Only Memory (PROM)**
It can be programmed by special equipment only one time.
- b. **Erasable Programmable Read Only Memory (EPROM)**
Can be erased and reprogrammed sending ultraviolet ray through the glass window installed at the top of ROM.
- c. **Electrically Erasable Programmable Read Only Memory (EEPROM)**
Can be erased under software control or using electric signal, is most flexible type of ROM and mostly used in PCs
- d. **Electrically Alterable Programmable Read Only Memory (EAPROM)**
Programmed by using **electric signal**, easy to load and store temporary or permanent information, information loaded in this memory can be retained for many years without any power supply. Works as a **backup of RAM**.

RAM (Random Access Memory)

It is **volatile memory**, i.e. all data gets lost when power supply is off. It is also known as **working memory** or **user memory** or **read/write memory**. Different types of RAM are:

- a. **Static Random Access Memory (SRAM)**
Maintains its data as long as power is provided, does not need to be rewritten (refreshed) periodically. It is very fast and expensive. Often used as cache memory due to its speed.
- b. **Dynamic Random Access Memory (DRAM)**
Data must be rewritten (refreshed) periodically done by placing memory on refresh circuit. Cheap and small.

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2. External / Auxiliary / Secondary Memory

This memory lies outside the main body of the CPU where programs and data are store for future use.

Magnetic Media

- Floppy Disk
- Magnetic Tape
- Ls-120 Disk
- Hard Disk
- Zip Drives

Optical Media

- CD-ROM
- DVD

Magnetic Tape

- It is thin tape coated with fine magnetic material used for analog or digital data.
- It is **serial access** medium, similar to audio cassette.
- Often used to **back up** large amount of important documents and files.
- It is **cheaper**.
- Data density of tape is measured in **BPI** (Bits per Inch) which ranges from 800 bpi upto 6250 bpi

Floppy Disk

It is a piece of plastic coated in magnetic material and encased in a hard plastic case.

The storage capacity of floppy disk is 1.44 MB

Floppy disk information

| Size and Type | Speed | Track | Sector | Capacity |
|------------------------|---------|-------|--------|----------|
| 5.25" (Double Density) | 300 rpm | 40 | 9 | 360 KB |
| 5.25" (High Density) | 360 rpm | 80 | 15 | 1.2 MB |
| 3.5" (Double Density) | 300 rpm | 80 | 9 | 720 KB |
| 3.5" (High Density) | 300 rpm | 80 | 18 | 1.44 MB |
| 3.5" (Extra HD) | 300 rpm | 80 | 36 | 2.88 MB |

Size of floppy disk

- 8-inch floppy disk
- 5.25-inch floppy disk
- 3.5-inch floppy disk

Hard Disk

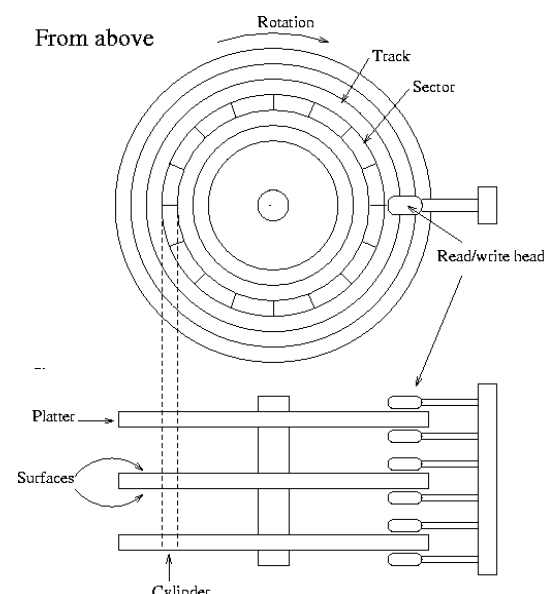
It is a metal disk coated in a magnetic material and encased in hard disk drive. The disk is divided into several **tracks or cylinders** and **sectors or clusters**. The process of reading/writing is done with electricity and magnetism. [Note: magnetized: 1, non-magnetized:0]
The hard disk spins at 3600, 7000 or above RPM.

Some factors affecting hard disk performance

Seek time: Speed with which drive can position its read/write head over particular data track.

Latency: Time elapses between the moment when the read/write head settles over the desired data track and the moment when the first byte of the required data appears under the head.

Access time: sum of seek time and latency



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Elements of formatted magnetic disk

Tracks: Circular ring on one side of the disk. Each track has a unique number.

Sectors: A disk sector is a wedge-shape piece of the disk. Each sector is numbered.

Clusters: A cluster is a set of track sectors, ranging from 2 to 32 or more.

Cylinder: Set of matched tracks.

Compact Disk (CD)

CD-R: CD Recordable

CD-ROM (Compact Disk-Read Only Memory): Standard CD has capacity of 650 MB.

CD-RW R/W (CD-ROM Re-writable): contains phase-change material, that can be written and overwritten several times.

DVD (Digital Video/Versatile Disk): Size is same as CDs but can hold data upto 17 GB.

Types of auxiliary storage devices based on type of data access.

1. **Sequential Access Media:** Data can be read in sequence, also called serial device. E.g. Magnetic Tape
2. **Random Access Media:** Data can be accessed directly without passing through intervening points, E.g. Magnetic disk, zip disk etc.

Disk Drive: Electromechanical Input-Output device, driven by some amount of electricity, denoted by drive letter

| Storage Media | Drive Letter |
|---------------|--------------|
| Floppy Disk | A:, B: |
| Hard Disk | C:, D:, E: |
| CD-ROM | F: |
| MO | G: |
| Network Drive | M: |

Storage Devices and their capacity

| Name | Size | Capacity |
|---------------|-------------|---------------------|
| Floppy Disk | 3.5" | 1.44 MB |
| Super Disk | 3.5" | 120 MB |
| Compact Disk | 4.75" | 630 MB to 1 GB |
| Hard Disk | 3.75"(app.) | 10 MB to several GB |
| Optical Tape | 4 mm, 8 mm | upto 1 TB |
| Magnetic Tape | 0.5", 0.75" | 60 MB to 5 GB |

Data storage technologies of computer

Paper Technology: Paper Tape, Punch Card

Magnetic Technology: Magnetic Disk, Magnetic Tape, Magnetic Core

Optical Technology: Optical Disk (CD, DVD)

Magneto-Optical Technology: MO Disk

Semiconductor Technology: Pen drive, Flash card, RAM etc.

Types of Storage

Based on Handling

Removable Disk: Can easily be removed from computer- Floppy disk, pen drive, CD

Fixed Disk: Attached in computer- Hard Disk

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Based on Data volume

Mass storage media: Holds amount of data- Magnetic tape, hard disk

Limited storage: Holds limited or small amount of data- Floppy disk, smart card

Other memories

Flash Memory:

- Solid state, non-volatile, rewritable, functions like RAM and hard disk combined.
- Used in cellular phone, camera, printer, pager, audio recorders etc.
- Introduced by **Toshiba** in 1984,
- Flash memory was developed from EEPROM (electrically erasable programmable read-only memory).

Cache Memory: faster memory serves as buffer between processor and main memory. There are 5 to 6 levels of cache.

Virtual Memory:

- Memory that appears to exist as main storage although most of it is supported by data held in secondary storage, transfer between the two being made automatically as required.
- If that piece of memory is later referenced by a program, the operating system reads the memory page back from the page file into physical memory, also called 'swapping' or 'paging in'.

INPUT DEVICE

Data and instruction (textual, audible, visual, graphic or mechanical) given to computer is known as **input**.

Input devices are the devices which give input to computer.

some popular input devices:

Keyboard

Keys are arranged in similar way to typewriter

Types of keyboard (on the basis of model)

QWERTY: The most commonly used layout of keyboard.

83 keys- XT Keyboard

84 keys- AT Keyboard

101 keys- Enhanced Keyboard

104 keys- Enhanced Windows Keyboard (Standard Keyboard)

Ergonomic: Divided into two parts- for left and right hands, to fit the natural position of hands

Mouse:

Pointing devices used for GUI (Graphic User Interface) based operating system. Consists of two or more buttons.

Graphic Tablet/ Graphic Digitizer: Flat board over which pen (**stylus**) is moved to create digital graphic arts

Light Pen: Pointing device connected to VDU (Visual Display Unit)

OMR (Optical Mark Recognition (or Mark Sensing)): Detects black marks on white paper, used to check **MCQ** (Multiple Choice Question) Test papers.

OCR (Optical Character Recognition): Used for **scanning text**. When light passes through page it give two dimensional pattern of light and dark, which can be represented by 1's and 0's. The binary code is assigned to ASCII code.

MICR (Magnetic Ink Character Recognition): Ink Character Recognition system specially used in **banking** industry to facilitate the processing and clearance of cheques and other document.

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Sensors: Used to collect data when processes are automated such as car washes, washing machine, heading control

Digital Camera: To take photos. Common Standard of the photo is JPEG (Joint Photographic Expert Group)

Scanner: Converts paper image into digital form.

Types:

- a. Sheet-Fed Scanner: Has mechanical roller
- b. Flatbed Scanner
- c. Handheld Scanner

Trackball: Used as alternate of mouse. It is fixed in its position, only ball is moved to control the cursor. Included in laptop also

Joystick: Having stick perpendicular to its base, used for playing games.

Touch Screen: Touch sensitive screen. When touched infrared light beam shines around and locate the position.

Bar Code Reader: Used to read the information stored in bar code.

[bar code is series of lines with different thickness]

Digitizer: Converts analog information into digital. Mostly used for **GIS** (Geographical Information System)

Touch Pad: Pointing device used in laptop.

Pedal Mouse: Controlled by foot, can be moved 360 degree

Data Glove: Glove equipped with sensors that senses the movement of hand, usually used in virtual environment.

OUTPUT DEVICE

Result obtained after the processing of data is known as output. Output devices are the devices which give output in the form user desired.

Types of Output Devices (based on the nature of output)

1. Softcopy Output Device: Gives temporary output or output in electronic form

e.g. Speaker, Monitor, Projector

2. Hardcopy Output Device: Gives permanent result (for future)

e.g. Plotter, Printer

Printer

The output device which has mechanism to produce output on paper

Types of Printer (Based on the contact between paper and print head or printing mechanism)

1. **Impact Printer:** Printer Head and paper touch each other
2. **Non-impactPrinter:** Printer head and paper do not touch each other.

IMPACT PRINTERS

- **Dot Matrix:** Printer head made up of pin, push out to give different patterns to produce text or graphics on paper. Very noisy
- **Daisy Wheel & Golf Ball Printer:** Solid font type character printer. Can't print graphics. printer head contains a set of arms arranged in wheel like form.

Types of impact printer (Based on speed)

1. **Serial or character printer:** produces a character at a time on a paper. can print graphics as well as text. Speed is low.

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- Dot Matrix Printer
 - Daisy Wheel Printer
2. **Line Printer:** Prints a line at a time. At each column there is a full set of character arranged in a circle around the cylinder. The cylinder revolves quickly.
- Chain Printer
 - Drum Printer
3. **Page Printer:** Transfer image of text and picture on paper at a time. High quality and high speed printer

NONIMPACT PRINTERS

Nonimpact printers, used almost everywhere now, are faster and quieter than impact printers because they have fewer moving parts. Nonimpact printers form characters and images without direct physical contact between the printing mechanism and the paper.

- **Inkjet Printer:** Creates images by spraying droplets or special inks contained in cartridges at the paper.
- **Laser Printers:** Uses deflecting laser beam on to the photosensitive surface of drum and the image attracts the toner to the areas. As heat and pressure is applied to the toner it is melted and pressed onto the paper to form a permanent image. expensive, speed and high quality printer.

Resolution: Resolution determines the quality of printer. It is measured in dots per inch (dpi). Higher the dpi, better the quality.

The speed of printer:

CPS: Character per Second

LPM: Line per Minute

PPM: Pages per Minute

PLOTTERS

Plotter, like printer produces hard copy output, which produces high quality color graphics, usually categorized by whether they use pen or electrostatic charges to create images.

Types of Plotter

Pen Plotter

Flatbed Plotter

Drum Plotters.

Electrostatic Plotter

[Quality of Pen Plotter is best]

Monitor: also known as VDU (Visual Display Unit), converts the electronic signals from computer into a visual display.

CRT (Cathode Ray Tube)

Flat Panel Display

LCD (Liquid Crystal Display)

LED (Light Emitting Diode)

VDA (Video Display Adapter): Also called video card or graphic card, an expansion card that creates a circuit pathway so that data can travel from the main board to the monitor.

- **Resolution:** refers number of dots on the screen or **pixels**. Expressed as pair of numbers that give the number of dots on a line (horizontal) and the number of lines (vertical). The resolution is determined by the number of colors and the amount of video memory.

Fundamental of Computer (Computer Operator)

640 * 480 pixels (VGA/SVGA)

800 * 600 pixels (SVGA)

1024 * 768 pixels (SVGA)

1280 * 1024 pixels (SVGA)

- **Color Depth:** it is the number of colors determines by the number of bits assigned to hold color value. Memory on the video adapter limits the number colors that can be displayed at each resolution.
4 bits- 16 colors 8 bits- 256 colors 16 bits- 32000 colors 24 bits – 16 Million (true color)
- **Refresh Rate:** Speed that the display uses to paint the dots on the screen
- **Accelerator:** Means that the display adapter can draw lines and boxes and can move windows and scroll itself.

