General Studies Manual for UPSC and State Public Services Examinations 2014

Everyday Science and Technology
Module-4: Basic Computer Knowledge

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Chapter 1. Introduction to Computers

Computer is an electric device and a programmable machine. The English mathematician, philosopher, inventor and mechanical engineer **Charles Babbage** (1791-1871) is known for originating the concept of a programmable computer and that is why he is called the "father of the computer".

Babbage was the first person who invented first mechanical computer that eventually led to more complex computers. He devised a plan for a stored-program mechanical computer, using data modelled after the punched card templates in industrial (jacquard) looms.

What is utility computing?

Utility computing is a service provisioning model in which a service provider makes computing resources and infrastructure management available to the customer as needed, and charges them for specific usage rather than a flat rate. Like other types of on-demand computing (such as grid computing), the utility model seeks to maximize the efficient use of resources and/ or minimize associated costs.

The first electronic digital computer was the **ABC unit** by John V. Atanasoff and Clifford Berry in 1940 at Iowa State University. Several of its ideas were incorporated into the **ENIAC** (*Electronic Numerical Integrator And Computer*) which ran from 1945-1955 and is considered the **first functionally useful electronic digital computer. Universal Automatic Computer** (UNIVAC) was innovated in 1940s that led to the **first commercially successful computer**.

What is Brain Computer Interface?

A brain computer interface refers to the exchange of data between the human mind and a computer. It has for long been the subject of study wherein brain signals can be used to operate a computer and no longer the stock stuff of science fiction where a person thinks of a command and the computer executes it. Earlier, implanted electrodes were used for this purpose. However, with recent advances in non-invasive technology, even these are not required and scientists are working at using brain activity for computer operation. It would be particularly useful for the disabled.

One of the earliest personal computers was the **Intellect 4** by Intel, using their first commercially produced microprocessor –the **four-bit 4004**. The Altair built by MITS was another first commercially successful personal computer. Bill gates and

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Paul Allen wrote Microsoft's (then known as Microsoft) first software product for-"**BASIC for the Altair**".

Then in 1983, came the **TRS-80** that was Tandy Corporation's desktop microcomputer model line, which became famous as one of the trendiest home computers. Its **TRS-80 Model 100** was an early portable computer introduced in 1983. It was one of the first notebook-style computers, or a **prototype of a laptop**, featuring a keyboard and LCD display, battery powered, in a package roughly the size and shape of notepad or large book. This model running on 4 AA batteries very soon got popular with newspaper reporters. Now writing stories from field was possible provided there was an internet connection.

The functioning of computers is primarily based on one thing that is their ability to determine whether a switch (gate) is open or closed. It can recognize whether it is on or off. But, it's the speed of this act which makes them so efficient. The speed which is now measured in megahertz and giga hertz trillions of cycles per second in the super computers. So, the data held in a computer in binary form, using the digits 0 and 1. By counting, comparing and manipulating these two digits in their various combinations according to a set of instructions held in its memory, computer is able to perform a variety of tasks.

Integrated Circuits

A monolithic integrated circuit (IC) also known as microchip, silicon chip, computer chip or chip is basically a miniaturized electronic circuit that consists of mainly of semiconductor devices, as well as passive components. This circuit is manufactured in the surface of a thin substrate of semiconductor material. A hybrid integrated circuit is a miniaturized electronic circuit constructed of individual semiconductor devices, as well as passive components, bonded to a substrate or circuit board.

The integrated circuit was first conceived by a radar scientist, **Geoffrey W.A. Dummer** (born 1909), working for the royal radar establishment of the British ministry of defense, and published in Washington, D.C. on may 7, 1952. Dummer unsuccessfully attempted to build such a circuit in 1956.

The first integrated circuits were manufactured independently by two scientists:

- **Jack Kilby** of Texas instruments filed a patent for a "solid circuit" made of germanium on February 6,1959. Kilby received patent 3261081, and U.S. patent 3434015.
- **Robert Noyce** of Fairchild semiconductor was awarded a patent for a more complex "Unitary circuit" made of silicon on April 25, 1961..

Integrated circuits can be classified into analog, digital and mixed signal. Digital integrated circuits can contain anything from one to millions of logic gates, Flip-flops, multiplexers, and other circuits in a few square millimeters. The small size of these circuits allows high speed, low power dissipation, and reduced manufacturing cost compared with board-level integration. These digital

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ICs, typically microprocessors, DSPs, and micro controllers work using binary mathematics to process "zero" signals.

Analog ICs, such as sensors, power management circuits, and operational amplifiers, work by processing continuous signals. They perform functions like amplification, active filtering, demodulation, mixing, etc. analog ICs ease the burden on circuit designers by having expertly designed analog circuits available instead of designing a difficult analog circuit from scratch.

ICs can also combine analog and digital circuits on a single chip to create functions such as A/D converters and D/A converters. Such circuits offer smaller size and lower cost, but must carefully account for signal interference.

SSI, LSI, MSI, LSI, VLSI & ULSI

The first integrated circuits contained only a few transistors and so were called "small-scale integration **(SSI)**. They used circuits containing transistors numbering in the tens. They were very crucial in development of early computers.

SSI was followed by introduction of the devices which contained hundreds of transistors on each chip, and so were called "medium-scale integration (**MSI**). They were attractive economically because which they cost little more systems to be produced using smaller circuit boards, less assembly work, and a number of other advantages.

Next development was of LSI. The development of LSI was driven by economic factors and each chip comprised tens of thousands of transistors. It was in 1970s, when LSI started getting manufactured in huge quantities.

LSI was followed by VLSI where "very large-scale integration" (VLSI), with hundreds of thousands of transistors, and beyond were used and still being developed. It was for the first time that a CPU was fabricated on a single integrated circuit, to create a microprocessor.

In 1986, with the introduction of first one megabit RAM chips, more than one million transistors were integrated. Microprocessor chips produced in 1994 contained more than three million transistors. ULSI refer to "ultra-large scale integration" and correspond to more than 1 million of transistors. However there is no qualitative leap between VLSI and ULSI, hence normally in technical texts the "VLSI" term cover ULSI.

Chapter 2. Structure of a Computer

The principal characteristic of a computer are.

- It responds to a specific set of instructions in a well-defined manner.
- It can execute and pre-recorded list of instructions.

All general-purpose computers need the following hardware components.

- **Memory:** Memory enables the computers to store, at least temporarily, data and programs.
- **Mass storage device:** Allows a computer to permanently retain large amounts of data. Common classic mass storage devices include disk drives and tape drives. The latest being the Hard Disks and USB mass storage devices.

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- **Input device:** The most usual input devices are a **keyboard and mouse.** They are used to put in data and instructions to computer.
- **Output device:** The most usual output devices are display screens such as Monitor which are of several types now a days and a printer, or other device that lets us see what the computer has accomplished.
- **Central processing unit (CPU)**: This can be called brain of the computer which actually executes the instructions.

However, computers can be divided into several categories on the basis of cost and performance. We can classify the computers by their size and powers, though there is considerable overlap. On this basis computers may be a personal computer, a Laptop, a Palmtop, a Workstation, a Minicomputer, a Mainframe or a Supercomputer.

To work on a computer, we need an operating system. Operating system (OS) provides a set of functions needed and used by most applications, and provides the necessary linkages to control a computer's hardware.

The first computers did not have the operating systems and each program would have to have drivers for the video card, memory card, and other peripherals used. So, the evolution of the computer applications and their complexity led to the OS necessities. Operating System has the job of managing the computer hardware resources, and providing common services for execution of various application software. The operating system is the most important type of system software in a computer system. Without an operating system, a user cannot run an application program on their computer, unless the application program is self booting.

Central Processing Unit

A general purpose computer has four main sections: the arithmetic and logic unit (ALU), the control unit, the memory, and the input and output devices (collectively termed I/O). These parts are interconnected by busses, often made of groups of wires. The control unit, ALU, registers, and basic I/O (and often other hardware closely linked with these) is collectively known as a Central Processing Unit (CPU).

Primitive CPUs were comprised of many separate components but since the mid-1970s CPUs have typically been constructed on a single integrated circuit called a microprocessor. CPU plays a role analogous to the brain in the computer.

The CPU can be a single chip or a series of chips that perform arithmetic and logical calculations and that time and control the operations of the other elements of the system. It was the contribution of the miniaturization and integration techniques that made possible the development of the microprocessor. A Microprocessor is a CPU chip that incorporates additional circuitry and memory. Typical CPU chips and microprocessors are composed of four functional sections:

- **Arithmetic/logic unit (ALU):** gives the chip its calculating ability and permits arithmetical and logical operations

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- **Registers:** The registers are temporary storage areas that hold data, keep track of instructions and hold the location and results of these operations.
- **Control section:** The control section times and regulates the operations of the entire computer system; its instruction decoder reads the patterns of data in a designated register and translates the pattern into an activity, such as adding or comparing; and its interrupt unit indicates the order in which individual operations use the CPU and regulates the amount of CPU time that each operation may consume.
- **An internal bus:** It's a network of communication lines that connect the internal elements of the processor and also leads to external connectors that link the processor to the other elements of the computer system.

The CPU Buses are of three types:

- Control bus consisting of a line that senses input signals and another line that generates control signals from within the CPU
- Address bus that is one-way line from the processor that handles the location of data in memory addresses
- Database, which is a two-way transfer line that both reads data from memory and writes new data into memory.

What are Dual Core and Quad Core?

Development of multi-core processors is one of the latest trends in the computer industry, because single core processors rapidly reach the physical limits of possible complexity and speed. A multi-core microprocessor is one that combines two or more independent processors into a single package, generally in a single integrated circuit (IC). A Dual Core is device that contains two independent microprocessors and a Quad-core device contains four microprocessors. Multi-core processor has enhanced performance, reduced power consumption, and more efficient simultaneous processing of multiple tasks.

