

2023

Information Technology (Computer) Notes

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Information Technology (Computer) Notes

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History of Computers:

Scientist	Invented/developed-	About
Blaise Pascal	Pascaline (1642AD)	1 st Mechanical calculator
Charles Babbage	Difference Engine (1822) Analytical Engine (1837)	1 st person to conceive automatic calculator. Father of Computer
Ada Lovelace (Lady Ada Augusta)	1 st computer programmer	
Herman Hollerith	Electromechanical	tabulating machine for punched cards
Howard Aiken	Mark-1 (1 st electro-mechanical computer)	Automatic sequence-controlled calculator
Alan Turing	Turing Machine (1936)	-model of general-purpose computer Father of Computer Science
John Vincent Atanasoff & Clifford E. Berry	Atanasoff-Berry computer (ABC)	1 st automatic electronic digital computer (but it was unprogrammable)
J. Presper Eckert & John Mauchly	ENIAC (Electronic Numerical Integrator & Calculator) 1946	1 st programmable electronic digital computer
John Van Newman	EDVAC (Electronic Discrete Variable Computer) 1949	Used binary numbers & stored-program for first time
-	EDSAC (Electronic Delay Storage Automatic Calculator)	2 nd electronic digital stored-program computer
-	UNIVAC (Universal Automatic Computer)	1 st commercially available computer
Douglas Engelbert	Computer Mouse (1964)	
-	Intel 4004 (1971)	4-bit central processing unit (CPU) 1 st Micro-processor

Generations of Computer:

Generations	Electronic component	Storage unit / memory device	Programming language	Operating speed is measured in-	Examples
First (1940s-1950s)	Vacuum Tube	Magnetic drums	Machine language	Milli-seconds	EDSAC, EDVAC, UNIVAC
Second (1950s-1960s)	Transistors	Primary-Magnetic cores Secondary-Magnetic tapes/disks	Assembly language	Micro-seconds	IBM-1401, IBM-1620, IBM-7094, CDC-1604, CDC-3600.
Third (1960s-1970s)	Integrated Circuit	Primary- Large Magnetic cores Secondary-Magnetic tapes/disks	FORTRAN, BASIC, PASCAL	Nano-seconds	IBM-360 series, IBM-370 CDC-1700
Fourth (1970s-1980s)	Very large scale Integrated circuits (Microprocessor)	Primary-Semiconductors (RAM, ROM) Secondary-Magnetic disks	Python, C, C++, Java, DBASE	Pico-seconds	Apple IBM-4341 STAR-1000
Fifth (1980s-present)	Ultra-Large-scale Integration Technology	Biochips	All higher languages [Can also understand natural (human) language]	Femto-seconds	Robots & Supercomputers

*(Timeline given is rough)

Types of Computers:

Based on operations –

- 1) **Analog computers** – Thermometer, Speedometer, Analogue Clock, Flight Simulators, Tide Predictors, Electricity meter etc.
- 2) **Digital computers**- Calculator, Digital Clock, Smart Phones, ATM, Consumer Electronic Equipments etc
- 3) **Hybrid computers**- ECG machine, Ultrasound Machine etc

Based on configurations (size & capacity) –

- 1) **Micro computer / Personal Computer (PC)**
- 2) **Minicomputer/ Mid-range computer**
- 3) **Mainframe computer**
- 4) **Super computer (aka Number crunchier) - PARAM Siddhi-AI** is a high-performance computing-artificial intelligence (HPC-AI) and by far the fastest supercomputer developed in India.
- 5) **Quantum computer:** The Ministry of Electronics and Information Technology (MeitY), Government of India launched the country's **first 'Quantum Computer Simulator (QSim) Toolkit'**.

Based on utility –

- 1) **General purpose computer**- Desktop computers and laptops.
- 2) **Special purpose computer**- traffic-light control systems, weather-forecasting simulators.

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Hardware:

It is Physical and tangible components of computer.

Ex. Motherboard, CPU, Input devices, Output devices, Memory devices.

Motherboard (=System Board)- Main printed circuit board that carries CPU chip, ROM, RAM, BIOS chip, etc. It is the backbone of computer. It serves as platform to connect all components of computer (viz; CPU, sound card, video card, Graphics card, optical drives, hard drives, memory, other ports, etc.)

CPU (Central Processing Unit) -

- Brain of the computer
- 3 main components:
 - 1) Arithmetic & Logic Unit (ALU) – performs all mathematical & logical operations.
 - 2) Control Unit (CU) – Reads & decodes program instructions and transform them into control signals that activate other parts of computer.
 - 3) Registers – Storage locations that hold instructions/data while CPU is using them. (In contrast, Memory unit holds data & instructions before and after CPU processes these.)

Input Devices –

- Devices that permit users to supply information to the computer.
- Keyboard, Mouse, Track ball, Joy stick, Scanner, Touch Screen, Web camera, Microphone, Light pen, MICR(Magnetic Ink Character Recognition), OMR(Optical mark recognition), OCR (Optical Character Recognition), Barcode reader, Digitizer etc.