Monochrome

Display only one color. A company called **Hercules Graphics** developed this video adapter.

CGA (Color Graphics Adapter) / EGA (Enhanced Graphics Adapter)

VGA (Video Graphics Array)

SVGA (Super Video Graphics Array)

XGA (Extended Graphics Array)

| Types | Resolution | Supporting Colors |
|-------|-------------|-------------------|
| CGA | 320 * 200 | 4 colors |
| EGA | 640 * 350 | 16, 64 colors |
| VGA | 640 * 480 | 16 colors |
| VGA | 320 * 200 | 256 colors |
| SVGA | 800 * 600 | 16 colors |
| SVGA | 1024 * 768 | 256 colors |
| SVGA | 1280 * 1024 | 256 colors |
| SVGA | 1600 * 1200 | 256 colors |
| XGA | 1024 * 768 | 256 colors |

Interface (port to connect printer)

Types

Proprietary: usually built into sound cards to control CD ROM drives, or bundled with tape drivers. They have been mostly discontinued since 1996.

Serial: Ports for serial mouse and modems

Parallel: Mostly used for high speed print ports: ECP (Enhanced Capabilities Port) and EEP (Enhanced Parallel Port) which transfer data faster and better.

SCSI (Small Computer System Interface): most commonly used for hard disk drives and [tape drives](#), but it can connect a wide range of other devices, including scanners and CD drives. There are 3 common types: 1, 2, 3.

USB (Universal Serial Bus): Hailed as the latest and greatest type of ports available interface.

Fundamental of Computer (Computer Operator)

SOFTWARE

Logical components or set of procedures or routines or instructions to perform any task is called software.

Types:

1. System Software
2. Application Software

A. System Software: Software which facilitate the operation of computer:

1. **Operating system software:** Software provides communication between computer hardware and user. It is the platform for all other software.

Types (Based on Interface):

- CLI (Character Line Interface): Work with commands
- GUI (Graphic User Interface): Windows with graphic and symbols

Types (Based on User):

- Single User: Windows
- Multiuser: Unix, Linux
- **Types (Based on operation)**
 - Single Task: DOS
- Multitask: Windows

Functions of OS

- Memory Management
 - Security Management
 - Input/ Output Management
2. **Utilities:** Software designed to maintain the computer system. e.g. Disk Defragmenter, Antivirus software
 3. **Device Driver:** Software needed to operate hardware components and peripheral devices of computer.

B. Application Software: Software designed for particular purpose

- **Packaged Software:** Designed for public use
- **Tailored Software:** Designed for personal use

C. Programming Language

a. **Low Level Language**

- i. **Machine Language:** 1st Generation Language Uses only 0 and 1.
- ii. **Assembly Language:** 2nd Generation Language, Uses mnemonic (symbols)

b. **High Level Language:** 3rd Generation Language, uses English Word and phrases.

Language Processor

Language translator or converter to convert high level or assembly language to low level language

Interpreter: Converts program written in High Level Language into Machine Language line by line

Assembler: Converts program written in assembly language into Machine language

Compiler: Converts whole program written in High Level language into Machine Language. The process is called compilation

[Source Code and Object Code: Source code original programming code. Object code is the output of compilation after converting HLL to LLL.]

Some terminologies

Firmware: Software stored in computer's ROM or computer's circuitry

Liveware (humanware): users and persons related to computer.

Shareware: programs available for trial

Freeware: programs available completely free

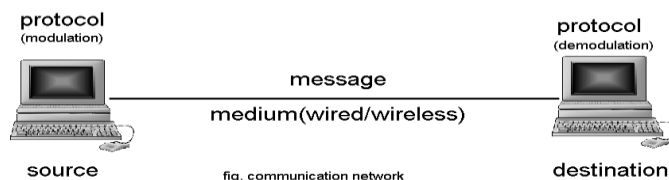
Netware: Networking software

Open Source: Software code available freely

COMPUTER NETWORK

- A group of computers connected together with wire or wireless medium which shares data and resources.
- Interconnection of two or more computers with wire or wireless medium.

The first computer network was ARPANET(Advanced Research Project Agency Network)



Layer Functions

| | |
|--------------|---------------------------|
| Application | User interface |
| Presentation | Data formatting |
| Session | Establish & maint connect |
| Transport | TCP - Accurate data |
| Network | IP - Routers |
| Data Link | MAC - Switches |
| Physical | Signals - Cables |

[layers defined by International Standard Organization's Open System Interconnect (ISO/OSI)]

Data Transmission Mode

Refers to the direction of signal flow

There are two types of transmission mode:

1. Simplex Mode
2. Duplex Mode:
 - a. Half Duplex
 - b. Full Duplex

Simplex Mode

Transmission Mode where communication is done only in one direction also known as unidirectional mode.

e.g. TV Broadcasting

Duplex Mode

Transmission Mode where communication is done in both directions also known as bidirectional mode.

Half Duplex

Two way communication, but one direction at a time

e.g. Walky Talky

Full Duplex

Two way simultaneous communication

e.g. Telephone

Bandwidth: Bandwidth, also known as data transfer rate, is the amount of data that can be carried from one point to another in a given time period. It is measured in terms of Bps(Bytes Per Second)

Fundamental of Computer (Computer Operator)

Narrow Band: low capacity, 64 KBPS to 1.54 MBPS

Wide Band: medium capacity, 1.54 MBPS to 45 MBPS

Broad Band: high capacity, upto GBPS (cable tv, microwave, satellite etc.)

Networking components

1. Server/ File Server
2. Work station
3. NOS (Network Operating System)
4. NIC (Network Interface Card)
5. Transmission Media / Communication channel
6. Network Devices

Server

The most powerful computer in the network which has large storage and high processing capacity, that controls and manages the computer in network is called server or file server. It has Network Operating System)

Client / Workstation

Computers connecting to the file server are known as workstation. They are of lesser capacity with their own operating system but they should have NIC (Network Interface Card)

NOS

Stands for Network Operating System. It is the system software that controls and manages all the resources and creates an environment for data sharing.

NIC

Stands for Network Interface Card, It is used to establish physical connection between in computers and network.

[Note: Each NIC is distinguished by its physical address known as MAC (Media Access Control) Address]

Transmission Media

The communication path in the network is called transmission media. It is of two types:

- a. bound/wired/ guided: that use physical path
- b. unbound/ wireless/unguided: that do not use physical path

Guided Media

- a. Open Wire: Electric Wire
- b. Twisted Pair: a type of copper cables with twisted wires

Types:

- **Unshielded Twisted Pair (UTP)**
- **Shielded Twisted Pair (STP)**
- c. Coaxial Cable: **single conductor made up of copper wire (used on Cable TV)**
- d. Fiber Optics: fasted guided transmission medium made up of glass or plastic fibers

Unguided Media

- a. **Microwave**:
 - Fast
 - Limited to line-of-sight transmission

Fundamental of Computer (Computer Operator)

- Used by mobile phone, television channel
- b. Satellite**
 - Station in the space which receives signals from earth-based station, amplifies it and broadcast back to the earth station
 - Allow high quality data transfer
- c. Infrared:**
 - Short-range wireless transmission
 - Used in mouse, printer, tv remote control
- d. Bluetooth**
 - Short-range wireless transmission (upto 10 meters)
 - Used in mobiles, laptops
- e. Wi-Fi**
 - Stands for wireless fidelity
 - Allows electronic devices to exchange data (including high-speed internet)

Examples of network devices

a. Modem (modulator-demodulator)

Converts analog signal into digital and vice versa.

b. Repeater

Amplifies and regenerates the weak signal

c. Hub:

Multiport repeater, used to connect various segments in network.

d. Router

Used to send/receive data packets. Also used for filtering and traffic control in the network.

e. Bridges

Used to connect two similar communication networks.

f. Gateway

Used to connect two dissimilar communication networks.

Types of Network: on the basis of architecture

a. Peer to Peer Network

b. Client-Server Network

c. Hybrid Network

Peer to Peer Network

The architecture of computer network where each computer in the network can act as a client and server for other computers is called peer to peer network.

It can be setup within the home, business or over the internet

Client Server Network

The architecture in which workstations are connected with main server or host is called client server network. In this architecture data sent by any computer first reaches to server and then shared to each computer in the network.

Hybrid Network

Combination of both peer to peer network and client server network

Fundamental of Computer (Computer Operator)

Types of Network: on the basis of geographical location

- LAN (Local Area Network): covers small area like school, office, computer lab upto 5 km
- MAN (Metropolitan Area Network): covers 5 to 50 km
- WAN (Wide Area Network): no physical boundary.

NETWORK TOPOLOGY

Topology can be considered as a virtual shape or structure of a network. Network Topologies can be physical or logical

- Physical Topology means the physical design of a network including the devices, location and cable installation.
- Logical Topology refers to the fact that how data actually transfers in a network as opposed to its design

Bus Topology

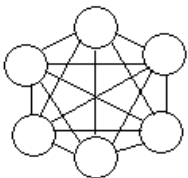
All devices are connected to a central cable, called the *bus* or *backbone*.

Star Topology

All devices are connected to a central [hub](#). Nodes communicate across the network by passing data through the hub.

Ring Topology

All devices are connected to one another in the shape of a closed loop, so that each device is connected directly to two other devices, one on either side of it.

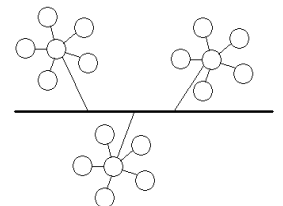
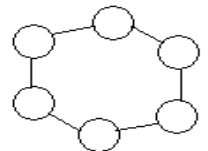
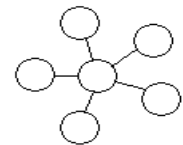
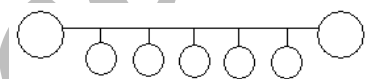


Mesh Topology

Devices are connected with many redundant interconnections between network *nodes*. In a true mesh topology every node has a connection to every other node in the network.

Tree Topology

A hybrid topology. Groups of star-configured networks are connected to a linear bus backbone. [combination of bus and star topology]



PROTOCOL

Protocols are standards or rules that controls communication within a network.

Types of Protocol

TCP/IP (Transmission Control Protocol/ Internet Protocol): It is the most commonly used protocol over internet.

HTTP (Hyper Text Transfer Protocol): It is the rules for transferring multimedia files (text, sound, image, video, animation) on the Word Wide Web.

FTP (File Transfer Protocol): It is the protocol used to transfer data from a particular computer to another over world wide web.

SMTP (Simple Mail Transfer Protocol): Protocol for mail delivery that cannot pull messages from remote server on demand

POP: Post Office Protocol for receiving e-mail

TELNET: It is a user command underlying TCP/IP protocol for accessing remote computer.

Fundamental of Computer (Computer Operator)

INTERNET AND EMAIL SERVICES

- Internet is the largest public global network that connects millions of computer networks all over the world. So, it is known as network of networks.

History of Internet

- The foundation of internet is ARPANET (Advanced Research Project Agency Network), the project started in 1969 by DOD (Department of Defense) of US to allow researchers and military personals to communicate with each other.
- Till 1960's this internet was only limited within the US.
- Internet became worldwide in early 1970's after it was distributed in Europe and Japan.

Internet services

- E-mail:** E-mail is short form of Electronic mail. It is a network service that allows to transfer text message, image from one computer to another.

It uses two protocols:

a. **POP:** Post Office Protocol

b. **SMTP:** Simple Mail Transfer Protocol

- E-commerce:** Electronic commerce refers to the online business like online shopping, e-banking etc.
- IRC:** It stands for Internet Relay Chat. It is a service that allows user to exchange message or information simultaneously. E.g. Yahoo messenger.
- Video Conferencing:** It transmits audio and video and enables face to face conference.
- Telnet:** It stands for telephone network and is the program that allows a user to connect and access remote computer. So, it is also known as remote log in
- FTP(File Transfer Protocol):** It is a protocol as well as internet service which allows transferring (uploading and downloading) files between remote computers.

Some Important Terms

World Wide Web(WWW): It is the service that allows end users to access data that is stored on the computer in networks through web address or URL (Uniform Resource Locator).

Website: Collection of information stored in internet in different files is known as website.

Web Page: Single page of a website that contains information in specific topic or subject is called a webpage.

URL: Unique address that specifies the location of the file on the internet is known as URL (Uniform Resource Locator). URL consists of four parts: protocol, host computer, domain and file name

<http://www.smartinfotechnepal.com/download.html>

[protocol: http, host: www, domain name: smartinfotechnepal, domain type: com, file: download.html]

Home Page: The first page of each website is known as home page, which contains the brief introduction of website.

Download : The process of transferring file from remote computer to user's computer is known as download.

Upload: The process of transferring file from user's computer to remote computer(server) is known as upload.

Search Engine: A website which allows users to search information about any subject based on the keyword or combination of keywords is known as search engine. Yahoo.com, google.com are popular search engines.