CPU Cache

A CPU cache is a cache used by the central processing unit of a computer to reduce the average time to access memory. The cache is a smaller, faster memory which stores copies of the data from the most frequently used main memory locations. As long as most memory accesses are to cached memory locations, the average latency of memory accesses will be closer to the cache latency than to the latency of main memory.

Motherboard

The motherboard is the main circuit board of the computer and as such acts as the "circulation system" of the computer. All signals used by the computer are processed by the motherboard. Memory chips, the central processor, expansion boards and cables to disk drives all attach to the motherboard.

A motherboard is very much like a city with many apartments, hotels etc. each using power from a common electrical system. Multiple lane highways of various widths transport data between the buildings. Thus, a motherboard is the data and power infrastructure for the entire computer. It's a Printed Circuit Board (PCB) that contains and controls the components that are responsible for

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processing data. The major components of a motherboard include the CPU, memory and basic controllers for the system.

Thus, the CPU is housed in the motherboard, which connections that allow the various components to communicate with each other. The motherboard must have a socket for at least one CPU chip, and sockets for typically 2 or 4 memory "sticks". The back panel has plugs for keyboard. mouse. USB. Ethernet, and external disks. Motherboards have integrated video and audio. It also has many slots and connectors

Port

A hardware computer port is a physical interface between a computer and other computers or devices. A software computer port is a virtual data connection between computer programs possibly through a computer network.

The Hardware ports come in different sizes such as round, rectangular, square, trapezoidal etc. They can be serial ports or parallel ports. The difference between them is in sending and receiving bits. Serial ports send and receive one bit at a time via a single wire pair (Ground and +/-) Parallel ports send multiple bits at the same time over several sets of wires. A parallel port is also referred to as the printer port since that is usually the device that plugs into it. Many other peripherals have been created to use the parallel port including external CD-ROM drives and ZIP drives. While plugging these devices into the parallel port makes them extremely easy to set up.

A COM Port stands for communications port and is also referred to as a serial port. Most intial computers have at least four COM ports internally which modems or other internal peripherals se. every computer has at least one and usually two external COM ports for physically attaching external peripheral devices, such as external modems, scanners, and digital cameras.

USB stands for universal serial Bus and is a common component on new computers. The port looks like a flat slot and there are usually two of them together. More than 120 devices in new computer peripherals (digital cameras, scanners, speakers) come with USB adapters that allow the user to plug the unit into the computer and use it immediately without having to install expansion cards inside the computer and make manual adjustments to the computer settings. These are also called Plug-and-play ports. They are such that once they are in used; the connected devices start handshaking automatically. USB Ports are typical examples of the plug-and-play. For Example, in a USB port, you can plug a USB Drive, USB Mouse, USB Keyboard etc. and the devices are detected automatically.

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BIOS

BIOS refers to **basic input/output system** (BIOS). BIOS software is built into the PC, and is the first code run by a PC when powered on, and that is why it is called **boot firmware**.

In computing, **firmware is software that is embedded in a hardware device**. It is often provided on flash ROM or as a binary image file that can be uploaded onto existing hardware by a user. When we turn on the power switch, computer will make some beeps while it goes through a self-check of the system components. If we want to change any of the setup options, such as setting a password for the system, changing the sequence for booting up the computer., or reconfiguring any other hardware, we need to press the F2 or any other key recommended by the hardware provider to access the key **BIOS settings**. The BIOS includes very basic information about the hardware to get the computer started before the operating system software takes over. Once the operating system takes over, more detailed information about the hardware is loaded into the computer's RAM and windows starts up.

A computer or laptop keeps track of time even when it is switched off. Why?

A desktop PC has a lithium cell or battery (the same is used in digital diaries) called a BIOS cell inside the CPU, and attached to the motherboard, which keeps track of time even after the computer is powered down, whereas in laptops, the battery of the laptop itself is used to keep track of time. This battery also saves the settings required during a boot operation.

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What is difference between Cold Boot and Warm Boot?

We actually perform a Cold Boot every time we turn on the power switch of our computer. To "boot" the computer means to start it up and reset the memory and BIOS. Sometimes, the programme running hangs and we press the ctrl-alt-delete keys simultaneously. This is called Warm Boot. So, when a computer stops responding because of memory problems or the "blue screen of death" appears, we need to do a warm boot. The latest operating system Windows 7 responds with task manager when we press the ctrl-alt-delete keys simultaneously. We can choose the not responding programmes to close and continue. However, if the warm boot fails to restart the computer, we need to resort to a cold boot by shutting off the power switch, waiting few seconds and then turning it back on.

Thus, **primary function of the BIOS is to set up the hardware and load and start an operating system**. When the PC starts up, the first job for the BIOS is to initialize and identify system devices such as the video display card, keyboard and mouse, hard disk drive, optical disc drive and other hardware. The BIOS then locates software held on a peripheral device ('boot device'), such as a hard disk or a CD/DVD, and loads and executes that software, giving it control of the PC. This process is known as **booting**. Booting is synonymous with a booting up, which is short for **bootstrapping**.

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CMOS

CMOS is an abbreviation for **Complementary Metal Oxide Semiconductor**. CMOS technology is used in microprocessors, microcontrollers, static RAM, and other digital logic circuits. CMOS technology is also used for several analog circuits such as image sensors (CMOS sensor), data converters, and highly integrated transceivers for many types of communication.

CMOS uses a complimentary arrangement of NMOS and PMOS, Negative And Positive Metal Oxide Transmitter Circuits. CMOS memory draws very little current (Nano-amps). Values stored in it can be maintained for very a long period of time while the computer is off with a rechargeable lithium battery. The CMOS memory is used to store system configuration information, such as disk drive parameters, memory configuration and setup program.

CMOS memory is used by the basic input output system (BIOS), a program permanently stored in the flash memory as disk drive parameters, memory configuration, and the date-time, some of which we enter in the CMOs setup program. CMOS setup is part of the BIOS program.

The CMOS memory is usually located with the real-time clock in the motherhood chipset or in a separate real-time clock chip. It is located in the chipset on most recent motherboards.

Bits and Bytes

A bit refers to binary digit. It refers to a digit in the binary numeral system, which consists of base 2 digits (i.e. there are only 2 possible values; 0 or 1).

This means that the number 10010111 is 8 bits long. Thus Bit is used as a variable or computed quantity that can have only two possible values. These two values are often interpreted as binary digits and are usually denoted by the Arabic numerical digits 0 and 1. Binary digits are almost always used as the basic unit of information storage and communication in digital computing and digital information theory. The bit is also a unit of measurement, the information capacity of one binary digit.

There are several units of information which are defined as multiples of bits, such as byte (8 bits), kilobit (either 1000 or 2^{10} = 1024 bits).

A kilobyte is a unit of information or computer storage equal to either 1024 or 100 bytes. It commonly abbreviate as Kb, KB or Kbyte. The term "kilobyte" was first used to refer to a value of 1024 bytes (2^{10}), because the binary nature of digital computers lends itself to quantities that are powers of two, and 2^{10} is roughly one thousand. This misuse of the SI prefixes spread from the slang of computer professionals into the mainstream lexicon, creating much confusion, between the Kilo and Kilobyte.

A megabyte is a unit of information or computer storage equal to approximately one million bytes. It is commonly abbreviated MB. Mb is used for megabits. A gigabyte (derived from the SI prefix giga)is a unit of information or computer storage equal to one billion (that is, a thousand million)bytes.

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1,073,741,824 bytes, equal to 1024^3, or 2^{30} bytes. This is the definition used for computer memory sizes, and most often used in computer engineering, computer science, and most aspects of computer operating systems. The IEC recommends that this unit should instead be called a gibibyte (abbreviated GiB), as it conflicts with SI units for bus speeds and the like.

What is difference between Bytes , Octets and Nibble?

The term byte initially meant the smallest addressable unit of memory. In the past, 5-,6-,7-,8-, and 9-bit bytes have all been individual bits (bit-addressed machine) or that could only address 16-or 32-bit quantities (bit-addressed machine).The term byte was usually not used at all in connection with bit- and word-addressed machines. However, term octet always refers to an 8-bit quantity. Today, it mostly used in the field of computer networking, where computers with different bytes widths might have to communicate.

A nibble is a four-bit aggregation, or half an octet. As a nibble contains 4 bits, there are sixteen (24) possible values, so a nibble corresponds to a single hexadecimal digit (thus, it is often referred to as a "hex digit" or "hexit"

SI System v/s IEC System

In computing, binary prefixes can be used to quantify large numbers where powers of two are more useful than powers of ten. Each successive prefix is multiplied by 1024(2^{10}) rather than the 1000 (10^3) used by the SI prefix system. Despite the ambiguity, binary prefixes are often written and pronounced identically to the SI prefixes, rather than using the IEC system.

In 1999, the international electro technical commission (IEC) published amendment 2 to "IEC 60027-2; letter symbols to be used in electrical technology-part 2; telecommunications and electronics". This standard, which was approved in 1998, introduced the prefixes kibi-, mebi-, gibi-, tebi-, pebi-, exbi-, to be used in specifying binary multiples of a quantity. The names come from the first two letters of the original SI prefixes followed by bi which is short for "binary". It also clarifies that, from the point of view of the IEC, the SI prefixes only have their base-10 meaning and never have a base-2 meaning. So, here is how IEC proposes them to be used:

Multiples of Bits				
SI decimal prefixes		Binary usage	IEC binary prefixes	
Name (Symbol)	Value		Name (Symbol)	Value
kilobit (kbit)	10^3	2^{10}	kibibit (Kibit)	2^{10}
megabit (Mbit)	10^6	2^{20}	mebibit (Mibit)	2^{20}
gigabit (Gbit)	10^9	2^{30}	gibibit (Gibit)	2^{30}
terabit (Tbit)	10^{12}	2^{40}	tebibit (Tibit)	2^{40}
petabit (Pbit)	10^{15}	2^{50}	pebibit (Pibit)	2^{50}
exabit (Ebit)	10^{18}	2^{60}	exbibit (Eibit)	2^{60}
zettabit (Zbit)	10^{21}	2^{70}	zebibit (Zibit)	2^{70}
yottabit (Ybit)	10^{24}	2^{80}	yobibit (Yibit)	2^{80}

Memory

Memory refers to the temporary internal storage areas within a computer. The term memory is usually used as shorthand for 'physical memory', which refers to the actual chips capable of holding data. Some computers also use 'virtual memory', which expands physical memory onto a hard drive.

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RAM

The main type of memory and the most familiar to users is random access memory (RAM). RAM is the same as main memory. A computer can both write data into RAM and read data from RAM.

Every time we turn on a computer, a set of operating instructions is copied from the hard disk into RAM. These instructions, which help control basic computer functions, remain in RAM until the computer is turned off. Most RAM is volatile, which means that it requires a steady flow of electricity to maintain its contents. As soon as the power is turned off, whatever data was in RAM disappears. The contents of RAM are necessary for the computer to process data. The results of the processing are kept temporarily in RAM until they are needed again or until they are saved onto the hard disk or other storage device.

Storage capacity of RAM is measured in megabytes (MB) and Giga Bytes (GBs). A 64 MB RAM means that it can hold 64 million bytes of data (a standard A4 page of text typically holds about 2,000 bytes or characters of text). Other types of memory include

ROM (read only memory)

Unlike RAM, ROM is non-volatile and only permits the user to read data. Computers almost always contain a small amount of read-only memory that holds instructions for starting up the computer.

PROM (programmable read-only memory)

A PROM is a memory chip on which you can store a program. Once the PROM has been used, you cannot wipe it clean and use it to store something else. Like ROMs, PROMs are non-volatile.

EPROM (erasable programmable read-only memory)

An EPROM is a special type of PROM that can be erased by exposing it to ultraviolet light. EEPROM (electrically erasable programmable read-only memory): an EEPROM is a special type of PROM that can be erased by exposing it to an electrical charge.

PROM, FPROM and ROM

A programmable read-only memory (PROM) or field programmable read-only memory (FPROM) is a form of digital memory where the setting of each bit is locked by a fuse or antifuse. Such PROMs are used to store programs permanently. They are most commonly seen in computer games or such products as electronic dictionaries, where PROMs for different languages can be substituted. Common PROM comes with all bites reading as 1. Burning a fuse during programming causes its bit to read as 0. The memory can be programmed just once after manufacturing by "blowing" the fuses (using a PROM blower), which is an irreversible process. Blowing a fuse opens a connection while blowing an antifuse closes a connection. Programming is done by applying high-voltage pulses which are not encountered during normal operation (typically 12 to 21 volts).

Read-only means that, unlike the case with conventional memory, the programming cannot be changed (at least not by the end user).

Difference between ROM and RAM

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Read-only memory (ROM) is a class of storage media used in computers and other electronic devices. It's easily cannot be written to, its main use lie in the distribution of software. Some ROMs can be erased and re-programmed multiple times, although they are still referred to as " read only" because the reprogramming process involves relatively infrequent, complete erasure and reprogramming, not the frequent, bit-or word at a time updating that is possible with RAM.

Why some data such as picture / videos take more time to copy?

All kinds of data are stored internally as binary digits(bits).Procedure for a copying a file is that the computer first copies the file content as bits from the main memory to its RAM buffer and then to the new location in the main memory. In this procedure there is a criteria that only certain amount of bits can be transferred from main memory to RAM at a time which is mentioned by the block size. Ex: 16-bit, 32-bit, 64-bit computers.

Data files are characters or numbers and thus each require just one byte (8 bits) or two bytes (16 bits) respectively. Whereas image files are stored pixel by pixel (smallest unit in the screen) and thus require more number of bits to store them. Thus during copying as more number of bits must be transferred between the main memory and RAM, the time taken for copying pictures is more than simple data files. Also the time taken for copying the same picture varies from computer to computer depending on the block size.

Random access memory (RAM) is a type of data store used in computers that allows the stored data to be accessed in any order-that is, at random, not just in sequence. Generally RAM in a computer is considered main memory or primary storage; the working area and data. This type of RAM is usually in the form of integrated circuits (ICs). These are commonly called memory sticks or RAM sticks because they are manufactured as small circuit boards with plastic packaging personal computers have slots for adding and replacing memory sticks. Most RAM can be both written to and read from, so "RAM" can both written to and read from, so "RAM" is often used interchangeably with "read-write memory". In this sense , RAM is he "opposite'' of ROM, but in a more true sense, of sequential access.

RAM v/s ROM and Primary Storage

RAM is also volatile, losing the stored information in an event of power loss, and quite expensive. ROM is not volatile, but is not suited to storage of large quantities of data because it is expensive to produce. Primary Storage is also known as internal memory. It is the computer memory that is accessible to the CPU of a computer without the use of computer's input/output channels. Primary storage is used to store that is likely to be in active use. Primary storage is typically very fast, as in the case of RAM. But, ROM must also be completely erased before it not impossible. Therefore, separate secondary storage, or external memory, is usually required for long-term persistent storage. Primary storage may include several types of storage, such as main storage, cache memory, and special registers, all of which can be directly accessed randomly, that is, accessing any location in storage at any moment takes the same amount of time.

SRAM v/s DRAM v/s VRAM

Dynamic Random Access Memory (DRAM) is a type of random access memory that stores each bit of data in a separate capacitor within an integrated circuit. Since real capacitors leak charge, the information eventually fades unless the capacitor charge is refreshed periodically. Because of this refresh requirement, it is a dynamic memory as opposed to SRAM and other static memory. Its advantage over SRAM is its structural simplicity; only one transistor and a capacitor are required per bit, compared to six transistors in SRAM.

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This allows DRAM to reach very high density. Since DRAM loses its data when the power supply is removed, it is in the class of volatile memory devices. VRAM is a dual-ported version of DRAM formerly used in graphics adaptors. It is now almost obsolete, having been superseded by SDRAM and SGRAM. VRAM has two paths (or ports) to its memory array that can be used simultaneously.

SDRAM & DDR SDRAM

Synchronous dynamic random access memory (SDRAM) is DRAM that is synchronized with the system bus. DRAM has an asynchronous interface, which means that it responds as quickly as possible to changes in control inputs. SDRAM has a synchronous interface, meaning that it waits for a clock signal before responding to control inputs and is therefore synchronized with the computer's system bus. The clock is used to drive an internal finite state machine that pipelines incoming instructions. This allows the chip to have a more complex pattern of operation than an asynchronous DRAM, enabling higher speeds.

Double data rate (DDR) SDRAM was a later development of SDRAM, used in PC memory beginning in 2000. DDR2 SDRAM was originally seen as a minor enhancement (Based upon the industry standard single-core CPU) on DDR SDRAM that mainly afforded higher clock speeds and somewhat deeper pipelining. However, with the introduction and rapid acceptance of the multi-core CPU in 2006, it is generally expected in the industry that DDR2 will revolutionize the existing physical DDR-SDRAM standard. Further, with the development and anticipated introduction of DDR3 in 2007, it is anticipated DDR3 will rapidly replace the more limited DDR and Newer DDR2.

Flash Memory

Flash memory is a form of non-volatile computer memory that can be electrically erased and reprogrammed. Flash memory applications include digital audio players, digital cameras and mobile phones. Flash memory is also used is USB flash drives (Thumb drives, handy drive), which are used for general storage and transfer of data between computers. It has also gained some popularity in the gaming market, where it is often of EEPROM or battery-powered SRAM for game save data.

Keyboard

The standard microcomputer keyboard consists of 104 keys arranged in the standard typewriter or QWERTY layout. A separate numeric keypad is at the right side of the keyboard and can be toggled on or off by pressing the "num lock" key. This numeric keypad may not be found in small size laptops and keywords.

QWERTY comes from the first six letters in the top row. It was invented by **C L Sholes** in 1872.

Keyboard v/s Game Console

Here we can note that the primary device for the PC is a keyboard and mouse, while all Game console systems come with game pads used to control movement within the game. Technically, a computer game can be thought of as one composed of a computer-controlled virtual universe. A video game is a computer game where a video display is the primary feedback, which is displayed on a television screen. It is the console system that takes advantage of the plug-and-play feature — there is no need to install the software or get different graphic cards, faster processors or CPU chips.

Mouse

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A mouse is a handheld device for moving the pointer around the screen. It is a primary component of the windows GUI (Graphical User Interface) environment.

The use of the mouse in windows allows the user to point at and clicks on various icons for programs and data files rather than having to type in commands to copy files, open programs, etc. as in the older DOS.

How does an Optical Mouse work?

To understanding its working, we should note how the mechanical mouse works. The mechanical mouse contains a ball which partially protrudes from the bottom surface, so that the ball rotates as the device is moved, internally actuating two pick-up elements which convert the motion to its `x' and `y' components and sends impulses to the computer that causes a mouse-responsive program to reposition a cursor on the display screen.

In principle, an optical mouse works almost same a mechanical mouse, but the working is entirely different. Optical Mouse was developed by Agilent Technologies and introduced in late 1999. It actually uses a tiny camera to take 1,500 pictures every second. Thus, Optical Mouse used Camera Technology and digital processing to compare and track the position of the mouse.

Pictures counting about 1500 per second are taken by bouncing light from a small, red light-emitting diode (LED) off the surface under the mouse, and onto a Complimentary Metal-Oxide Semiconductor (CMOS) sensor. The sensor sends each image to a digital signal processor (DSP) for analysis. DSP compares the pictures and determines the speed and direction of movement and sends the corresponding coordinates to the computer.

The most visible benefit of an optical mouse is that it has less wear due to elimination of moving parts, and it does not require a mouse pad (unless u we use a glass surface) and can be used on many surfaces, including those that are not entirely flat. The sensing in optical mouse is more precise.