Browser: A software that allows user to view the content on the internet or world wide web is called a browser. In another word, a browser is the software required for browsing or surfing websites. E.g. Internet Explorer, Mozilla Firefox, Opera, Safari, Google Chrome, Netscape Navigator

Hypertext: The text or link that jumps to another page is known as hypertext or hyperlink or simply link

ISP (Internet Service Provider): ISP is an organization that provides the internet service to different users.

Mercantile, World Link, Web Surfer are some of ISP's in Nepal.

Smart InfoTech

[A Corner for Computer Learners]

Fundamental of Computer (Computer Operator)

DNS Servers

DNS server is a computer that translates the domain name of another computer into an IP (Internet Protocol) address and vice versa on request. Every computer in the network has an IP address, which specifies its physical network connection. To locate the information in Internet two kinds of addresses can be used. These are domain names and IP addresses. Domain names follow a format called Domain Name system.

INTRANET AND EXTRANET

Intranet: A private computer network serving a single organization is known as intranet. Intranets are typically limited to one organization or site with little or no access to outside users.

Extranet: A private network that is extended to users outside the company or branches of organization through the internet is known as extranet.

Internet Related Organizations

- ❖ **W3C:** World Wide Web Consortium
- ❖ **IETF:** Internet Engineering Task Force
- ❖ **IRTF:** Internet Research Task Force
- ❖ **ISOC:** Internet Society
- ❖ **IAB:** Internet Architecture Board
- ❖ **ISO:** International Standard Organization
- ❖ **IEEE:** Institute of Electrical and Electronic Engineers

Some Facts about email and internet

- ❖ First email system was MAILBOX, used at Massachusetts Institute of Technology from 1965. Another early program to send messages on the same computer was called SNDMSG.
- ❖ **Raymond Tomlinson** was the person who sent the first email in **1971**, through the **ARPANET** (considered the mother of the internet)
- ❖ Today's email systems are based on a store-and-forward model
- ❖ **The first domain name ever registered was Symbolics.com on March 15, 1985.** Now it serves as a historic site.
- ❖ Hotmail was founded on July 4, 1996 by [Sabeer Bhatia](#) and [Jack Smith](#). In December 1997, there Microsoft bought Hotmail for \$400 million. The service was renamed to Outlook.com in 2012.

FULL FORMS

WLAN: Wireless Local Area Network
MODEM: Modulator Demodulator
IPX/SPX: Internet Packet Exchange/Sequantial Packet Exchange
IR: Infrared
CCTV: Closed Circuit Television
VOIP: Voice Over Internet Protocol
Telnet: Terminal Emulation
Fax: Fascimile

PSTN: Public Switched Telephone Network
ADSL: Asymmetric Digital Subscriber Line
ISDN: Integrated Services Digital Network
IRC: Internet Relay Chat
FDMA: Frequency Division Multiple Access
TDMA: Time Division Multiple Access
CDMA: Code Division Multiple Access
WIMAX: Worldwide Interoperability for Microwave Access

SOME TERMS

URLs, Domain Name and IP Address:

The universal resource locator, or URL, is an entire set of directions, and it contains extremely detailed information. The domain name is one of the pieces inside of a URL. The IP address is a numerical code that makes this possible.

The domain name is a part of the URL, which points to the IP address.

Fundamental of Computer (Computer Operator)

Broadcast address -- An IP address with a host portion that is all ones.

Host -- A computer or other device on a TCP/IP network.

Internet -- The global collection of networks that are connected together and share a common range of IP addresses.

InterNIC -- The organization responsible for administration of IP addresses on the Internet.

IP -- The network protocol used for sending network packets over a TCP/IP network or the Internet.

IP Address -- A unique 32-bit address for a host on a TCP/IP network or internetwork.

Network address -- An IP address with a host portion that is all zeros.

Octet -- An 8-bit number, 4 of which comprise a 32-bit IP address. They have a range of 00000000-11111111 that correspond to the decimal values 0- 255.

Packet -- A unit of data passed over a TCP/IP network or wide area network.

RFC (Request for Comment) -- A document used to define standards on the Internet.

Router -- A device that passes network traffic between different IP networks.

Subnet Mask -- A 32-bit number used to distinguish the network and host portions of an IP address.

Subnet or Subnetwork -- A smaller network created by dividing a larger network into equal parts.

TCP/IP -- Used broadly, the set of protocols, standards and utilities commonly used on the Internet and large networks.

Wide area network (WAN) -- A large network that is a collection of smaller networks separated by routers. The Internet is an example of a very large WAN.

Cyberspace : The computer world.

Web site: The electronic storefront.

Web Browser: The software to glide through the network.e.g. Netscape, Mozilla, Google Chrome, Internet Explorer etc.

HomePage: The introductory screen.

HTML: Hyper Text Markup Language. A Language for the home page.

Protocol: Set of rules framed for transmission on the network

HTTP : Hypertext transfer Protocol. This is how the WWW (World Wide Web) pages are transferred over the net.

Ping

Ping is a computer network administration software utility used to test the reachability of a host on an Internet Protocol (IP) network and to measure the round-trip time for messages sent from the originating host to a destination computer.

NETWORK PORTS

In computer networking, a **port** is a software construct serving as a communications endpoint in a computer's host operating system. A port is always associated with an IP address of a host and the protocol type of the communication. It completes the destination or origination address of a communications session. A port is identified for each address and protocol by a 16-bit number, commonly known as the **port number**.

Port numbers range from 0 to 65536, but only ports numbers 0 to 1024 are reserved for privileged services and designated as well-known ports. This list of well-known port numbers specifies the port used by the server process as its contact port.

WELL KNOWN PORT Numbers

20 & 21: File Transfer Protocol (FTP)

22: Secure Shell (SSH)

23: Telnet remote login service

25: Simple Mail Transfer Protocol (SMTP)

53: Domain Name System (DNS) service

80: Hypertext Transfer Protocol (HTTP) used in the World Wide Web

110: Post Office Protocol (POP3)

119: Network News Transfer Protocol (NNTP)

143: Internet Message Access Protocol (IMAP)

161: Simple Network Management Protocol (SNMP)

194: Internet Relay Chat (IRC)

443: HTTP Secure (HTTPS)

465: SMTP Secure (SMTPS)

The protection given to computer for the hardware, software, data and information from being lost or damaged due to accidental or intentional harm is known as computer security.

3 Aspects of computer security

1. **Confidentiality:** Information should be available only to authorized user- 'the right people' and should be prevented by unauthorized one- 'the wrong people'. This is possible by using username and password
2. **Integrity:** Information should not be modified due to unauthorized access. Receiver should receive the information exactly as it was sent by sender.
3. **Availability:** Information should be available in complete form when it is required by the authorized user.

Types of security measure / Ways of security

Hardware and Environmental Security: The protection of all hardware components used in computer system is known as hardware security.

Hardware Security Measures

- Regular Maintenance
- Insurance
- Dust free environment
- Protection from fire
- Building construction
- Protection from theft
- Power protection devices (UPS, Volt Guard)
- Air conditioner System
- Access Control

Software and Data Security: The protection of data and programs used in computer system is known as software security. In other words, software security is the means which ensures that data and software are kept safe from corruption and loss

Software Security Measures

- Password Protection
- Backup System
- Avoid pirated software
- Use of anti-virus software
- Use of anti-spyware soft.
- Use scandisk, CHKDSK and defragmentation tool

Some Important terms

Back up: is the process of copying data and programs to another location or creating duplicate copy of it in a secured location

Password: Password is a secret word or sequence of characters that gives a user access to particular programs or computer system

CHKDSK (Check Disk): It is an important utility program that helps to keep a disk in good working condition.

UPS: UPS (Uninterruptible Power Supply) is a battery supported power protect device that controls the electric voltage and supplies clean and continuous power to the computer system even during power failure.

Fragmentation and Defragmentation:

The spreading of the parts of the same disk file over different location is called fragmentation. It makes slow disk access and breakdown the overall performance of the disk operation

Defragmentation is the process of rearranging the fragmented files in the continuous spaces on the disk.

Fundamental of Computer (Computer Operator)

COMPUTER VIRUSES AND SECURITY MEASUREMENT

Computer Virus is a computer program that can execute itself by making copies of itself and infect a computer without permission or knowledge of the user.

It is developed by the programmer with the intent of destroying or damaging the data, information and programs residing in the computer system.

Trojan Zlob.H, W32.Neshuta, Blackdoor.Dccane are some common viruses

Types of Virus

Boot sector virus

Boot sector virus infects the boot sector or Master Boot Record (MBR) of the disk

Script Virus

Script Virus infects programs written in high level scripting languages like Visual Basic Script and JavaScript.

Macro Virus

Macro Virus infects the macros within a documents or template. It is activated when we open the word or excel program. Microsoft applications have the feature called "Macro Virus Protection".

Multipartite Virus

A multipartite virus is a computer virus that infects and spreads in multiple ways

Ghostball is an example of Multipartite Virus.

[the first multipartite, discovered in October 1989.]

Stealth Virus

Stealth Virus is a type of virus which tries to fool antivirus software by hiding itself and files infected by it.

Examples: 4096, Brain

Polymorphic and Metamorphic Virus

Polymorphic Virus: A polymorphic virus is one that can change its appearance with every infection

Metamorphic Virus: A metamorphic virus is one that rewrites itself completely each time if infects the system

Polymorphic and Metamorphic virus are also known as self-modifying viruses

COMPUTER WORMS

A **computer worm** is a destructive malware program that replicates itself in order to spread to other computers. Often, it uses a computer network to spread itself.

TROJAN HORSE

Trojan horse is a type of malware that steal information with the purpose of granting hacker unauthorized access to computer.

LOGIC BOMB

A logic bomb is a piece of code intentionally inserted into a software system that will set off a malicious function when specified conditions are met. Most common activator for a logic bomb is date and time, which is activated in the specified time.

SPYWARE

Spyware is a type of malware that can be installed on computers, and which collects small pieces of information about users without their knowledge. E.g.: Keylogger, Zango, HuntBar etc.

[Anti-spyware are tools to combat or eliminate spyware on a computer system.]

ANTIVIRUS SOFTWARE

Antivirus Software is a type of program that is designed to detect and remove viruses from computer system to make virus free environment. Some popular antivirus software are: Norton, Kaspersky, McAfee, Avg, Avira, Avast, Bit Defender, e-Scan, Quick Heal

CYBER LAW AND ETHICS

Cyber Law is the standard rules and regulation (law) adopted by any government or organizations to control and minimize the computer crime and it is related to the use of inter-networked information technology.

The main aim of the cyber law is to explain the legal issues to the computer users.

Fundamental of Computer (Computer Operator)

Cyber Law Deals with

- a. Intellectual Property Right
- b. Privacy and Data protection
- c. Computer (Cyber) Crime
- d. Digital Signature system
- e. Freedom of expression
- f. Electronic Transaction Act
- g. Telecommunication Law

Intellectual Property Right (IPR)

It is the right /law to preserve the intellectual property of individuals like artists, authors, musicians etc.

It includes:

- Copyrights
- Patent Rights
- Trademark

Cyber Crime

Computer crime, cyber crime, e-crime or electronic crime refers to any criminal activity that uses a computer or network as source, tool, target or place of a crime

Digital Signature

A digital signature is a mathematical scheme for demonstrating the authenticity of a digital message or document

Cyber Law in Nepal

The government of Nepal passed “The Electronic Transaction and Digital Signature Act-Ordinance” popularly known as “Cyber Law” on Bhadra 2061 B.S. (15 September, 2004)

Electronic Transaction Act

It deals with controlling and monitoring the electronic transaction like e-business, e-payment, online payment, electronic fund transfer etc.

IT Policy in Nepal

The information technology policy in Nepal was adopted in 2057 B.S. (2000 AD).

The objectives of IT policy are

- a) Make IT accessible to general public; increase employment through IT.
- b) Build knowledge -based society
- c) Establish knowledge-based industries.

Computer Ethics

The moral principles that guides the computer user for his/her social and professional conduct/behavior related to the use of computer and internet is known as computer ethics.

- Technological impact on society
- Plagiarism (stealing idea or work)
- Intellectual Property Law
- Copyright
- Piracy
- Hacking
- Internet Pornography
- Harassment and Stalking

Hacking:

The unauthorized access and use of networked computer system is known as hacking

Fundamental of Computer (Computer Operator)

MULTIMEDIA APPLICATION

Multimedia is a form of communication combining with different media and they may include text, audio, music, images, animation and video.

For e.g.

- Multimedia presentation
- Presentation of audio and video clips
- Multimedia software
- Educational software that involves animation, sound and text

Multimedia System

The proper combination of different multimedia tools (computer, multimedia software, sound card, microphone, CD/DVD Drive, CD/DVD-ROM, Scanner, Digital Camera, Headphone, Speakers, Webcam, iPod, Projector, Graphic Card) which work together to create, edit, store and publish the multimedia content is called the multimedia system.

DIFFERENT MULTIMEDIA ELEMENTS / COMPONENTS

There are five different multimedia elements:

- Text
- Graphic
- Audio
- Video
- Animation

TEXT

It is the combination of letters, digits and special characters.