- A Laser mouse is an optical mouse that uses coherent (Laser) light.
- Cordless mice instead transmit data via Infrared Radiation or radio (including Bluetooth)

Mouse is invention of **Douglas Carl Engelbart**. Douglas Carl Engelbart is an American inventor and early computer pioneer and internet pioneer, best known for inventing the Computer Mouse.

Apart from the mouse, his team also developed the hypertext, networked computers, and precursors to GUIs.

A typical Mouse consists of two buttons, each of which functions differently in windows. A single click of the left button on an icon selects the item, a double click (clicking twice in rapid succession) button will open a pop-up menu offering choices relative to the item clicked. The primitive mouse did not contain the roller. Now the intelliMouse includes a roller between the two buttons for easy scrolling up and down, specially while visiting websites. The early mouse contained the touchpad's, large and small trackballs, and graphics tablets.

Here we should note that almost all functions that we do with a mouse can be replaced with keyboard commands. The keyboard equivalents are visible in the menus in most programmes.

Data Storage

The area within a computer system where data can be left on a longer term basis while it is not needed for processing is called "Data storage" . The mass storage devices include the diskettes, Hard Drives, Optical Disks and Magnetic Tapes. Diskette is a small, removable, flexible plastic disk covered with a thin layer of a magnetisable substance, onto which digital data can be recorded and stored. They are called Floppy Disks and now they are outdated. The Hard Drive is the storage area

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within the computer itself, where gigabytes of space are available to store bits of information. Then, we have the Optical Disks, which is a storage device that uses reflecting surfaces and laser technology to read and write data on a disk, so also known as Laser Disk. CD-ROM's are the most popular type of optical storage. CD-ROM stands for Compact Disc Read Only Memory. A computer CD-ROM disk, like its audio counterpart, contains data that has been stamped on the disk surface as a series of pits. To read the data on a CD-ROM an optical read head distinguishes the patterns of pits that represent bytes. CD-ROM disks provide tremendous storage capacity. CD-ROMs usually come with data already written onto them. These days most applications software is provided on CD-ROM.

Hard Disk

The hard disk is an internal storage device which holds programs and data used by a computer. It consists of magnetic platters with read/write heads that float above the platters to record and play back data. In many respects, it is similar to a phonograph turntable. It is susceptible to strong jarring, which could cause the heads to physically damage the disk. The disk is enclosing in an airtight casing to keep it dust-free. HDD is a is a non-volatile, random access digital data storage device, which was first introduced by IBM in 1956.

Why there is no B drive?

It's not that computers don't have B drives. We should be aware that the primitive personal computers didn't have hard discs. They were equipped with two floppy drives called drives A and B. Later, a hard disk was introduced and was labeled as the C drive. Other drives like the CD drive, DVD drive, flash drive and others were labeled D, E, F,G, H etc.

Can a computer have more than one hard disk?

Yes. We use usually two kinds of Hard Disks today. IDE (Integrated Drive Electronics) and SCSI (Small Computer System Interface) hard drives. The IDE drives are used in PCs and SCSI in servers. Motherboards usually come with two embedded IDE ports. Each port can have two devices connected to it on the same data cable for a total of four devices. CD and DVD units are also connected to the IDE ports and counted as one of those four devices. Once we have four devices, then we can add a PCI IDE controller to have more ports to add devices. SCSI hard drives are connected to a PCI SCSI controller that will be able to accept seven devices for standard SCSI and 15 for the newer, wide SCSI.

The Microsoft Operating Systems allow a drive letter assignment such as C Drive, D Drive, E Drive etc. This is the process of assigning alphabetical identifiers to physical or logical disk drives or partitions (drive volumes) in the root file system namespace.

The basic question here arrives that how does computer write information to the hard disk. Please note that unlike a cassette, a *computer writes information to the hard disk in a sequential manner*. This means that one file's a data may be scattered around the disk. When files are deleted, or even edited, blank spaces may appear around the disk.

Compact Discs

Compact Disc (CD) is made of several layers of a type of plastic usually **Polycarbonates**. The outer layers are protection layers, which simply absorb scratches so that the inner layer holding data remains intact. The inner data layer has small tracks which spiral out from the centre of the disc

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towards the ends. These tracks ate such tightly wound that the entire length of the track if stretched out in a straight line would stretch over five kilometers.

Data is written to the CD-ROM by burning microscopic pits into the reflective surface of the disk with a powerful laser. These spiral tracks have flat reflective areas and non-reflective bumps. A flat reflective area represents a binary 1, while a non-reflective bump represents a binary 0. The data is stored in a spiral pattern that originates from the centre of the disc and spirals out toward the outer edge.

Data is read from a CD-ROM with a low power laser contained in the drive that reflects **infrared light** off of the reflective surface of the disk and back to a photo detector. The pits in the reflective layer of the disk scatter light, while the land portions of the disk reflect the laser light to the photo detector. The photo detector then converts these light and dark spots to electrical impulses corresponding bits. Electronics and software interpret this data and accurately access the information contained on the CD-ROM. A standard 74 min. CD contains 333,000 blocks and each block is 2,352 bytes.

How CD Writer records data?

Writing and erasing in a CD is carried out by a laser spot focused to about a micrometer in size, which converts the transparent light sensitive material of a `land' spot to opaque state of the `pit' spot.

Please note that the CD lasers with a wavelength of 780 nm were used, being within infrared range. For DVDs, the wavelength was reduced to 650 nm (red color), and the wavelength for Blu-ray Disc was reduced to 405 nm (violet color).

The sensitive data region of a CD/DVD is made up of a special material which can be called phase-change material. It can change from one phase (crystalline) to another (amorphous) when it is heated and cooled. The material used is chosen because it reflects light differently in the two states. The amorphous state reflects less light than the crystalline state. So, by starting with a disc surface in the crystalline state, heating with the laser can change small spots to the amorphous state and the rapid cooling of the spot causes the material to freeze in the amorphous state. This appears dark during `reading.' During the erasure of an amorphous spot, it is converted back to crystalline state by a process known as annealing, accomplished by heating the material to a lower temperature.

Thus, with proper devices and software, one can record and read the data from a CD ROM. It's worth note that CDROM is manufactured with an organic dye layer that is permanently changes by the laser of the recorder in a pattern that represents the bits and bytes of the data. These are called **Write once** discs. On the other hand, CD-RW (CD-read/write) are discs, which can be erased and re-recorded with data.

Why DVD stores more data than CD?

Please note that DVD uses 650 nm (red) wavelength laser diode light as opposed to 780 nm for CD (infra red). This permits a smaller pit to be etched on the media surface compared to CDs (0.74 µm for DVD versus 1.6 µm for CD), allowing in part for DVD's increased storage capacity. Further, the Blu-ray Disc, the successor to the DVD format, uses a wavelength of 405 nm, and one dual-layer disc has a 50 GB storage capacity. So basically, it is the laser optics that matters in storage capacities of various kinds of Discs.

Please note that underside of the CD-ROM disk is coated with a very thin layer of **aluminum** that reflects light

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DVD

Digital Video Disc or Digital Versatile Disc (DVD) is also an optical storage device that looks the same as a compact disc but is able to hold about 15 times as much information and transfer it to the computer about 20 times as fast as a CDROM. The CD and DVD have the same dimensions.

DVDs come in two formats: the DVD-Video and the DVD-ROM (DVD Read Only Memory) format. The DVD-Video format is used for home movie entertainment through a DVD player.

Blu Ray Disc

Blu-ray, also known as Blu-ray Disc is the name of a next-generation optical disc format that has been jointly developed by the Blu-ray Disc Association (BOA). Blu-ray Disc association is a group of world's leading consumer electronics, personal computer and media companies. It was initially launched as "Blu-ray Disc founder group" in 2002 by MIT and nine leading electronic companies: Sony, Panasonic, Pioneer, Philips, Thomson, LG (Lucky GoldStar) Electronics, Hitachi, Sharp, and Samsung.

Why Blu, why not magenta or orange?

We have studied above that DVD uses 650 nm (red) wavelength laser diode light as opposed to 780 nm for CD (infra red). Blu-ray Disc uses a wavelength of 405 nm, that is coming in the violet (blue) region of electromagnetic spectrum and that is why this term is used.

Blu Ray disc was developed for the following purposes:

- Enable recording, rewriting and playback of high-definition video (HD)
- Storing larger amounts of data.

So, the Blu Ray Disk offers more than five times the storage capacity of traditional DVDs and can hold up to 25GB on a single-layer disc and 50GB on a dual-layer disc. The benefit of using a blue violet laser (405nm) is that it has a shorter wavelength than a red laser (650nm), which makes it possible to focus the laser spot with even greater precision, leading to the packing of data more tightly and stored in less space. The dimension of the Blu Ray disc is same as that of a CD or DVD.

Why is Blu–ray disc black on top?

Blu-ray disc data layer is closer to the surface of the disc, compared to the DVD standard, it was at first more vulnerable to scratches. The first discs were housed in cartridges for protection. Now, the rewritable media are spin-coated with a scratch-resistant and antistatic coating, which gives the surface of the disc its black color.

But the HDDVD was also developed as an answer to the Blu ray Discs. This would also succeed the normal DVD. The HD DVD as well as Blu Ray Disc have a single-layer capacity of 15 GB and a dual-layer capacity of 30 GB, while the the HD DVD-RAM has a single-layer capacity of 20 GB and a dual-layer capacity of 40 GB. The data layer of HD DVD is 0.6 mm below the surface physically protecting the data layer from damage.

Monitor

Monitor or visual display unit is the most common output device of a computer. It comprises a display device, circuitry, and an enclosure. The display device in modern monitors is typically a thin film transistor liquid crystal display (TFT-LCD) thin panel, while older monitors use a cathode ray

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tube about as deep as the screen size. The primitive monitors used the Cathode Ray Tubes (CRTs), until they were replaced by LCD monitors.

A cable connects the monitor to a video adapter (video card) that is installed in an expansion slot on the computer's motherboard. This system converts signals into text and pictures and displays them on Monitor. The computer sends a single to the video adapter, telling it what character, image, or graphic to display. The video adapter converts that signal to a set of instructions that tell the display device (monitor) how to the image on the screen.

We need to understand separate concepts to understand how a Monitor works:

Cathode Ray Tube

Cathode Ray Tube (CRT) was invented by German physicist Karl Ferdinand Braun in 1897. It is the device that was long used in most computer displays, video monitors, televisions radar displays and oscilloscopes. The CRT has undergone numerous development until the advent of plasma screens, LCD , TVs, DLP, OLED displays, and other technologies. Technically, CRT has an electronic vacuum tube employing a focused beam of electrons.

Pixels

That most common type of graphics monitors employing a cathode ray tube are the raster-scan display based on television technology. In such a system, the Electron beam is swept across the screen, one row at a time from top to bottom. As this beam moves across each row, the beam intensity is turned on and off. This would create a pattern of illuminated spots.

There is a memory area called refresh buffer or frame buffer where the picture definition is stored. This memory area holds the set of intensity values for all the screen points. These stored intensity values are then retrieved from the refresh buffer and "painted" on the screen one row (scan line) at a time. Such each screen point is referred to as a 'pixel' or pel (shortened forms of picture elements). The capability of a raster-scan system to store intensity information for each pixel makes it well suited for the realistic display of scenes containing subtle shading and colour patterns.

LCD TFT Display

Liquid Crystal Display television (LCD TV) is television that uses LCD technology for its visual output. The technology used is generally TFT. TFT refers to a Thin Film Transistor, which is a special kind of field effect transistor made by depositing thin films for the metallic contacts, semiconductor active layer, and dielectric layer. The channel region of a TFT is a thin film that is deposited onto a substrate (often glass, since the primary application of TFT is in liquid crystal displays).

LCD panels are made of two layers of transparent material, which are polarized, and are "glued" together. One of the layers is coated with a special polymer that holds the individual liquid crystals. Current is then passed through individual crystals, which allow the crystals to pass or block light to create images. LCD crystals do not produce their own light, so an external light source, such as

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florescent bulb is needed for the image created by the LCD to become visible to the viewer. Thus, LCDs use a **strong backlight as the light source** and **control how much of this light is allowed to reach the pixels by selectively allowing the light to reach each pixel.** LCDs achieve this by taking advantage of a key property of 'twisted' liquid crystal molecules, which have the ability to naturally block polarized light but then let it through by degrees when a small electric field is applied. LCD cells are accurately controlled and arranged in a flat matrix of rows and columns.

Plasma Display Panel (PDP)

We have read above that LCD crystals do not produce their own light, so an external light source, such as florescent bulb is needed for the image created by the LCD to become visible to the viewer. The Plasma television technology is absolutely different from this. The Plasma Display Panel is based loosely on the fluorescent light bulb. The display itself consists of very microscopic cells and within each cell two glass panels are separated by a narrow gap in which neon-xenon gas is injected and sealed in plasma form. Gas is electrically charged at specific intervals and then strikes red, green, and blue phosphors, thus creating a television image. Each group of red, green, and blue phosphors is called a pixel (picture element).

Why are screensavers used in computers?

Screensavers are designed to prevent phosphor burn-in on CRT and plasma computer monitors by blanking the screen or filling it with moving images or patterns when the computer is not in use are programs that display images when the computer is idle for a specified time. In early CRT monitors when the same image would be displayed for a long time, the phosphors used to make the pixels in the display glow at a constant rate for so long a period that they would discolor the glass surface of the CRT.

But now, the advances in display technology and energy-saver monitors have solved this problem. So now we use screensavers for entertainment or security and they are perceived as works of art and used to prevent others from viewing confidential data when the user is away.

Due to presence of its own source of light, PDP suffers from the issues such as **heat generation and screen-burn of static images.**

Thus, we note that Plasma display panel (PDP) is an emissive flat panel display where visible light is created by phosphors exited by a plasma discharge between two flat panels of glass. The **gas discharge contains no mercury (contrary to the backlights of an active matrix LCD),** an insert mixture of noble gases (neon and xenon) is used instead.

Dead Pixels, Hot Pixel, Stuck Pixel

A dead pixel is a defective pixel that remains unlit on an LCD screen, monitor, camera, charge-coupled device or CMOS sensor. A permanently lit pixel is a hot pixel, and a pixel that stays on a solid colour is a stuck pixel. Dead pixels can also occur in clusters and these are particularly annoying and in most cases these can be sent back to the manufacturer. The majority of dead pixels are only noticeable on a solid colour background, for example through the use of the "Dead Pixel Checkers" which consist of four-five solid-colour images.

EFT monitors

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All types of monitors are a strain on our eyes. EFT, or Eye Fresh Technology, monitors have a vital coating on the rear that emits anions and far-infrared rays that serve to make the environment fresh and ease the strain on the eyes and relax the eyes and body. ☺

Why Plasma Display Panel does not work on High Altitudes?

We have just now studied that Plasma Display Panel consists of very microscopic cells and within each cell two glass panels are separated by a narrow gap in which neon-xenon gas is injected and sealed in plasma form. This neon-xenon gas expands at high altitudes due to low pressure and that is why the picture is distorted. The Plasma TV at high altitude also creates a slight buzzing noise, which is basically because of the increased power consumption and the corresponding increase in its cooling needs (its fan usage)

A Laptop monitor appears like a film negative when seen from the side. Why?

The sleek screens of the Laptops are based upon the liquid crystal display technology. We have studied above that the LCD monitors rely on fluorescent backlights behind the LCD panel to provide the illumination that creates the image. We should also be aware that LCD displays utilize two sheets of polarizing material with a liquid crystal solution between them. An electric current passed through the liquid causes the crystals to align so that light cannot pass through them.

Here we must note that the liquid crystals work like shutters that either block the backlight or let is pass through. These make hundreds of thousands of pixels that are charged or not charged, making them reflect or not reflect light to form images. When we see the screen from 180°, it would mean that the pixels are fully visible. But viewing from sides, LCDs may appear to lose some brightness and image quality.

The concepts which play important role here are the Passive matrix addressing and Active matrix addressing. The earlier LCDs used the passive matrix addressing, which means that only m + n control signals are required to address a m × n display. A pixel in a passive matrix must maintain its state without active driving circuitry until it can be refreshed again. But in the Active matrix addressing, each pixel is attached to a switch-device, which actively maintains the pixel state while other pixels are being addressed, which also prevents crosstalk from inadvertently changing the state of an unaddressed pixel. The best example is Thin Film Transistors (TFT). But the Passive matrix addressing has grown older and today the black-and-white palmtops, pagers, and mobile phones use passive-matrix LCDs. However, the TFT Monitors and latest LCD screens use the Active matrix addressing that lets us view the screen from all angles with superior image quality.

Working of Touchscreen Monitors

In Touchscreen Monitors, we can use our finger on the computer screen to navigate through the contents. This type of screens is most commonly visible in Public Information Kiosks and ATMs. The touch screen has 3 main components as follows:

1. **A Touch sensor:** It's a textured coating across the glass face. This coating is sensitive to pressure and registers the location of the user's finger when it touches the screen.
2. **A controller:** It is a small PC card that connects the touch sensor to the PC. It takes information from the touch sensor and translates it into information that PC can understand.
3. **A Software driver:** Software Driver is a software update for the PC system that allows the touchscreen and computer to work together. It tells the computer's operating system how to interpret the touch event information that is sent from the controller.

Please note that the touch screen monitor is an input device and it needs to be combined with a display and a PC to make a complete touch input system.

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There are 3 basic systems used to recognize a person's touch.

1. **Resistive:** The resistive system consists of a normal glass panel that is covered with a conductive and a resistive metallic layer. These layers are held apart by spacers, and a scratch-resistant layer is placed on top of the whole set up. An electrical current runs through the two layers while the monitor is operational. When a user touches the screen, the two layers make contact in that spot. The change in electrical field is noted and coordinates of the point of contact are calculated. Once the coordinates are known, a special driver translates the touch into something that the operating system can understand, much as a computer mouse driver translates a mouse's movements into a click or drag.
2. **Capacitive:** In the capacitive system, a layer that stores electrical charge is placed on the glass panel of the monitor. When a user touches the monitor with his or her finger, some of the charge is transferred to the user, so the charge on the capacitive layer decreases. This decrease is measured in circuits located at each corner of the monitor. The computer calculates, from the relative differences in charge at each corner, exactly where the touch event took place and then relays that information to the touch screen driver software. One advantage of the capacitive system is that it transmits almost 90 per cent of the light from the monitor, whereas the resistive system only transmits about 75 per cent. This gives the capacitive system a much clearer picture than the resistive system.
3. **Surface acoustic wave:** The surface acoustic wave system uses two transducers (one receiving and one sending) placed along the x and y axes of the monitor's glass plate. Also placed on the glass are reflectors — they reflect an electrical signal sent from one transducer to the other. The receiving transducer is able to tell if the wave has been disturbed by a touch event at any instant, and can locate it accordingly. The wave setup has no metallic layers on the screen, allowing for 100-percent light throughput and

A computer monitor seems to scroll when seen on a television. Why?

The basic difference is in the "refresh rate" of television and computer screens. Refresh rate refers to the number of frames displayed per second for the user to experience continuous motion. Higher this rate, the smoother will be the picture. For example, the movie projectors advance from one frame to the next one 24 times each second. However, each frame is illuminated two or three times before the next frame is projected using a shutter in front of its lamp. As a result, the movie projector runs at 24 frames per second, but has a 48 or 72 Hz refresh rate.

The Refresh rate of a computer monitor is usually around 70-85 Hz, however, it differs according to the capability of the graphics card in the computer and the monitor. If the refresh rate is below 70 Hz, the screen appears to be slightly flickering.