File formats: txt, rtf(rich text format, doc, pdf(portable document format)

Application: notepad, wordpad, ms-word, adobe reader

GRAPHIC

Still images and graphics

File formats: jpg/jpeg (Joint Photographic Experts Group), bmp (bitmap), png (Portable Network Graphic), tiff(Tagged Image File Format), gif(Graphics Interchange Format)

Application: picasa, photoshop, paint, corel draw

AUDIO

Sound files

File formats: wav (Windows Audio Video), wma (Windows Media Audio), mp3 (Media Player layer 3), midi (Musical Instrument Digital Interface), amr (Adaptive Muti-Rate)

Application: winamp, sound forge, adobe audition, switch

VIDEO

Motion picture or live images

File formats: mp4 (Media Player Layer 4), mpg/mpeg (Motion Picture Expert Group), WMV (Windows Media Video), AVI (Audio Video Interleave)

Application: Windows Media Player, VLC Player, Adobe Premier, PowerDVD

Fundamental of Computer (Computer Operator)

ANIMATION

Simulation of series of pictures in frame is called animation.

File formats: swf (Short Wave File), gif (Graphic Interchange Format)

Application: Flash, swish, 3D Studio, MAYA, ImageReady

Advantages of Multimedia

- Easier medium of communication
- Helpful to create interactive teaching-learning environment
- Attractive tool in marketing, advertisement
- Portable
- Useful in motion pictures and film making

Disadvantages of Multimedia

- Developing multimedia content is expensive
- Expensive to set up multimedia system
- Well trained man power is needed
- Multimedia files are too large to share and transfer
- Requires high speed communication media

[Morphing: It is related to animation. It is a technique that allows smooth changes to occur to an object's shape by defining beginning, end, and possibly intermediate forms as guides or targets.]

Fundamental of Computer (Computer Operator)

SYSTEM

A "system" is a regularly interacting or inter – dependent group of items forming a united whole. A system is thus a set of interacting elements, interacting with each other to achieve a predetermined objective or goal.

For example, in a computer system, the computer receives inputs and processes than produces the output.

INPUT > PROCESS > OUTPUT

Conceptual model of a system:

A system can be defined any set of objects and ideas, and their interrelationships which are ordered to a common goal or purpose.

Characteristics of a System

- Every system has a certain objectives and goals.
- Main system has a several subsystems or models.
- The structure of the system is representation of the interaction and inter relationships between different components or subsystems that from a system.
- The lifecycle of the system is expression of the phases in the life of the system.
- System operates in the terms of goals and predetermined scope.
- Systems in real life do not operate in isolation.

Components of Information System :

In all information systems. Use the following components ;

- 1) **Human resources** [HR] - information system specialize and end users.
- 2) **Data resources** - data and knowledge base.
- 3) **Software resources** - system procedures and programmer .
- 4) **Hardware resources** - media and machines
- 5) **Networks resources** - for communications systems media and network support to perform input,

Types of system

Open and Close Systems

A closed system is one which is self contained. It has no interaction with its environment. No known system can continue to operate for a long period of time without interacting with its environment. An open system continuously, interacts with its environment. This type of system can adapt to changing internal and environmental conditions. A business organization is an excellent example of an open system.

Deterministic and Probabilistic System

In the deterministic system the behavior is completely known.

In the probabilistic system, the behaviour cannot be predicted with certainty

Fundamental of Computer (Computer Operator)

SYSTEM DEVELOPMENT LIFE CYCLE (SDLC)

SDLC refers to the steps to be followed while designing system or computer program.

1. **Defining the problem:** to find out the problem
2. **Analyzing the solution:** to find out way to solve the problem
3. **Designing the solution:** to design the solution with different designing tools like algorithm and flowchart
4. **Coding:** to code the program
5. **Testing and debugging:** to test the program and remove the errors
6. **Implementation:** to implement the program for practical use
7. **Review and maintenance:** to review the program for further modification

Tools for designing the solution




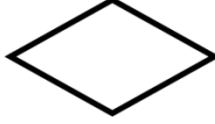

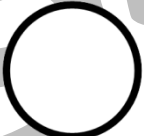
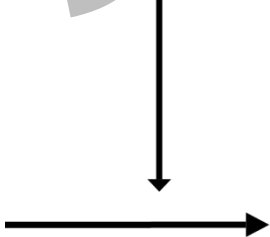
Algorithm

Stepwise solution for any problem is known as algorithm

Flowchart

Symbolic representation of algorithm (stepwise solution for any problem) is known as flowchart

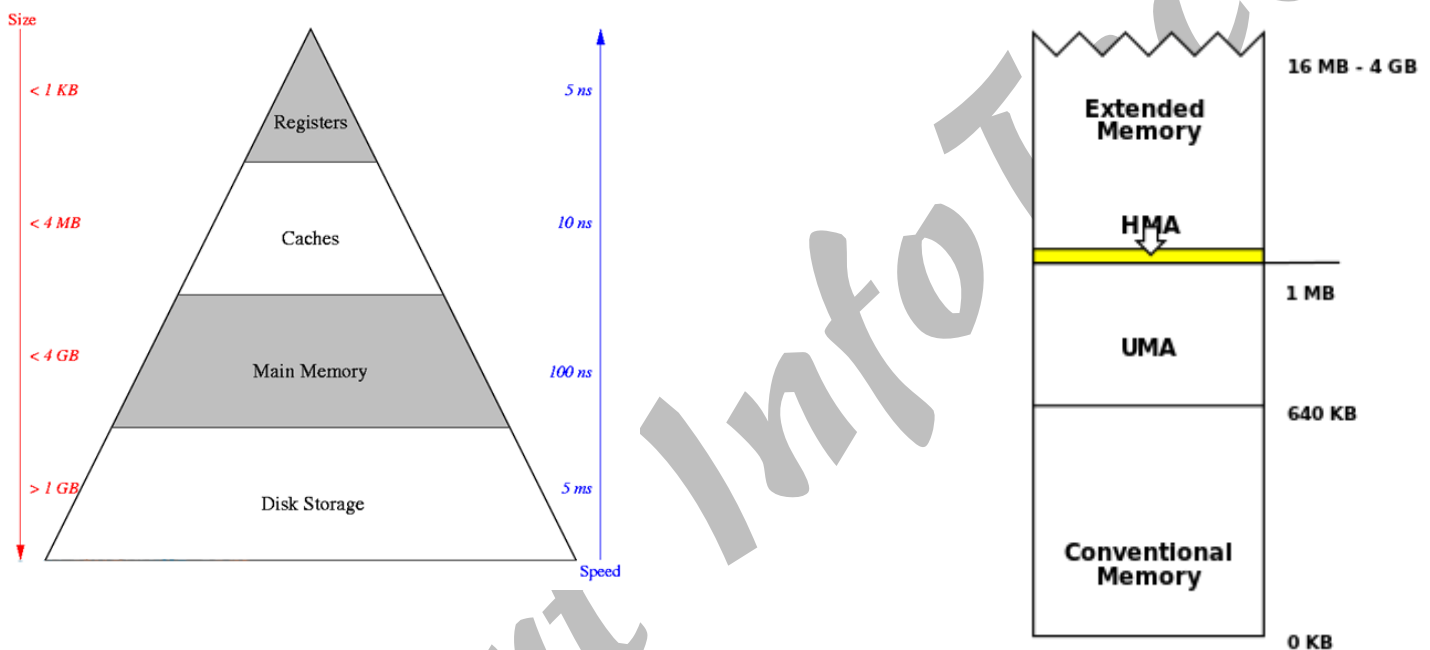
Symbols used in flowchart:

| Symbol | Name | Purpose/ function |
|---|-------------------------|-------------------|
|  | Rounded rectangle/ Oval | Start/ Stop |
|  | Rectangle | Process |
|  | Parallelogram | Input/ Output |
|  | Diamond/ Kite shape | Decision |
|  | - | Storage |
|  | Circle | Connector |
|  | Arrows | Flow Lines |

Fundamental of Computer (Computer Operator)

MEMORY HIERARCHY

1. **Register:** It is the fastest accessible memory of a computer system. It is the part of processor.
2. **Cache (MB):** Cache is the fastest accessible memory after register resides between cpu and main memory
3. **Main memory (GB):** Main memory is arguably the most used memory. The main memory is reasonably fast, with access speed around 100 nanoseconds. However, the main memory is volatile.
4. **Secondary storage (TB):** Secondary storage refers to nonvolatile data storage units that are external to the computer system. Hard drives and solid state drives are examples of secondary storage.
5. **Tertiary storage (PB):** Tertiary storage refers storage designed for the purpose data backup. Examples of tertiary storage devices are tape drives are robotic driven disk arrays. They are capable of petabyte range storage, but have very slow access speed with data access latency in seconds or minutes.



GENERATIONS OF COMPUTER LANGUAGE

A programming language is a set of written symbols that instructs the computer hardware to perform specific tasks. Typically, a programming language consists of a vocabulary and a set of rules (called syntax) that the programmer

1st generation of programming languages (1GL)

Machine language is the only programming language that the computer can understand directly without translation. It is a language made up of entirely 1s and 0s.

Machine language programs have the advantage of very **fast execution** speeds and **efficient use of primary memory**. Use of machine language is very **tedious, difficult and time consuming** method of programming. Machine language is low-level language..

2nd Generation of programming languages (2GL)

The first step in making software development easier and more efficient was the creation of **Assembly languages**. They are also classified as **low-level languages** because detailed knowledge of hardware is still

Fundamental of Computer (Computer Operator)

required. They were developed in 1950s. Assembly languages use **mnemonic** operation codes and symbolic addresses in place of 1s and 0s to represent the operation codes.

3rd Generation of programming languages (3GL)

Third generation languages, also known as **high-level languages**, are very much like everyday text and mathematical formulas in appearance. They are designed to run on a number of different computers with few or no changes.

The earliest 3GLs, such as **Fortran** and **COBOL**, **ALGOL** (short for **ALGO**rithmic Language)

Most "modern" languages (**BASIC**, **C**, **C++**, **C#**, **Pascal**, **Ada** and **Java**) are also third-generation languages.

4th Generation of programming languages (4GL)

Fourth generation languages are also known as **very high level languages**. They are non-procedural languages, so named because they allow programmers and users to specify what the computer is supposed to do without having to specify how the computer is supposed to do it. E.g.: PHP, Python, Ruby, FoxPro, SPSS etc.

Five basic types of language tools fall into the fourth generation language category.

1. Query languages
2. Report generators.
3. Applications generators.
4. Decision support systems and financial planning languages.
5. Some microcomputer application software.

5th Generation of programming languages (5GL)

Natural Languages represent the next step in the development of programming languages, i-e fifth generation languages. The text of a natural language statement very closely resembles human speech. These languages are also designed to make the computer "smarter". Natural languages already available for microcomputers include **Clout**, **Q&A**, and **Savvy Retriever** (for use with databases) and HAL (Human Access Language).

The use of natural language touches on expert systems, computerized collection of the knowledge of many human experts in a given field, and artificial intelligence, independently smart computer systems. **Prolog**, **OP55** (Official Production System), **Mercury** are examples of fifth-generation languages.

1xx Informational

2xx Success

Eg.

204 No Content

The server successfully processed the request, but is not returning any content. Usually used as a response to a successful delete request.

3xx Redirection

4xx Client Error

| | | |
|-----|-------------------------------|--|
| 400 | Bad Request | The request had bad syntax or was impossible to be satisfied. |
| 401 | Unauthorized | User failed to provide a valid user name / password required for access to file / directory. |
| 402 | Payment Required | |
| 403 | Forbidden | The request does not specify the file name. Or the directory or the file does not have the permission that allows the pages to be viewed from the web. |
| 404 | Not Found | The requested file was not found. |
| 405 | Method Not Allowed | |
| 406 | Not Acceptable | |
| 407 | Proxy Authentication Required | |
| 408 | Request Time-Out | |
| 409 | Conflict | |
| 415 | Unsupported Media Type | |

5xx Server Error

| | | |
|-----|----------------------------|---|
| 500 | Server Error | In most cases, this error is a result of a problem with the code or program you are calling rather than with the web server itself. |
| 501 | Not Implemented | The server does not support the facility required. |
| 502 | Bad Gateway | |
| 503 | Out of Resources | The server cannot process the request due to a system overload. This should be a temporary condition. |
| 504 | Gateway Time-Out | The service did not respond within the time frame that the gateway was willing to wait. |
| 505 | HTTP Version not supported | |

NUMBER SYSTEM

Number System: Number system is writing system for expressing numbers.

Base of number system: Number of digits used in number system is known as the base of the number system. It is also called **radix**.