In India, PAL system (Phase Alternating Line, is an analogue television colour encoding system used in broadcast television systems in many countries) is used for video recording, broadcasting and reproduction. According to this standard, the number of frames per second is 50, so refresh rate is 50Hz. In the U.S. and many other countries the adopted standard is NTSC (National Television System Committee) and the rate specified by this standard is 65 Hz.

When a video camera captures a computer screen, the photo cathode of the camera is scanned 50 times per second but computer screen sweeps at a rate which may be 65, 70, 72, 75 or 85 frames per second. The merging of two different scanning frequencies causes production of beats. These beats appear to us as horizontal bars scrolling from top to bottom.

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perfect image clarity. This makes the surface acoustic wave system best for displaying detailed graphics (both other systems have significant degradation in clarity).

Another area in which the systems differ is which stimuli will register as a touch event. A resistive system registers a touch as long as the two layers make contact, which means that it doesn't matter if you touch it with your finger or a rubber ball. A capacitive system, on the other hand, must have a conductive input, usually your finger, in order to register a touch. The surface acoustic wave system works much like the resistive system, allowing a touch with almost any object — except hard and small objects like a pen tip. (For more information, you may visit www.touchscreens.com)

Pervasive Computing

Pervasive Computing means Ubiquitous computing or **ubicomp.** It refers to post-desktop model of human-computer interaction in which information processing has been thoroughly integrated into everyday objects and activities. Thus Pervasive computing refers to increasing integration of Information Technology into human life and environment. This has been made possible by growing availability of microprocessors with inbuilt communications facilities.

The core principle of Pervasing Computing shares a vision of small, inexpensive, robust networked processing devices, distributed at all scales throughout everyday life and generally turned to distinctly common-place ends. This is based upon a simple assumption that millions of embeded microprocessors being produced today which may be used in devices ranging from a few millimetres in size such as small sensors to displays and surfaces ranging several meters. The wire or wireless technology can interconnect them into extremely capable networks and this lead to a greater degree of user control over the surrounding environment.

For example, a domestic ubiquitous computing environment might interconnect lighting and environmental controls with personal biometric monitors woven into clothing so that illumination and heating conditions in a room might be modulated, continuously and imperceptibly. Another common scenario posits refrigerators "aware" of their suitably tagged contents, able to both plan a variety of menus from the food actually on hand, and warn users of stale or spoiled food.

Applications of Pervasive Computing:

There can be an array of applications for pervasive computing ranging from healthcare, home care, transport and environmental monitoring and agriculture. In Healthcare, it may have applications such as in diagnosis, treatment and management of diseases by remote sensors and monitoring technology. Similarly, Environmental Monitoring Pervasive computing may provide ways to monitor the environment by allowing real-time data collection and analysis via remote, wireless devices.

Chapter 3. Software

The computer programme which contains the instructions to make the hardware work are called software. There are two primary software categories viz. Operating Systems or System Software and Application Software.

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Operating System handles the essential task such as maintaining file system and coordination of data and memory with CPU, external devices and output devices. Operating System is needed to give a platform for the applications to run. Thus, we can say that Operating Systems would control the execution of instructions in the CPU of the computer, but it is the applications that perform specific tasks of interest to end users. For example Windows is an operating system and Microsoft Word is an application.

What are Beta testing and Alpha testing?

Software testing is to test a software or software code to find bugs and errors. There are basically of two types: alpha testing and beta testing. The first is done at the developer end, while the second is at the user end. A beta tester is the customer itself and notes down defects and reports them to the developer. The user/ customer is called a 'beta tester' because he is the second one to carry out the testing. The term is derived from the fact that beta comes after alpha in the Greek alphabet.

Then we have network software, which enable groups of computers to communicate, and language software which provides programmers with the tools they need to write programs. They are neither system nor application software but have the elements of both of them. Then we have Proprietary software, sharewares and freeware. The Proprietary software is the so-called packaged software which are developed and sold primarily online or offline via computer shops. The freeware and public-domain software are made available without cost. The sharewares are also freeware but carries a small fee for those who wish to use it. Shareware may be proprietary software that is provided to users without payment on a trial basis and is often limited by any combination of functionality, availability, or convenience.

World 's First Software

Ada Lovelace wrote a rudimentary programme for the analytical machine designed by Charles Babbage in 1827, but the machine never became operational. In 1949, the language short code appeared. It was the first computer language for electronic devices and required the programmer to change its statements into 0s and 1s by hand.

Chapter 4. Programming Languages

A computer needs to be given instructions in a programming language that it understands. A programming language is an artificial language that can be used to control the behaviour of computer. Programming languages, like human languages, are defined through the use of syntactic and semantic rules, to determine structure and meaning respectively. Programming languages are used to facilitate communication about the task of organizing and manipulating information and to express algorithms precisely". Some authors restrict the term "programming language" to those languages that can express all possible algorithms; sometimes the term "computer language" is used for more limited artificial languages.

We should know that in the primitive computers, the programming was such a laborious task that the vacuum-tube ON-OFF switches had to be set by hand. The development in technology has made the programming friendly to the developers.

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Machine Language

The computer's own binary-based language, or machine language, is difficult for human beings to use. The programmer is required to input every command and all data in binary form. Machine-language programming is such a tedious, time-consuming task that the time saved in running the program rarely justifies the days or weeks needed to write the program.Machine languages are the most primitive types of the computer language.

High Level Languages

The high level languages use the English words such as OPEN, LIST, PRINT, which might stand for an array of instructions. These commands are entered via a keyboard or from a programme in a storage device.

Some Historical Landmarks

- ✓ Programming has its origin in the 19th century, when the first "programmable" looms and player piano scrolls were developed.
- ✓ This followed the punch cards encoded data in 20th century that used to direct the mechanical processing. In the 1930s and early 1940s lambda calculus remained the influential in language design.
- ✓ The decade of 1940s has many landmarks to its credit in the initial development of modern computers and programming languages.
- ✓ In the beginning of this decade, first electrically powered digital computers were created. The first high-level programming language to be designed for a computer was **Plankalkül,** developed for the German Z3 by Konrad Zuse between 1943 and 1945.
- ✓ Programmers of early 1950s computers, notably UNIVAC I and IBM 701, used machine language programs, that is, the first generation language (1GL).
- ✓ Grace Hopper is credited with implementing the first commercially oriented computer language. After programming an experimental computer at Harvard University, she worked on the UNIVAC I and II computers and developed a commercially usable high-level programming language called FLOW-MATIC.
- ✓ The 1GL programming was quickly superseded by similarly machine-specific, but mnemonic, second generation languages (2GL) known as assembly languages or "assembler".
- ✓ Later in the 1950s, assembly language programming, which had evolved to include the use of macro instructions, was followed by the development of "third generation" programming languages (3GL), such as FORTRAN, LISP, and COBOL.
- ✓ IBM in 1957 developed a language that would simplify work involving complicated mathematical formulas known as FORTRAN (FORmula TRANslator).
- ✓ FORTRAN was the first comprehensive high-level programming language that was widely used. In 1957, the Association for Computing Machinery in the United States started development of a universal language that would correct some of FORTRAN's shortcomings.
- ✓ Next year they released ALGOL (ALGOrithmic Language), another scientifically oriented language. This was followed by LISP. Originally specified in 1958, lisp is the

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second-oldest high-level programming language in widespread use today; only FORTRAN is older.

- ✓ Lisp is a family of computer programming languages with a long history and a distinctive fully-parenthesized syntax. OBOL (Common Business-Oriented Language), a commercial and business programming language, concentrated on data organization and file-handling and is widely used today in business.
- ✓ 3GLs are more abstract and are "portable", or at least implemented similarly on computers that do not support the same native machine code. Updated versions of all of these 3GLs are still in general use, and each has strongly influenced the development of later languages.
- ✓ At the end of the 1950s, the language formalized as ALGOL 60 was introduced, and most later programming languages are, in many respects, descendants of ALGOL. The format and use of the early programming languages was heavily influenced by the constraints of the interface.
- ✓ CBASIC (Beginner's All-purpose Symbolic Instruction Code) was developed in the early 1960s for use by non-professional computer users.
- ✓ LOGO was developed to introduce children to computers. C, a language Bell Laboratories designed in the 1970s, is widely used in developing systems programs, as is its successor, C++.
- ✓ Other languages have been developed to permit programming in Internet applications. The most popular is Java, an Object-Oriented programming language introduced in 1995 by Sun Microsystems. Java enables the distribution of both the data and small applications called applets.
- ✓ These applets could be transmitted over internet. The specialty of java was that it is machine independent and can run on any kind of computer.

DOS and WINDOWS

DOS stands for disk operating system. The most prevalent from of DOS was manufactured by Microsoft. The last version of DOS to be marketed separately was 6.22 and was used in conjunction with windows 3.11 windows 95 includes DOS. The main difference between windows and DOS is the ability to "multitask" or use two or more programs or data files simultaneously. In these programmes we have directories or folders that work like a filling cabinet. They help keep our hard disk organized by keeping system files together or program files together and separate from data files. Some types of files include executable or from data files. Some types of files include executable or program files (file names end in .exe) dynamic link libraries (.dll) which are called upon by programs to do routines, and initialization files (.ini) which are used by certain programs to store startup settings.

> The earliest avatar of Microsoft Windows was Interface Manager, which was being developed in September 1981. The first ever version of Windows operating system was announced on November 10, 1983. It was an extension of MS DOS, and sported a graphic user interface. Windows 1.0 was finally released into market in November, 1985.

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Open Source Software

The DOS and Windows are the proprietary software of Microsoft. Then, we have thousands of Open source software (OSS). The OSS has its underlying 'source code' made available under a license, so that the developers and users are **allowed to adapt and improve it**. Most popular licensing system is GNU General Public License (GNU GPl, or GPL). Under GNU GPL, the licensees may not 'close' versions. The licensee may modify copy and redistribute any derivative version, under the same GPl license. The licensee can either charge a fee for this service or work free of charge. Please note that Open source doesn't just mean access to the source code.