1. **Binary Number System / Base 2 Number System:** uses digits 0 and 1
2. **Octal Number System / Base 8 Number System:** uses digits from 0 to 7
3. **Decimal Number System / Base 10 Number System:** uses digits from 0 to 9
4. **Hexadecimal Number System / Base 16 Number System:** uses digits from 0 to 9 and letters A to F where A is equivalent to 10 and F is equivalent to 15

Number system conversion

Number system conversion can be performed in two ways:

- Direct Method
- Indirect Method

Direct Method

- a. From decimal to other number system
- b. From other number system to decimal

1. Decimal to Binary

$$25_{10} \rightarrow (?)_2$$

| | | |
|---|----|-----------|
| 2 | 25 | Remainder |
| 2 | 12 | 1 |
| 2 | 6 | 0 |
| 2 | 3 | 0 |
| 2 | 1 | 1 |
| | 0 | 1 |

$$25_{10} \rightarrow 11001_2$$

2. Decimal to Octal

$$100_{10} \rightarrow (?)_8$$

| | | |
|---|-----|-----------|
| 8 | 100 | Remainder |
| 8 | 12 | 4 |
| 8 | 1 | 4 |
| | 0 | 1 |

$$\therefore 100_{10} \rightarrow 144_8$$

3. Decimal to Hexadecimal

$$500_{10} \rightarrow (?)_{16}$$

| | | |
|----|-----|-----------|
| 16 | 500 | Remainder |
| 16 | 31 | 4 |
| 16 | 1 | 15(F) |
| | 0 | 1 |

$$\therefore 500_{10} \rightarrow 1F4_{16}$$

1. Binary to Decimal

$$1101_2 \rightarrow (?)_{10}$$

$$\begin{aligned} 1101_2 &= 2^3 \quad 2^2 \quad 2^1 \quad 2^0 \\ &\quad \quad 1 \quad 1 \quad 0 \quad 1 \\ &= 1 \times 2^3 + 1 \times 2^2 + 0 \times 2^1 + 1 \times 2^0 \\ &= 8 + 4 + 0 + 1 \\ &= 13_{10} \end{aligned}$$

$$\therefore 1101_2 \rightarrow 13_{10}$$

2. Octal to Decimal

$$274_8 \rightarrow (?)_{10}$$

$$\begin{aligned} 274_8 &= 8^2 \quad 8^1 \quad 8^0 \\ &\quad \quad 2 \quad 7 \quad 4 \\ &= 2 \times 8^2 + 7 \times 8^1 + 4 \times 8^0 \\ &= 128 + 56 + 4 \\ &= 188_{10} \end{aligned}$$

$$\therefore 274_8 \rightarrow 188_{10}$$

3. Hexadecimal to Decimal

$$A29_{16} \rightarrow (?)_{10}$$

$$\begin{aligned} A29_{16} &= 16^2 \quad 16^1 \quad 16^0 \\ &\quad \quad A \quad 2 \quad 9 \\ &= A \times 16^2 + 2 \times 16^1 + 9 \times 16^0 \\ &= 10 \times 256 + 32 + 9 \\ &= 2560 + 41 \\ &= 2601_{10} \end{aligned}$$

$$\therefore A29_{16} \rightarrow 2601_{10}$$

Fundamental of Computer (Computer Operator)

Conversion of other number system

- Converting into Decimal first
- Using ON-OFF method (involving Binary)

■ One Octet Value= 3 binary bits

■ One Hexadecimal Value= 4 binary bits

1. 234_8 to Binary

forming group of 3 binary bits

| | | |
|--------------------------|--------------------------|--------------------------|
| 2 | 3 | 4 |
| 4 2 1 (0+2+0) | 4 2 1 (0+2+1) | 4 2 1 (4+0+0) |
| 0 1 0 | 0 1 1 | 1 0 0 |

$$\therefore 234_8 = 10011100_2$$

2. 1010111_2 to Octal

forming group of 3 binary bits

| | | |
|--------------------------|--------------------------|--------------------------|
| 0 0 1 | 0 1 0 | 1 1 1 |
| 4 2 1 (0+0+1) | 4 2 1 (0+2+0) | 4 2 1 (4+2+1) |
| 1 | 2 | 7 |

$$\therefore 1010111_2 = 127_8$$

3. $FA7_{16}$ to Binary

forming group of 4 binary bits

| | | |
|-------------------|-------------------|-------------------|
| F(15) | A(10) | 7 |
| 8 4 2 1 (8+4+2+1) | 8 4 2 1 (8+0+2+0) | 8 4 2 1 (0+4+2+1) |
| 1 1 1 1 | 1 0 1 0 | 0 1 1 1 |

$$\therefore FA7_{16} = 111110100111_2$$

4. 1010111_2 to Hexadecimal

forming group of 4 binary bits

| | |
|------------------------------|------------------------------|
| 0 1 0 1 | 0 1 1 1 |
| 8 4 2 1 (8+0+2+0) | 8 4 2 1 (0+4+2+1) |
| 5 | 7 |

$$\therefore 1010111_2 = 57_{16}$$

5. 740_8 to Hexadecimal

First converting into Binary

forming group of 3 binary bits

| | | |
|--------------------------|--------------------------|--------------------------|
| 7 | 4 | 0 |
| 4 2 1 (4+2+1) | 4 2 1 (4+0+0) | 4 2 1 (0+0+0) |
| 1 1 1 | 1 0 0 | 0 0 0 |

$$740_8 = 111100000_2$$

Fundamental of Computer (Computer Operator)

Now, Converting into Hexadecimal

Forming the group of 4 binary bits

| | | |
|-----------------------------|------------------------------|----------------------------|
| 0 0 0 1 | 1 1 1 0 | 0 0 0 0 |
| 8 42 1 (0+0+0+1) | 8 4 2 1 (8+4+2+0) | 8 421 (0+0+0+0) |
| 1 | 14(E) | 0 |

∴ 740₈ = 1E0₁₆

6. 2A9₁₆ to Octal

First converting into Binary

forming group of 4 binary bits

| | | |
|---|------------------------------|-------------------|
| 2 | A(10) | 9 |
| 8 4 2 1 (0+0+2+0) | 8 4 2 1 (8+0+2+0) | 8 4 2 1 (8+0+0+1) |
| 0 0 1 0 | 1 0 1 0 | 1 0 0 1 |

2A9₁₆ = 1010101001₂

Now, Converting into Octal

Forming the group of 3 binary bits

| | | | |
|--------------------------|--------------------------|--------------------------|---------------|
| 0 0 1 | 0 1 0 | 1 0 1 | 0 0 1 |
| 4 2 1 (0+0+1) | 4 2 1 (0+2+0) | 4 2 1 (4+0+1) | 4 2 1 (0+0+1) |
| 1 | 2 | 5 | 1 |

∴ 2A9₁₆ = 1251₈

Binary Arithmetic

1.

Binary Addition

1 + 0 = 1
 0 + 1 = 1
 0 + 0 = 0
 1 + 1 = 10 (with carry over 1)

2. Binary Subtraction

1 - 0 = 1
 0 - 1 = 1 (with borrow of 1)
 0 - 0 = 0
 1 - 1 = 0

3. Binary Multiplication

1 × 0 = 0
 0 × 1 = 0
 0 × 1 = 0
 1 × 1 = 1

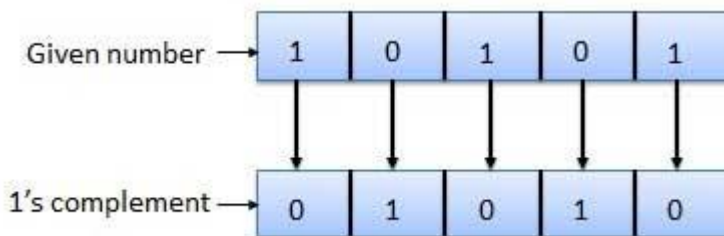
| Dec | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|-----|---|---|----|----|-----|-----|-----|-----|------|------|------|------|------|------|------|------|
| Bin | 0 | 1 | 10 | 11 | 100 | 101 | 110 | 111 | 1000 | 1001 | 1010 | 1011 | 1100 | 1101 | 1110 | 1111 |
| Oct | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
| Hex | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | A | B | C | D | E | F |

Binary system complements

As the binary system has base $r = 2$. So the two types of complements for the binary system are 2's complement and 1's complement.

1's complement

The 1's complement of a number is found by changing all 1's to 0's and all 0's to 1's. This is called as taking complement or 1's complement. Example of 1's Complement is as follows.

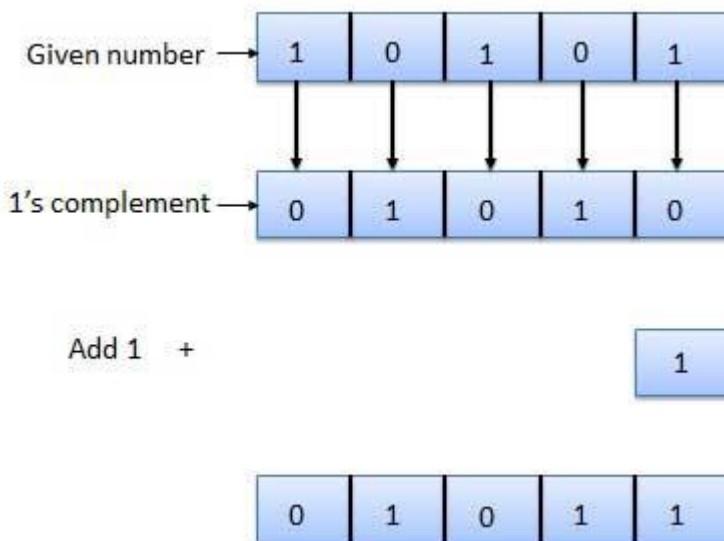


2's complement

The 2's complement of binary number is obtained by adding 1 to the Least Significant Bit (LSB) of 1's complement of the number.

2's complement = 1's complement + 1

Example of 2's Complement is as follows.



Binary arithmetic is essential part of all the digital computers and many other digital system.

Fundamental of Computer (Computer Operator)

Signed number

The subtraction problem of $7 - 5$ is essentially the same as the addition problem $7 + (-5)$.

Usually we represent a negative decimal number by placing a minus sign directly to the left of the most significant digit, just as in the example above, with -5 . However, the whole purpose of using binary notation is for constructing on/off circuits that can represent bit values in terms of voltage (2 alternative values: either "high" or "low"). In this context, we don't have the luxury of a third symbol such as a "minus" sign, since these circuits can only be on or off (two possible states). One solution is to reserve a bit (circuit) that does nothing but represent the mathematical sign:

```
.           1012 = 510      (positive)
.
.  Extra bit, representing sign (0=positive, 1=negative)
.           |
.           01012 = 510      (positive)
.
.  Extra bit, representing sign (0=positive, 1=negative)
.           |
.           11012 = -510     (negative)
```

Adding signed numbers

Adding signed numbers is not significantly different from adding unsigned numbers. Recall that signed 4 bit numbers (2's complement) can represent numbers between -8 and 7 . To see how this addition works, consider three examples.

| Decimal | Signed Binary |
|---------|---------------|
| -2 | 1110 (carry) |
| +3 | 1110 |
| 1 | +0011 |
| | 0001 |

| Decimal | Signed Binary |
|---------|---------------|
| -5 | 011 (carry) |
| +3 | 1011 |
| -2 | +0011 |
| | 1110 |

| Decimal | Signed Binary |
|---------|---------------|
| -4 | 1100 (carry) |
| -3 | 1100 |
| -7 | +1101 |
| | 1001 |

In this case the extra carry from the most significant bit has no meaning. With signed numbers there are two ways to get an overflow -- if the result is greater than 7 , or less than -8 . Let's consider these occurrences now.

Fundamental of Computer (Computer Operator)

| Decimal | Signed Binary |
|---------|---------------|
| 6 | 110 (carry) |
| +3 | 0110 |
| 9 | +0011 |
| | 1001 |

| Decimal | Signed Binary |
|---------|---------------|
| -7 | 1001 (carry) |
| -3 | 1001 |
| -10 | +1101 |
| | 0110 |

There's another method for representing negative numbers which works with our familiar technique of longhand addition, and also happens to make more sense from a place-weighted numeration point of view, called *complementation*. With this strategy, we assign the leftmost bit to serve a special purpose, just as we did with the sign-magnitude approach, defining our number limits just as before. However, this time, the leftmost bit is more than just a sign bit; rather, it possesses a negative place-weight value. For example, a value of negative five would be represented as such:

Extra bit, place weight = negative eight

$$\begin{aligned}
 & \cdot \quad \quad \quad 1011_2 = 5_{10} \quad (\text{negative}) \\
 & \cdot \\
 & \cdot \quad (1 \times -8_{10}) + (0 \times 4_{10}) + (1 \times 2_{10}) + (1 \times 1_{10}) = -5_{10}
 \end{aligned}$$

With the right three bits being able to represent a magnitude from zero through seven, and the leftmost bit representing either zero or negative eight, we can successfully represent any integer number from negative seven ($1001_2 = -8_{10} + 1_{10} = -7_{10}$) to positive seven ($0111_2 = 0_{10} + 7_{10} = 7_{10}$).

Representing positive numbers in this scheme (with the fourth bit designated as the negative weight) is no different from that of ordinary binary notation. However, representing negative numbers is not quite as straightforward:

| | | | |
|----------------|------|----------------|------|
| zero | 0000 | | |
| positive one | 0001 | negative one | 1111 |
| positive two | 0010 | negative two | 1110 |
| positive three | 0011 | negative three | 1101 |
| positive four | 0100 | negative four | 1100 |
| positive five | 0101 | negative five | 1011 |
| positive six | 0110 | negative six | 1010 |
| positive seven | 0111 | negative seven | 1001 |
| positive eight | 1000 | negative eight | 1000 |

Those right three bits are referred to as the *two's complement* of the corresponding positive number. Consider the following comparison:

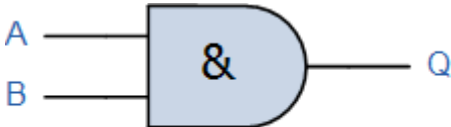
| positive number | two's complement |
|-----------------|------------------|
| 001 | 111 |
| 010 | 110 |
| 011 | 101 |
| 100 | 100 |
| 101 | 011 |
| 110 | 010 |
| 111 | 001 |

LOGIC GATES

Logic Gate Truth Tables

2-input AND Gate

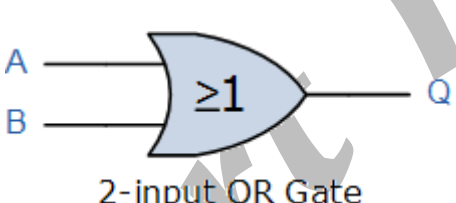
For a 2-input AND gate, the output Q is true if BOTH input A “AND” input B are both true, giving the Boolean Expression of: ($Q = A \text{ and } B$).

| Symbol | Truth Table | | |
|---|-------------------------|---|---|
| <div><p>2-input AND Gate</p></div> | A | B | Q |
| | 0 | 0 | 0 |
| | 0 | 1 | 0 |
| | 1 | 0 | 0 |
| | 1 | 1 | 1 |
| Boolean Expression $Q = A.B$ | Read as A AND B gives Q | | |

Note that the Boolean Expression for a two input AND gate can be written as: $A.B$ or just simply AB without the decimal point.

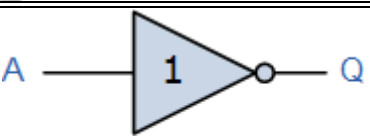
2-input OR (Inclusive OR) Gate

For a 2-input OR gate, the output Q is true if EITHER input A “OR” input B is true, giving the Boolean Expression of: ($Q = A \text{ or } B$).

| Symbol | Truth Table | | | | | | | | | | | | | | | |
|--|--|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| <div><p>2-input OR Gate</p></div> | <table><tr><th>A</th><th>B</th><th>Q</th></tr><tr><td>0</td><td>0</td><td>0</td></tr><tr><td>0</td><td>1</td><td>1</td></tr><tr><td>1</td><td>0</td><td>1</td></tr><tr><td>1</td><td>1</td><td>1</td></tr></table> | A | B | Q | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 |
| A | B | Q | | | | | | | | | | | | | | |
| 0 | 0 | 0 | | | | | | | | | | | | | | |
| 0 | 1 | 1 | | | | | | | | | | | | | | |
| 1 | 0 | 1 | | | | | | | | | | | | | | |
| 1 | 1 | 1 | | | | | | | | | | | | | | |
| Boolean Expression $Q = A+B$ | Read as A OR B gives Q | | | | | | | | | | | | | | | |

NOT Gate

For a single input NOT gate, the output Q is ONLY true when the input is “NOT” true, the output is the inverse or complement of the input giving the Boolean Expression of: ($Q = \text{NOT } A$).

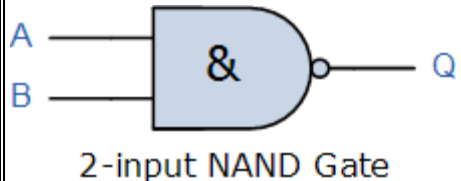
| Symbol | Truth Table | | | | | | |
|---|--|---|---|---|---|---|---|
|  Inverter or NOT Gate | <table><tr><th>A</th><th>Q</th></tr><tr><td>0</td><td>1</td></tr><tr><td>1</td><td>0</td></tr></table> | A | Q | 0 | 1 | 1 | 0 |
| A | Q | | | | | | |
| 0 | 1 | | | | | | |
| 1 | 0 | | | | | | |
| Boolean Expression $Q = \text{NOT } A$ or \bar{A} | Read as inversion of A gives Q | | | | | | |

The NAND and the NOR Gates are a combination of the AND and OR Gates with that of a NOT Gate or inverter.

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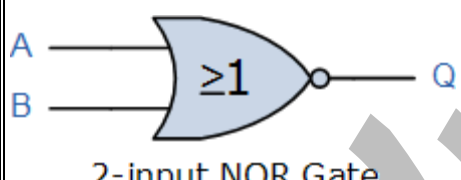
2-input NAND (Not AND) Gate

For a 2-input NAND gate, the output Q is FALSE if BOTH input A and input B are TRUE, giving the Boolean Expression of: ($Q = \text{not}(A \text{ and } B)$).

| Symbol | Truth Table | | |
|--|-----------------------------|---|---|
|  <p>2-input NAND Gate</p> | A | B | Q |
| | 0 | 0 | 1 |
| | 0 | 1 | 1 |
| | 1 | 0 | 1 |
| | 1 | 1 | 0 |
| Boolean Expression $Q = \overline{A.B}$ | Read as A AND B gives NOT-Q | | |

2-input NOR (Not OR) Gate

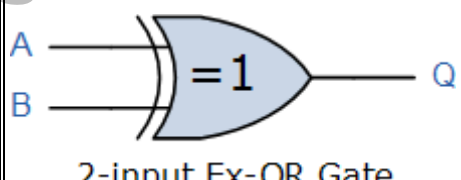
For a 2-input NOR gate, the output Q is TRUE if BOTH input A and input B are FALSE, giving the Boolean Expression of: ($Q = \text{not}(A \text{ or } B)$).

| Symbol | Truth Table | | | | | | | | | | | | | | | |
|--|--|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  <p>2-input NOR Gate</p> | <table><tr><th>A</th><th>B</th><th>Q</th></tr><tr><td>0</td><td>0</td><td>1</td></tr><tr><td>0</td><td>1</td><td>0</td></tr><tr><td>1</td><td>0</td><td>0</td></tr><tr><td>1</td><td>1</td><td>0</td></tr></table> | A | B | Q | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 0 |
| A | B | Q | | | | | | | | | | | | | | |
| 0 | 0 | 1 | | | | | | | | | | | | | | |
| 0 | 1 | 0 | | | | | | | | | | | | | | |
| 1 | 0 | 0 | | | | | | | | | | | | | | |
| 1 | 1 | 0 | | | | | | | | | | | | | | |
| Boolean Expression $Q = \overline{A + B}$ | Read as A OR B gives NOT-Q | | | | | | | | | | | | | | | |

As well as the standard logic gates there are also two special types of logic gate function called an Exclusive-OR Gate and an Exclusive-NOR Gate. The actions of both of these types of gates can be made using the above standard gates however, as they are widely used functions, they are now available in standard IC form and have been included here as reference.

2-input EX-OR (Exclusive OR) Gate

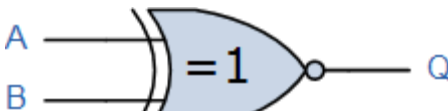
For a 2-input Ex-OR gate, the output Q is true if EITHER input A or if input B is true, but NOT both giving the Boolean Expression of: ($Q = (A \text{ and NOT } B) \text{ or } (\text{NOT } A \text{ and } B)$).

| Symbol | Truth Table | | |
|---|-------------|---|---|
|  <p>2-input Ex-OR Gate</p> | A | B | Q |
| | 0 | 0 | 0 |
| | 0 | 1 | 1 |
| | 1 | 0 | 1 |
| | 1 | 1 | 0 |
| Boolean Expression $Q = A \oplus B$ | | | |

Fundamental of Computer (Computer Operator)

2-input EX-NOR (Exclusive NOR) Gate

For a 2-input Ex-NOR gate, the output Q is true if BOTH input A and input B are the same, either true or false, giving the Boolean Expression of: ($Q = (A \text{ and } B) \text{ or } (\text{NOT } A \text{ and } \text{NOT } B)$).

| Symbol | Truth Table | | | | | | | | | | | | | | | |
|--|--|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| <div><p>2-input Ex-NOR Gate</p></div> | <table><tr><th>A</th><th>B</th><th>Q</th></tr><tr><td>0</td><td>0</td><td>1</td></tr><tr><td>0</td><td>1</td><td>0</td></tr><tr><td>1</td><td>0</td><td>0</td></tr><tr><td>1</td><td>1</td><td>1</td></tr></table> | A | B | Q | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 1 |
| A | B | Q | | | | | | | | | | | | | | |
| 0 | 0 | 1 | | | | | | | | | | | | | | |
| 0 | 1 | 0 | | | | | | | | | | | | | | |
| 1 | 0 | 0 | | | | | | | | | | | | | | |
| 1 | 1 | 1 | | | | | | | | | | | | | | |
| Boolean Expression $Q = \overline{A \oplus B}$ | | | | | | | | | | | | | | | | |

Summary of 2-input Logic Gates

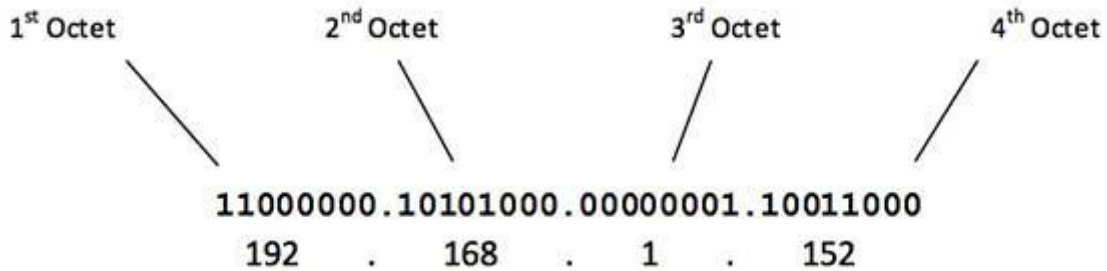
The following Truth Table compares the logical functions of the 2-input logic gates above.

| Inputs | | Truth Table Outputs For Each Gate | | | | | |
|--------|---|-----------------------------------|------|----|-----|-------|--------|
| A | B | AND | NAND | OR | NOR | EX-OR | EX-NOR |
| 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 |
| 0 | 1 | 0 | 1 | 1 | 0 | 1 | 0 |
| 1 | 0 | 0 | 1 | 1 | 0 | 1 | 0 |
| 1 | 1 | 1 | 0 | 1 | 0 | 0 | 1 |

The following table gives a list of the common logic functions and their equivalent Boolean notation.

| Logical Function | Boolean Notation |
|------------------|-------------------------|
| AND | $A \cdot B$ |
| OR | $A + B$ |
| NOT | \overline{A} |
| NAND | $\overline{A \cdot B}$ |
| NOR | $\overline{A + B}$ |
| EX-OR | $A \oplus B$ |
| EX-NOR | $\overline{A \oplus B}$ |

IP Addressing

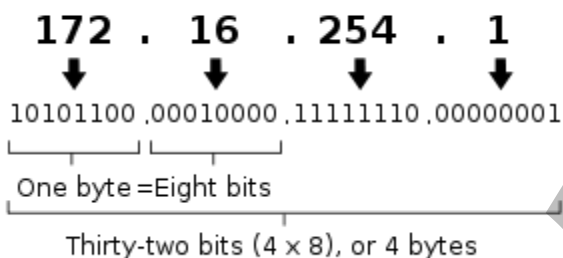


IP Address: Every computer connected to the Internet is identified by a unique four-part string, known as its Internet Protocol (IP) address. An IP address consists of four numbers (each between 0 and 255) separated by periods.

IP Version 4 uses 32 bits

IP Version 6 uses 128 bits

An IPv4 address (dotted-decimal notation)



Static and dynamic IP address.

Static IP addresses are manually assigned to a computer by an administrator. IP addresses are most frequently assigned dynamically on LANs and broadband networks by the Dynamic Host Configuration Protocol (DHCP).

IP addresses are classified into several classes of operational characteristics: unicast, multicast, anycast and broadcast addressing.

- **Unicast:** The most common concept of an IP address is in unicast addressing, available in both IPv4 and IPv6. It normally refers to a single sender or a single receiver, and can be used for both sending and receiving.
- **Broadcast:** In IPv4 it is possible to send data to all possible destinations ("all-hosts broadcast"), which permits the sender to send the data only once, and all receivers receive a copy of it. In the IPv4 protocol, the address 255.255.255.255 is used for local broadcast.
- **Multicast:** A multicast address is associated with a group of interested receivers. In IPv4, addresses 224.0.0.0 through 239.255.255.255 (the former Class D addresses) are designated as multicast addresses.
- **Anycast:** Like broadcast and multicast, anycast is a one-to-many routing topology. However, the data stream is not transmitted to all receivers, just the one which the router decides is logically closest in the network.

Network Classes

Class A Address

The first bit of the first octet is always set to 0 (zero). Thus the first octet ranges from 1 – 127, i.e.

00000001 – 01111111
1 – 127

Fundamental of Computer (Computer Operator)

Class A addresses only include IP starting from 1.x.x.x to 126.x.x.x only. The IP range 127.x.x.x is reserved for loopback IP addresses.

The default subnet mask for Class A IP address is 255.0.0.0 which implies that Class A addressing can have 126 networks (2^7-2) and 16777214 hosts ($2^{24}-2$).