The distribution terms of open-source software must comply with the following criteria:

Free Redistribution

- No restriction on any party from selling or giving away the software as a component of an aggregate software distribution containing programs from several different sources.

Source Code

- The program must include source code, and must allow distribution in source code as well as compiled form.

Derived Works

- The license must allow modifications and derived works, and must allow them to be distributed under the same terms as the license of the original software.

Integrity of the Author's Source Code

- The license may restrict source-code from being distributed in modified form only if the license allows the distribution of "patch files" with the source code for the purpose of modifying the program at build time. The license must explicitly permit distribution of software built from modified source code. The license may require derived works to carry a different name or version number from the original software.

No Discrimination Against Persons or Groups

- The license must not discriminate against any person or group of persons.

No Discrimination Against Fields of Endeavour

- The license must not restrict anyone from making use of the program in a specific field of endeavour. For example, it may not restrict the program from being used in a business, or from being used for genetic research.

Distribution of License

- The rights attached to the program must apply to all to whom the program is redistributed without the need for execution of an additional license by those parties.

License Must Not Be Specific to a Product

- The rights attached to the program must not depend on the program's being part of a particular software distribution.

License Must Not Restrict Other Software

- The license must not place restrictions on other software that is distributed along with the licensed software.

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License Must Be Technology-Neutral

- No provision of the license may be predicated on any individual technology or style of interface.

Linux

Linux is an open source operating system developed by Linus Torvalds as a version of UNIX that could run on a home computer. He patented Linux in 1991, and then made the system and its code available to others, free of charge, over the Internet. He licensed the system in such a way that anyone can copy and use it, but any improved versions a user creates must be made available to others under the same term, so this was under the GNU GPL. This was more than enough to make the computer programmers from all over the world to flock and make additions and improvements. Today, Linux is considered to be a faster, safer operating system.

Popular Open Source Programmes

Most popular Open Source Programmes are as follows:

Application software

- 7-Zip — file archiver
- Blender — 3D graphics editor
- GIMP — graphics editor
- LibreOffice — office suite
- Open Office- Office Suite
- Mozilla Firefox — web browser
- Mozilla Thunderbird — e-mail client

Operating systems

- Ubuntu is a popular open-source computer operating system, and a form of Linux.
- FreeBSD — operating system derived from Unix
- Linux/GNU — family of Unix-like operating systems
- OpenSolaris — Sun Microsystems's discontinued operating system derived from Unix
- Symbian — real-time mobile operating system
- Haiku — free and open source operating system.

Programming languages

- PHP — scripting language suited for the websites.
- Python — general purpose programming language

Server software

- Apache — HTTP web server
- Drupal — content management system
- MediaWiki — wiki server software, the software that runs Wikipedia
- MongoDB — document-oriented, non-relational database
- Moodle — course management system or virtual learning environment
- RenovatioCMS — content management system

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- WordPress — blog software
- Joomla - a website software

Chapter 5. Networks

A network consists of multiple computers connected using some type of interface, each having one or more interface devices. The primitive computers were the self contained devices in which the data was confined in it. The only way to transfer the data from one machine to another was to take the data in a storage device and send it across the machine. So, this necessity led to invention and development in the networks. In a computer network, the autonomous computers are interconnected and are able to communicate with each other. Networks enable the sharing of data among groups of computers and their users.

Development History of Ethernet

- ✓ Computer Networking began at the same time as computers themselves. In 1940 George Stibitz and Samuel Williams, at AT&T's Bell Laboratories, developed their Complex Number Generator, one of the earliest digital computers and then, they made it possible for users to operate the computer remotely from teletype machines on three different floors in their Manhattan building. They also developed a system to allow users to communicate with the machine even more remotely, via telex machines. This was the beginning of the Networking era.
- ✓ In 1964, Drs John Kemeny and Tom Kurtz of Dartmouth College in New Hampshire developed not only the simplified BASIC programming language (Beginners All-purpose Symbolic Instruction Code) but also a system called time sharing, which allowed many students to use a single computer at what seemed like the same time, from a large number of teleprinter terminals spread around the campus and elsewhere.
- ✓ However, networking is said to have started in 1976, when researchers Dr Robert Metcalfe and Dr David Boggs of the Xerox Palo Alto Research Center (PARC) presented details of a Local Computer Networking System which allowed data to be transferred between a number of computers and printers, at 2.94Mb/s (megabits per second), which was considered to be a very high speed. They dubbed the new networking system **Ethernet.**
- ✓ **Xerox Corporation was granted a patent for Ethernet** in 1977. Then in 1979 Xerox teamed up with Digital Equipment Corporation and Intel to define the first official standard specification for Ethernet. This Ethernet Version 1.0 was capable of transferring data at 10Mb/s over fairly thick (10mm diameter) 50W coaxial cable. It was called Thick Ethernet' or '10Base5'. The meaning of 10Base5 is that it allowed a 10Mb/s data rate, it used baseband transmission rather than a modulated high-frequency carrier, and would give reliable data communication over cable lengths up to 500 meters.
- ✓ A few years later, the 802.3 working group of the IEEE (Institution of Electrical and Electronics Engineers) released its first industry standard for Ethernet, giving it the name

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IEEE 802.3 Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications. This was the refined version of DEC-Intel-Xerox Thick Ethernet.

- ✓ In 1985, the IEEE working group came out with 'thin' Ethernet, also known as 'cheapernet' or 10Base2'. This specified the use of thinner (5mm diameter) 50W coaxial cable, which still allowed 10 Mb/s baseband transmissions as before, but with a maximum cable length of 185 meters.
- ✓ It was followed by IEEE 802.3i or 10BaseT'Ethernet standard, released in 1990. 10BaseT opened the door to much cheaper networking because it allowed 10 Mb/s transmissions over the low cost 100W unshielded twisted-pair or 'UTP' Category 3 cabling which had by then become widely used for telephone wiring in buildings.
- ✓ In 1995 IEEE working group released the 802.3u standard. This became known as '100BaseT' or 'Fast Ethernet, which had 10 times the speed of 10BaseT.
- ✓ In 1997 came IEEE 802.3x, which defined full duplex or simultaneous two-way data communication over either 10BaseT or 100BaseT. Before this development, Ethernet allowed only half duplex or 'one way at a time' communication .
- ✓ In 1998 and 1999, the IEEE working group released four different implementations of the 802.3z 'Gigabit Ethernet' standard, achieving 1Gb/s transmission or another 10-times increase in data transfer rates.
- ✓ Please note that out of above, **10BaseT and 100BaseT**, turn out to be very suitable and cost-effective for both home and small office networking and are widely used today.

Basic Components of Networks

A network has 5 basic components viz. clients, servers, channels, interface devices and operating systems. A brief intro:

- **Servers:** Servers or Host computers are are powerful computers that store data or applications and connect to resources that are shared by the users of a network.
- **Clients:** Client is the computer used by the users of the network to access the servers and shared resources (such as hard disks and printers). So, a personal computer is a client.
- **Channels:** The technical name of channels is network circuit. It is the pathway over which information travels between the different computers (clients and servers) that comprise the network.
- **Interface devices:** The devices that connect clients and servers (and sometimes other networks) to the channel are called interface devices. The common examples are modems and network interface cards.
- **Operating systems:** This is the Network Software. It serves purpose that the operating system serves in a stand-alone computer.

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Channel Dimensions

There are a number of varieties of the types, speeds and capabilities of network channels. These may be Transmission medium such as wireless or wire line, Transmission rate or bandwidth, Transmission directional capability and the Type of the Signal.

- ✓ **Transmission medium** is the physical medium of the channel, which can be either wire line or wireless. The wire line is called the **guided media** or line based media. The wire line are of several kinds such as twisted pair wire, coaxial cable and fiber optic cable. The wireless media there is no physical wire along which information travels and the information is transmitted without wires from one transmission station to the next. Common examples are radio, mobile networks, microwave and satellite.
- ✓ **Transmission rate** or bandwidth shows how fast information can be transmitted over the channel. It is measured in bits per second (bps).
- ✓ **Transmission directional capability** refers to the direction in which information can be transmitted over a channel; It can be simplex, half-duplex or full-duplex. Simplex means that information can be transmitted only in one direction, Half-duplex means that information can be transmitted in both directions, but only in one direction at a time. Full-duplex means that Information can be transmitted in both directions simultaneously.
- ✓ **Signal type** can be analog and digital. Analog signals are 'continuous' (they take on a wide range of values) and digital signals are 'discrete', and binary (take on only two values). So, Digital signals are more suitable for computer networks because, computers represent all information in binary.

LAN, WAN & MANs

Local Area Networks (LANs) is confined to a fairly small geographic area. The clients and servers on a LAN are connected to the same channel, and are typically in the same building or in neighbouring buildings. The Metropolitan Area Networks (MANs) spans a wider area than LAN and Wide Area Networks (WANs) spread over a large geographic area, such as a country or a state.

How does a firewall work?

In computer security, a firewall is a device that blocks unauthorized access to an organization's local area network. A firewall can reside on the administrative computer, the server that acts as the LAN's gateway to the Internet. The firewall keeps track of every file entering or leaving the local area network in order to detect the source of viruses and other problems that might enter the network.

Routers, Bridges & Backbone

The facilities on most LANs are very powerful. Most organizations do not wish to have small isolated islands of computing facilities confined to the buildings. They want to extend facilities over a wider area so that groups can work without having to be located together. Two or more LANs can be connected with specialized devices called Routers and bridges. Bridge connects LANs of the same type but, router is a more intelligent component that can interconnect many different types of

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computer network. Then, we can have Backbone Networks, which are high-bandwidth channels that typically connect LANs with each other, and are often referred to as backbones.

Network Protocols

A protocol is more like a language that can be shared by many people. If all the people would like to use the same language, the protocol becomes a standard. The same is applicable with networks. Most networks have one feature in common that they transmit information by breaking the original information into a set of messages (called packets), transmitting these packets sequentially, and then reassembling these packets back into the original information.