Class A IP address format is thus: **Network. Host.Host. Host (network. Node.Node. Node)**

Class B Address

An IP address which belongs to class B has the first two bits in the first octet set to 10, i.e.

10000000 – **10**111111
128 – 191

Class B IP Addresses range from 128.0.x.x to 191.255.x.x. The default subnet mask for Class B is 255.255.x.x.

Class B has 16384 (2^{14}) Network addresses and 65534 ($2^{16}-2$) Host addresses.

Class B IP address format is: **Network. Network.Host. Host**

Class C Address

The first octet of Class C IP address has its first 3 bits set to 110, that is:

11000000 – **110**11111
192 – 223

Class C IP addresses range from 192.0.0.x to 223.255.255.x. The default subnet mask for Class C is 255.255.255.x.

Class C gives 2097152 (2^{21}) Network addresses and 254 (2^8-2) Host addresses.

Class C IP address format is: **Network. Network.Network. Host**

Class D Address

Very first four bits of the first octet in Class D IP addresses are set to 1110, giving a range of:

11100000 – **1110**1111
224 – 239

Class D has IP address range from 224.0.0.0 to 239.255.255.255. Class D is reserved for Multicasting. In multicasting data is not destined for a particular host, that is why there is no need to extract host address from the IP address, and Class D does not have any subnet mask.

Class E Address

This IP Class is reserved for experimental purposes only for R&D or Study. IP addresses in this class ranges from 240.0.0.0 to 255.255.255.254. Like Class D, this class too is not equipped with any subnet mask.

Private and Public IP Addresses

What are Public IP Addresses?

A public IP address is assigned to every computer that connects to the Internet where each IP is unique. In this case, there cannot exist two computers with the same public IP address all over the Internet. This addressing scheme makes it possible for the computers to “find each other” online and exchange information. User has no control over the IP address (public) that is assigned to the computer. The public IP address is assigned to the computer by the Internet Service Provider as soon as the computer is connected to the Internet gateway.

A public IP address can be either **static** or **dynamic**. A static public IP address does not change and is used primarily for hosting web pages or services on the Internet. On the other hand, a dynamic public IP address is chosen from a pool of available addresses and changes each time one connects to the Internet.

Most Internet users will only have a dynamic IP assigned to their computer which goes off when the computer is disconnected from the Internet. Thus when it is re-connected it gets a new IP.

You can check your public IP address by visiting www.whatismyip.com

What are Private IP Addresses?

An IP address is considered private if the IP number falls within one of the IP address ranges reserved for private networks such as a Local Area Network (LAN). The Internet Assigned Numbers Authority (IANA) has reserved the following three blocks of the IP address space for private networks (local networks):

10.0.0.0 - 10.255.255.255 (Total Addresses: 16,777,216)

172.16.0.0 - 172.31.255.255 (Total Addresses: 1,048,576)

192.168.0.0 - 192.168.255.255 (Total Addresses: 65,536)

Default gateways

A default gateway serves as an access point or IP router that a networked computer uses to send information to a computer in another network or the Internet. Default simply means that this gateway is used by default, unless an application specifies another gateway. The default server does not even need to be a router; it may be a computer with two network adapters, where one is connected to the local subnet and the other is connected to an outside network.

Subnet mask

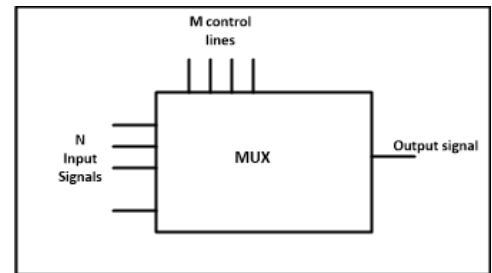
In an IP network, every machine on the same physical network sees all the data packets sent out on the network. As the number of computers on a network grows, network traffic will grow many fold, bringing down performance drastically. In such a situation, you would divide your network into different subnetworks and minimize the traffic across the different subnetworks. Interconnectivity between the different subnets would be provided by routers, which will only transmit data meant for another subnet across itself. To divide a given network address into two or more subnets, you use subnet masks. **The default subnet masks for class A networks is 255.0.0.0, for class B is 255.255.0.0, and for class C is 255.255.255.0**, which signify a network without subnets.

SOME IMPORTANT TERMINOLOGIES

Multiplexer and Demultiplexer (MUX and DEMUX)

Multiplexer:

Multiplexer means many into one. A multiplexer is a circuit used to select and route any one of the several input signals to a signal output.

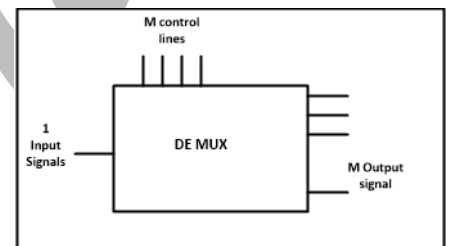


Applications of Multiplexer:

1. Communication system
2. Telephone network
3. Computer memory -
4. Transmission from the computer system of a satellite

Demultiplexer:

Demultiplexer means one to many. A demultiplexer is a circuit with one input and many output. By applying control signal, we can steer any input to the output



Applications of Demultiplexer:

1. Communication
2. ALU (Arithmetic Logic Unit)

Fundamentals of Communications Access Technologies

FDMA (Frequency Division MultipleAccess)

FDMA is the process of dividing one channel (RF channel) or bandwidth into multiple individual bands, each for use by a single user

TDMA (Time Division MultipleAccess)

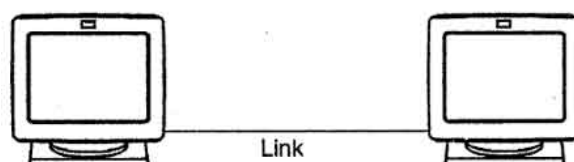
TDMA is a digital technique that divides a single channel or band into time slots. Each time slot is used to transmit one byte or another digital segment of each signal in sequential serial data format

CDMA (Code Division MultipleAccess)

CDMA is another pure digital technique. It is also known as spread spectrum because it takes the digitized version of an analog signal and spreads it out over a wider bandwidth at a lower power level

POINT TO POINT AND POINT TO MULTIPOINT COMMUNICATION

In [telecommunications](#), a **point-to-point** connection refers to a communications connection between two nodes or endpoints. An example is a [telephone call](#), in which one telephone is connected with one other, and what is said by one caller can only be heard by the other. **Abbreviations:** P2P, Pt2Pt



Fundamental of Computer (Computer Operator)

In telecommunications, **point-to-multipoint communication** is communication which is accomplished via a distinct type of one-to-many connection, providing multiple paths from a single location to multiple locations. It can be broadcast or non broadcast. **Abbreviations:** P2MP, PTMP, or PMP

E.g.: [wireless Internet](#) and [IP telephony](#)



Bit: A computer's most basic unit of information

Byte: Small unit of data storage; 8 bits; usually holds one character

Bug - a programming error that causes a program to behave in an unexpected way.

Driver: Software program that controls a piece of hardware or a peripheral;

FAQ: documents that answer questions common to a particular website or program

Clipboard - A portion of memory where the Mac temporarily stores information. Called a Copy Buffer in many PC applications because it is used to hold information which is to be moved, as in word processing where text is "cut" and then "pasted"

Freeze - a system error which causes the cursor to lock in place.

Power PC - a processing chip designed by Apple, IBM and Motorola (RISC based)

DHCP: The dynamic host configuration protocol allows computers to automatically request and be assigned IP addresses and other network settings

ANSI: American National Standards Institute. The principle group in the US for defining standards.

Adware :A general term used for software that invades your computer in the form of persistent pop-up ads.

Cracker: Someone who looks for and breaks into computers or networks without authorization, either for the fun of it or to steal valuable information such as credit card numbers; also called a "black hat" hacker

Hacker : a general term used for anyone who spends time poking into computers and operating systems, trying to discover their vulnerabilities.

Firewall: software, hardware or both used to block unauthorized access to a machine or a network

Parity check and Parity bits

A parity check is the process that ensures accurate data transmission between nodes during communication

A parity bit is appended to the original data bits to create an even or odd bit number; the number of bits with value one

A **parity bit**, or **check bit** is a bit added to the end of a string of binary code that indicates whether the number of bits in the string with the value one is even or odd. Parity bits are used as the simplest form of error detecting code.

There are two variants of parity bits: **even parity bit** and **odd parity bit**

Odd parity means the number of 1's in the given string including the parity bit should be odd (1,3,5...)

Even parity means the number of 1's in the given string including the parity bit should be even (2,4,6...)

| 7 bits of data | (count of 1 bits) | 8 bits including parity | |
|----------------|-------------------|-------------------------|----------|
| | | even | Odd |
| 0000000 | 0 | 00000000 | 00000001 |
| 1010001 | 3 | 10100011 | 10100010 |
| 1101001 | 4 | 11010010 | 11010011 |
| 1111111 | 7 | 11111111 | 11111110 |

Fundamental of Computer (Computer Operator)

Registered Jack

RJ45: 8P8C = 8 Position 8 Conductor – used in Network Wiring

RJ12: 6P6C = 6 Position 6 Conductor – used in System phones

RJ11: 6P4C = 6 Position 4 Conductor – used for ADSL, telephone, and modem cables etc.

RJ10 / RJ22: 4P4C = 4 Position 4 Conductor – used for Telephone Handset cables.

Modulation and Demodulation

Modulation: Conversion of digital signal to analog

Demodulation: Conversion of analog signal to digital

Data Encryption and Decryption

Encryption is the process of translating plain text data (plaintext) into something that appears to be random and meaningless (ciphertext). Decryption is the process of converting ciphertext back to plaintext.

Simulator and Emulator

Simulator: Process of imitating a real phenomenon with a set of formulas. It is software that duplicates some process in almost all the possible ways.

***Example:** In a simulation of flying an airplane, if you fail, you don't actually get hurt. The best devices for creating simulated flight are called flight simulators. They look and react like a real airplanes, but they never leave the ground and the scenery outside the windows is made of computer projections.*

Emulator: It is the hardware that duplicates the features and functions of real system which behaves as actual system.

***Example 2:** A person who copies the movements of an ape is creating an emulation of ape movements. The person is the emulator.*

***Example 2:** A robot can't dance, but it can be programmed to replicate pre determined dance steps. Dancing robots are emulators of dance creating an emulation of dance.*

Cookie: The cookies contain information that is sent from a web server to a web browser and are stored on hard disk.

Encoder and decoder

Encoding is the process of putting a sequence of characters (letters, numbers, punctuation, and certain symbols) into a specialized digital format for efficient transmission or transfer. **Decoding** is the opposite process -- the conversion of a digital signal into a sequence of characters.

Decoder

- A digital circuit that converts an input binary code into a continuous sine wave or analog wave.
- Used to change the computer languages of 1's and 0's to characters that a person can understand.
- It is human readable form

Encoder

- A digital circuit that produces a binary output code depending on which of the inputs are activated.
- Used to change human readable language into series of binary language that is 1 and 0
- It is machine readable form
- All input devices are encoder

Fundamental of Computer (Computer Operator)

Some More Full forms

- GOOGLE : Global Organization Of Oriented Group Language Of Earth .
- YAHOO : Yet Another Hierarchical Official Oracle .
- WINDOW : Wide Interactive Network Development for Office work Solution
- COMPUTER : Common Oriented Machine Particularly United and used under Technical and Educational Research.
- VIRUS : Vital Information Resources Under Siege .
- OLED : Organic light-emitting diode
- IMEI: International Mobile Equipment Identity .
- UPS: uninterruptible power supply .
- HDMI: High-Definition Multimedia Interface
- VPN: virtual private network
- APN: Access Point Name
- SIM: Subscriber Identity Module
- LED: Light emitting diode.
- VGA: Video Graphics Array
- QVGA: Quarter Video Graphics Array
- WVGA: Wide video graphics array.
- WXGA: Widescreen Extended Graphics Array
- WLAN: Wireless Local Area Network
- PPI: Pixels Per Inch
- GPRS: General Packet Radio Service
- GPS: Global Positioning System
- DVD: Digital Video Disk
- DTP: Desk top publishing.
- CDMA: Code Division Multiple Access
- WCDMA: Wide-band Code Division Multiple Access
- GSM: Global System for Mobile Communications
- WI-FI: Wireless Fidelity
- DIVX: Digital internet video access.
- APK: authenticated public key.
- DELL: Digital electronic link library.
- ACER: Acquisition Collaboration Experimentation Reflection
- RSS: Really simple syndication
- AMR: Adaptive Multi-Rate
- MPEG: moving pictures experts group
- IVRS: Interactive Voice Response System
- HP: Hewlett Packard
- PAN - permanent account number.
- Wi-Fi - Wireless fidelity.

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[A Corner for Computer Learners]

Fundamental of Computer (Computer Operator)

FULL FORMS

| S.NO. | ACRONYM | FULL FORM |
|-------|---------|--|
| 1 | 4GL | Fourth Generation Language |
| 2 | 3D | 3 Dimensions |
| 3 | ABC | Atanasoff Berry Computer |
| 4 | ADSL | Asymmetric Digital Subscriber Line |
| 5 | AI | Artificial Intelligence |
| 6 | ALGOL | Algorithmic Oriented Language |
| 7 | AM | Amplitude Modulation |
| 8 | ANSI | American National Standard Institute |
| 9 | AOL | American Online |
| 10 | ARCNet | Attached Resource Computer Network |
| 11 | ARP | Address Resolution Protocol |
| 12 | ARPANET | Advanced Research Project Agency Network |
| 13 | ASCC | Automatic Sequence Control Calculator |
| 14 | ASCII | American Standard Code for Information Interchange |
| 15 | ASIC | Application Specific Integrated Circuit |
| 16 | AT | Advanced Technology |
| 17 | AT&T | American Telephone & Telegraph |
| 18 | ATM | Automated Teller Machine |
| 19 | AVI | Audio Video Interleave |
| 20 | BASIC | Beginner's All-Purpose Symbolic Instruction Code |
| 21 | BBS | Bulletin Board Service |
| 22 | BCR | Bar Code Reader |
| 23 | BIOS | Basic Input Output System |
| 24 | BIT | Binary Digit |
| 25 | BMP | Bitmap |
| 26 | BNC | British Naval Connector |
| 27 | BPI | Bits Per Inch |
| 28 | CAD | Computer Aided Design |
| 29 | CAI | Computer Aided Instruction |
| 30 | CAL | Computer Aided Learning |
| 31 | CAM | Computer Aided Manufacture |
| 32 | CAT | Computer Aided Topography |
| 33 | CAVE | Cave Automatic Virtual Environment |
| 34 | CBE | Computer Based Education |
| 35 | CBT | Computer Based Training |
| 36 | CD-ROM | Compact Disk Read Only Memory |
| 37 | CGA | Colour Graphics Adapter |
| 38 | CMI | Computer Managed Instruction |
| 39 | CMOS | Complementary Metal Oxide Semiconductor |
| 40 | COBOL | Common Business Oriented Language |
| 41 | CODASYL | Conference of Data System Language |

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[A Corner for Computer Learners]

Fundamental of Computer (Computer Operator)

| | | | |
|----|-------------|-------|---|
| 42 | COM | ----- | Computer Output to Microfilm |
| 43 | CPAV | ----- | Central Point Anti-Virus |
| 44 | CPM | ----- | Control Program for Microcomputers |
| 45 | CPS | ----- | Character Per Second |
| 46 | CPU | ----- | Central Processing Unit |
| 47 | CRT | ----- | Cathode Ray Tube |
| 48 | CSMA/CD | ----- | Carrier Sense Multiple Access/Collision Detection |
| 49 | CSU | ----- | Channel Service Unit |
| 50 | CSU/DSU | ----- | Channel Service Unit/Digital Service Unit |
| 51 | DARPA | ----- | Defense Advanced Research Project Agency |
| 52 | DBMS | ----- | Database Management System |
| 53 | DCU | ----- | Device Control Unit |
| 54 | DHCP | ----- | Dynamic Host Configuration Protocol |
| 55 | DIMM | ----- | Dual In-Line Memory Module |
| 57 | DIX | ----- | Digital, Intel, Xerox |
| 58 | DNA | ----- | Digital Network Architecture |
| 59 | DNS | ----- | Domain Name System |
| 60 | DPI | ----- | Dots Per Inch |
| 61 | DRAM | ----- | Dynamic Random Access Memory |
| 62 | DSDD | ----- | Double Sided Double Density |
| 63 | DSHD | ----- | Double Sided High Density |
| 64 | DSS | ----- | Decision Support Systems |
| 65 | DSU | ----- | Digital Service Unit |
| 66 | DTR | ----- | Data Transfer Rate |
| 67 | DTR | ----- | Data Transfer Rate |
| 68 | DVD | ----- | Digital Versatile Disk |
| 69 | EBCDIC | ----- | Extended Binary Coded Decimal Interchange Code |
| 70 | EDO DRAM | ----- | Extended Data Out Dynamic Random Access Memory |
| 71 | EDP | ----- | Electronic Data Processing |
| 72 | EDS | ----- | Electronic Data Storage |
| 73 | EDSAC | ----- | Electronic Delay Storage Automatic Computer |
| 74 | EDVAC | ----- | Electronic Discrete Variable Automatic Computer |
| 75 | EEPROM | ----- | Electrically Erasable and Programmable Read Only Memory |
| 76 | EGA | ----- | Enhanced Graphics Adapter |
| 77 | E-Mail | ----- | Electronic Mail |
| 78 | EMF | ----- | Electromagnetic Field |
| 79 | EMI | ----- | Electromagnetic Interference |
| 80 | EMR | ----- | Electromagnetic Radiation |
| 81 | EMS | ----- | Expanded Memory System |
| 82 | ENIAC | ----- | Electronic Numerical Integrator and Calculator |
| 83 | EPROM | ----- | Erasable and Programmable Read Only Memory |
| 84 | FAT | ----- | File Allocation Table |

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[A Corner for Computer Learners]

Fundamental of Computer (Computer Operator)

| | | | |
|-----|---------|-------|---|
| 85 | FAX | ----- | Facsimile System |
| 86 | FDD | ----- | Floppy Disk Drive |
| 87 | FDDI | ----- | Fiber Distributed Data Interface |
| 88 | FDS | ----- | Fixed Data Storage |
| 89 | FM | ----- | Frequency Modulation |
| 90 | FORTRAN | ----- | Formula Translation |
| 91 | FPMDRAM | ----- | Fast Page Mode Dynamic Random Access Memory |
| 92 | FTP | ----- | File Transfer Protocol |
| 93 | GaAs | ----- | Gallium Arsenide |
| 94 | GB | ----- | Gigabytes |
| 95 | Gbps | ----- | Gigabits Per Second |
| 96 | GIF | ----- | Graphic Interchange Format |
| 97 | GIGO | ----- | Garbage In Garbage Out |
| 98 | GPL | ----- | General Public License |
| 99 | GUI | ----- | Graphical User Interface |
| 100 | HD DVD | ----- | High-Definition Digital Versatile Disc |
| 101 | HDD | ----- | Hard Disk Drive |
| 102 | HLL | ----- | High Level Language |
| 103 | HMA | ----- | High Memory Area |
| 104 | HMD | ----- | Head Mounted Display |
| 105 | HTML | ----- | Hyper Text Markup Language |
| 106 | HTTP | ----- | Hyper Text Transfer Protocol |
| 107 | I/O | ----- | Input/Output |
| 108 | IBM | ----- | International Business Machine |
| 109 | IBM PC | ----- | International Business Machine Personal Computer |
| 110 | IC | ----- | Integrated Circuit |
| 111 | IKBS | ----- | Intelligent Knowledge Based System |
| 112 | IPO | ----- | Input Process Output |
| 113 | IPX/SPX | ----- | Internetwork Packet Exchange/Sequence Packet Exchange |
| 114 | IRC | ----- | Internet Relay Chat |
| 115 | ISDN | ----- | Integrator Services Digital Network |
| 116 | ISOC | ----- | Internet Society |
| 117 | ISP | ----- | Internet Service Provider |
| 118 | IT | ----- | Information Technology |
| 119 | JPEG | ----- | Joint Photographic Expert Group |
| 120 | KB | ----- | Kilobytes |
| 121 | Kb | ----- | Kilobits |
| 122 | LAN | ----- | Local Area Network |
| 123 | LCD | ----- | Liquid Crystal Display |
| 124 | LCD | ----- | Liquid Crystal Display |
| 125 | LISP | ----- | List Processing |
| 126 | LSI | ----- | Large Scale Integration |
| 127 | MAC | ----- | Media Access Control |

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[A Corner for Computer Learners]

Fundamental of Computer (Computer Operator)

| | | | |
|-----|---------|-------|--|
| 128 | MAN | ----- | Metropolitan Area Network |
| 129 | MB | ----- | Megabytes |
| 130 | Mb | ----- | Megabits |
| 131 | MBPS | ----- | Million Bits Per Second |
| 132 | MDA | ----- | Monochrome Display Adapter |
| 133 | MHz | ----- | Mega Hertz |
| 134 | MICR | ----- | Magnetic Ink Character Reader |
| 135 | MIDI | ----- | Musical Instrument Digital Interface |
| 136 | MILNET | ----- | Military Network |
| 137 | MIPS | ----- | Millions of Instruction Per Second |
| 138 | MIS | ----- | Management Information System |
| 139 | MODEM | ----- | Modulator and Demodulator |
| 140 | MP3 | ----- | MPEG-1 Audio Layer 3 |
| 141 | MPEG | ----- | Motion Picture Experts Group |
| 142 | MSAV | ----- | Microsoft Anti-Virus |
| 143 | MUK | ----- | Multimedia Utility Kits |
| 144 | NAV | ----- | Norton Anti-Virus |
| 145 | NCC | ----- | National Computer Center |
| 146 | NetBEUI | ----- | NetBIOS Extended User Interface |
| 147 | NIC | ----- | Network Interface Card |
| 148 | NITC | ----- | National Information Technology Center |
| 149 | NITCC | ----- | National Information Technology Coordination Committee |
| 150 | NITDC | ----- | National Information Technology Development Council |
| 151 | NSFNET | ----- | Network Science Foundation Network |
| 152 | NT | ----- | New Technology |
| 153 | OAS | ----- | Office Automation System |
| 154 | OCR | ----- | Optical Character Reader |
| 155 | OMR | ----- | Optical Mark Reader |
| 156 | OODBMS | ----- | Object Oriented Database Management System |
| 157 | OS/2 | ----- | Operation System-2 |
| 158 | PC | ----- | Personals Computer |
| 159 | PDF | ----- | Platform Independent Document Format |
| 160 | PL/1 | ----- | Programming Langage-1 |
| 161 | PM | ----- | Phase Modulation |
| 162 | PNG | ----- | Portable Network Graphics |
| 163 | POP | ----- | Post Office Protocol |
| 164 | POS | ----- | Point Of Sales Terminal |
| 165 | POST | ----- | Power On Self Test |
| 166 | PROLOG | ----- | Programming Logic |
| 167 | PROM | ----- | Programmable Read Only Memory |
| 168 | PS/2 | ----- | Personal System-2 |
| 169 | PSTN | ----- | Public Switched Telephone Network |
| 170 | QBE | ----- | Query By Example |
| 171 | QEL | ----- | Query Language |

Fundamental of Computer (Computer Operator)

| | | | |
|-----|----------|-------|---|
| 172 | RAM | ----- | Random Access Memory |
| 173 | RARP | ----- | Reverse Address Resolution Protocol |
| 174 | RDBMS | ----- | Relational Database Management System |
| 175 | RJ-45 | ----- | Registered Jack - 45 |
| 176 | RMM | ----- | Read Mostly Memory |
| 177 | ROM | ----- | Read Only Memory |
| 178 | ROM BIOS | ----- | Read Only Memory Basic Input Output System |
| 179 | RPG | ----- | Report Program Generator |
| 180 | RPM | ----- | Revolutions Per Minute |
| 181 | SCP | ----- | System Control Processor |
| 182 | SDRAM | ----- | Synchronous Dynamic Random Access Memory |
| 183 | SIMM | ----- | Single In-Line Memory Modules |
| 184 | SMS | ----- | Static Memory Systems |
| 185 | SMTP | ----- | Simple Mail Transfer Protocol |
| 186 | SNA | ----- | System Network Architecture |
| 187 | SNOBOL | ----- | String Oriented Symbolic Language |
| 188 | SPITBOL | ----- | Speedy Implementation of SNOBOL |
| 189 | SQL | ----- | Structured Query Language |
| 190 | SRAM | ----- | Static Random Access Memory |
| 191 | SSI | ----- | Small Scale Integration |
| 192 | STP | ----- | Shielded Twisted Pair |
| 193 | SVGA | ----- | Super Video Graphics Array |
| 194 | TB | ----- | Terabytes |
| 195 | Tb | ----- | Terabits |
| 196 | TCP/IP | ----- | Transmission Control Protocol / Internet Protocol |
| 197 | TPS | ----- | Transaction Processing System |
| 198 | ULSI | ----- | Ultra Large Scale Integration |
| 199 | UMB | ----- | Upper Memory Block |
| 200 | UPC | ----- | Universal Product Code |
| 201 | UPS | ----- | Uninterruptible Power Supply |
| 202 | URL | ----- | Uniform Resource Locator |
| 203 | UTP | ----- | Unshielded Twisted Pair |
| 204 | VDT | ----- | Visual Display Terminal |
| 205 | VDU | ----- | Visual Display Unit |
| 206 | VGA | ----- | Video Graphics Array |
| 207 | VLSI | ----- | Very Large Scale Integration |
| 208 | VR | ----- | Virtual Reality |
| 209 | VRML | ----- | Virtual Reality Modelling Language |
| 210 | VSAT | ----- | Very Small Aperture Terminal |
| 211 | WAIS | ----- | Wide Area Information Service |
| 212 | WAN | ----- | Wide Area Network |
| 213 | WORM | ----- | Write Once Read Many |
| 214 | WWW | ----- | World Wide Web |
| 215 | XM | ----- | Extended Memory |
| 216 | XP | ----- | eXPerience |
| 217 | XT | ----- | Extended Technology |