Each packet is a string of bits. But these packets sometimes have to travel a long way, over a bunch of different networks, there are typically lots of computers sending and receiving information over the same network, and the information getting sent can often get altered during transmission (this is called a transmission error). In order to make sure that the original information gets transmitted correctly, to the right place, computer networks use a set of rules, called networking protocols.

Thus, a data communication protocol is a set of rules that must be followed for two electronic devices to communicate with each other. These rules cover:

1. Syntax: Data format and coding
2. Semantics: Control information and error handling
3. Timing: Special matching and sequence

The tasks which a protocol does fall into two categories

1. Network layer tasks
2. Data-link layer tasks

The rules associated with each category are called network layer protocols and data-link layer protocols. **Network-layer protocols**

Network-layer protocols are also known as Layer-3 protocols. These rules specify how a network does the following three tasks:

1. Packetizing: breaking up the information into packets, and reassembling the packets at the receiving end.
2. Addressing: Determining which computer and network the packets are headed to.
3. Routing: Determining the best way for the packets to get to where they are headed.

The most common example of Network-layer Protocol is TCP/IP.

Data-link layer protocols

The Data-link layer protocols are also known as Layer-2 protocols. These rules specify how a network does the following three tasks:

- **Delineation:** Figuring out when a message (packet) begins and ends.
- **Error control:** Figuring out when a transmission error has occurred, and correcting it.
- **Channel access:** Controlling when a particular client or server accesses the channel.

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Ethernet is the most common example of Layer-2 protocol. The token ring protocol, developed by IBM is another example. The networks that we connect to from home using a telephone line typically use one of two data link protocols: SLIP or PPP.

Internet

Internet is a network connecting many computer networks and based on a common addressing system and communications protocol.

Brief History

- ✓ It was **J.C.R. Licklider** of the Massachusetts of Technology, who first proposed a global network of computers in 1962, and moved to the Defense Advanced Research Projects Agency (DARPA) to develop it.
- ✓ **Leonard Kleinrock** developed the theory of packet switching, the basis of Internet connections.
- ✓ On September 2, 1969, **Stephen Crocker and Vinton Cerf,** two graduate students at the University of California Los Angeles (UCLA), linked two large computers using a 15-foot cable and tested a new way to exchange data. In January next year, three other "nodes" were added to this network.
- ✓ The earliest idea of a computer network intended to allow general communication between users of various computers was the **ARPANET,** the *world's first packet switching network.* It was in December 1969 that ARPA (Advanced Research Projects Agency) went online connecting four major U.S. universities. Designed for research, education, and government organizations, it provides a communications network linking the country in the event that a military attack destroys conventional communications systems.
- ✓ In 1972, E-mail was introduced by **Ray Tomlinson**, a programmer at Bolt, Beranek and Newman, an engineering company in Cambridge, Massachusetts. He used the @ to distinguish between the sender's name and network name in the email address.
- ✓ In 1973, the Transmission Control Protocol/Internet Protocol (TCP/IP) was designed and in 1983 it became the standard for communicating between computers over the Internet. In 1976, US Presidential candidate Jimmy Carter and running mate Walter Mondale used email

Why the symbol @ used in e–mail is addresses?

An e-mail address identifies a location to which e-mail messages can be delivered. Ray Tomlinson needed a way to separate, in the email address, the name of the user from the machine the user was on. He wanted a character that would not, under any conceivable circumstances, be found in the user's name. He looked down at the keyboard and chose the @ sign among various punctuation marks available on his Model 33 teletype keyboard, without an idea that he was creating an icon for the internet world. A general format for an e-mail address is: username@computer_name. The part before the @ sign is the local part of the address, the user name of the recipient, and the part after the @ sign is the domain part which is a host computer name.
The `@' symbol indicates that the user can be reached on the Internet by giving the email address (also called the User's Uniform Resource Locator (URL)).

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to plan campaign events. In the same year, Queen Elizabeth sent her first email, becoming the first state leader to do so. In 1982, the term "Internet" was used for the first time.

Common methods of Internet access in homes include dial-up, landline broadband (over coaxial cable, fiber optic or copper wires), Wi-Fi, satellite and 3G/4G technology cell phones. Public places to use the Internet include libraries and Internet cafes, where computers with Internet connections are available.

Files on Internet

The internet is a collection of a large number of client-server based systems. So all files and other resources on it are stored on secondary storage devices of the respective servers. Servers of websites are termed as web servers. When we type in a URL of a website in the address bar of browser, it makes a connection to that web server which in turn fetches the data from the secondary storage device (such as the hard disk) that they must be using and returns it to the respective browser. The same holds true for any other resource (image, MP3 file, zipped file, etc.) that you access on the internet.

Buffering in internet

Buffering is a situation which occurs when a streaming media player is saving portions of a streaming media file to local storage for playback. Most streaming media players buffer a small percentage of a streaming media presentation before beginning to play it. Buffering also may occur in the middle of a presentation when available bandwidth does not match the presentation's required bandwidth.

How do search engines work?

A search engine does not search the entire Internet, but databases of Web pages. When a designer contacts a search engine for the addition of his website in the database, a program called Spider visits the site, reads the pages, indexes the contents and follows links to move on. Search engines like Google use algorithms to find pages with matter relevant to the keywords entered by the user. If the title or headings of the page contain the keywords, then it gets higher preference. Google also uses a patented algorithm called PageRank system that ranks a website based on how many sites have links to it and their ranks as well.

Chapter 6. Selected Terms related to Info-Tech

What are Cookies?

A cookie is a text string that is included with Hypertext Transfer Protocol requests and responses. Cookies are used to maintain information as we navigate different pages on a website or return to the website at a later time. Cookies cannot be used to run code (programmes) or deliver viruses to computer. One of their primary purposes is to provide a convenience feature that one can use to save time — it tells the web server that you have returned to the page. If you personalize web pages or register for products and services, a cookie helps the page server recall your specific information, like billing address, shipping address.

What is Software Entropy?

The tendency, over time, for software to become difficult and costly to maintain is known as software entropy. A software system that undergoes continuous change, like new functionality

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added to its original design, will eventually become more complex, losing its original design structure, and may even become disorganized as it grows. In theory, it may be better to redesign the software in order to support the changes rather than build on the existing programme.

What is E–mail Apnea?

Email apnea is the stress caused by the inability to process emails and connect even as mails flood the inbox. It is marked by a suspension of breathing, shallow breathing or hyperventilating while checking mail. Researcher Linda Stone coined this term after realizing that many people go through this process every morning, the mind whirling from mail to mail, filing, forwarding etc. She also found the effect of this kind of apnea on general health to be negative in the long term.

What is Captcha?

Captcha refers to **Completely Automated Public Turing test** to differentiate between computers and humans. A Captcha Security Code is an image of letters that a person must type in to match the Captcha image they see. It is a type of challenge response test used in computing to ensure that the response is not generated by a computer. This code was created to stop automated computer spam robots from filling out forms and harvesting email addresses and then sending out spam emails. Only a human can type out a code he sees correctly, an automated computer programme cannot.

What is Digital Cleanse?

Digital cleanse is a term mooted by John Mayer, musician and avid blogger and tweeter, as a resolution and challenge for the first week of 2010. It means keeping off all digital contraptions — a stop to emailing, texting, social networking, blogging and surfing sites. It is seen as a new health craze, considered good for the body and mind. The basic idea is to unplug and meet people.

What is a Digital Nomad?

A person who works on the move is called a digital nomad. Such a worker may or may not be on the rolls of a company, and could be a consultant/freelancer/a writer on the move. They are persons with a free spirit who like a remote lifestyle and earn as they move, and believe that with discipline and the correct technology, they can be as productive as a person sitting in office. This is new tribe of people and for them, the economic downturn has brought little distress as companies turn to part-timers to save on costs.

How does a Webcam work?

A simple webcam comprises a digital camera attached to a computer. These cameras are easy to connect through a USB port. A piece of software grabs frames from the camera. For example, the software might grab a still image from the camera once every 30 seconds. The software then turns that image into a normal JPG file and uploads it to a Web server. This image can be placed on any Web page. Several companies offer free space to upload images. This is the simplest possible webcam. Putting a JPG image into a web page is straightforward, but it has the disadvantage that readers must refresh the image.

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What is a Simputer?

The word 'Simputer' is an acronym for 'simple, inexpensive and multilingual people's computer'. It is a small, inexpensive, handheld computer, intended to bring computing power to developing countries. It includes textto-speech software and runs the GNU/ Linux operating systems. The device was designed by the Simputer Trust, a non-profit organisation formed in November 1999. Simputers are generally used in environments where computing devices such as PCs cannot be used.

What are Cyberchondriacs?

Much like hypochondriacs who obsess about any small ache or pain they may have, cybercondriacs frequently surf the internet to glean information about anything that affects them. They now form 84% of all adult net users. Cyberchondriacs are even said to discuss what they learnt from the net about a particular ailment with their doctors. The term could also refer to people who imagine they have a disease because their symptoms match those on a health website.

What is Cybersquatting?

Cybersquatting is registering a website in the names of popular brands. The word squatting in this context means unauthorised occupation of someone else's property. In the internet domain, techsavvy entrepreneurs register websites in the names of popular brands, whose owners do not have websites of their own. This can lead to misrepresentation in the internet media about the products or services the brand sells in the market. The brand owners naturally would like to buy the domain either to give authentic information about products and services or to stem the ill-effects of such misrepresented sites. The person who first registered the brand name sells the site and makes a profit. The ethical and legal aspects of such practice are ambiguous as the intention of the original owner of the site can either be genuine or fraudulent.

What is Website Pharming?

Pharming involves rerouting the traffic of a particular website to a bogus one. This is done by exploiting the weaknesses of the site's Domain Name System (DNS) server. Pharming poses major concerns to corporates and e-commerce sites. Anti-pharming measures are required to safeguard sites.

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