Output Devices –

- Permits computer to convey processed information to outside world.
- Monitor (Visual Display Unit), Printers, Plotters, Speakers, Digital Projectors, etc.

Monitors –

(i) Cathode-Ray Tube (CRT) - The CRT display is made up of small picture elements called pixels.(Smaller the pixels, the better the image clarity/resolution. CRT tube creates an image on the screen using a beam of electrons.

(ii) Flat- Panel Display -2 types:

- a) Emissive displays- Converts electrical energy into light. Ex; LED
- b) Non-emissive displays- Use optical effects to convert sunlight or light from some other source into graphics patterns. Ex; LCD

Liquid Crystal Display (LCD) Monitor - LCD monitors use compact fluorescent tubes to illuminate and brighten the image on the screen and produce good image quality, resolution and contrast levels.

Light Emitting Diode (LED) Monitor - LED monitors use new backlighting technology to improve picture quality. The LED monitor is more lifelike and accurate due to the improved contrast ratios and colour saturation over LCD.

- **Organic Light Emitting Diode (OLED) Monitor** – This type of monitor made up of some organic material (containing carbon, like wood, plastic or polymers) that is used to convert the electric current into light. They are directly used to produce the correct colour and there is no need for backlight which saves power and space.

Printers –

1) Impact Printers - The impact printers print the characters by striking them on the ribbon which is then pressed on the paper. Ex; Dot-Matrix Printers, Line Printers, Daisy wheel printer, Drum printer, Chain printer, Band printer.

Dot-Matrix Printers – It prints characters as a combination of dots. They have a matrix of pins on the print head of the printer which form the character.

Line Printers - A line printer can print one line of text at a time. (= bar printer).

2) Non-Impact Printers - Non-impact printers form characters and images without direct physical contact between printing mechanism and the paper. These printers print a complete page at a time (=Page printers). Ex; Laser Printers, Inkjet Printers etc.

Laser Printers - A laser printer uses a non-impact photocopier technology. (Dry ink is used). It gives high-quality output. The resolution of laser printers is measured in dpi (dots-per-inch).

Inkjet Printers - Inkjet printers work by spraying ink on a sheet of paper. (Wet ink is used).

3) Other Types:

Solid Ink Printer - It is a type of colour printer. It works by melting the solid ink that applies the images to the paper. It is non-toxic and convenient to handle.

LED Printer - This printer uses a light emitting diode instead of a laser. It starts by creating a line-by-line image of the page.

Memory Devices

- Stores all instructions and data for CPU.
- Receive data, hold it and deliver according to instruction from Control Unit.
- Two types –

1) Primary Memory – (= Working/main memory of computer)

-Two types – a) ROM & b) RAM

a) ROM (Read Only Memory) –

- Non-volatile memory (retains its information even after power is turned off)
- cannot be altered.
- Information stored on ROM at the time of its manufacture.
- It stores such instructions that are required to start a computer.

Types:

1. Masked ROM (MROM) - The very first ROMs were hard-wired devices that contained a pre-programmed set of data or instructions. These kinds of ROMs are inexpensive.

2. Programmable Read Only Memory (PROM) - PROM can be modified only once by a user. The user can buy a blank PROM and enter the desired contents using a PROM programmer. It can be programmed only once and is not erasable.

3. Erasable and Programmable Read Only Memory (EPROM) - The EPROM can be erased by exposing it to ultra-violet light for up to 40 minutes.

4. Electrically Erasable and Programmable Read Only Memory (EEPROM) - The EEPROM is programmed and erased electrically. It can be erased and reprogrammed about ten thousand times. Both erasing and programming take about 4 to 10 milliseconds.

b) RAM (Random Access Memory) –

- Temporary in nature (i.e., Data is lost when computer is switched off). Thus, called as volatile memory.
- Read/write memory.
- CPU can change contents of RAM at any time.

Types:

Dynamic Random-Access Memory (DRAM) - Off-Chip Memory. Capacitors are used in it. Periodic refresh is required to retain the data. It is slower than static RAM.

Static Random-Access Memory (SRAM) - On-Chip Memory. Transistors are used in it. It is faster and less volatile than DRAM but requires more power and is more expensive. No refresh is needed. Retains data as long as power is supplied.

2) Secondary memory(= External memory)

- Stores data for long-term.
- Permanent, Non-volatile memory.
- It cannot be processed directly by the CPU. It must first be copied into primary Storage.
- Cheaper than primary memory.
- Operates at slower rate than primary memory.
- Types-
 - a) Fixed- Hard disk drive, floppy disk, Compact disk (CD) drive, Digital Video Display (DVD) drive
 - b) Removable- USB drive (pen drive), Blue ray disk

TYPES	EXAMPLES
Semiconductor Memory	RAM, ROM
Optical Memory	CD-ROM, CD-R, CD-RW, DVD, HVD, Blue ray disk
Magnetic Memory	Hard disk drive (HDD), Floppy disk drive (FDD)
Flash Memory	Pen drive, Memory card

Memory Units – Bit is the smallest memory unit.

4 Bits	=	1 Nibble
2 Nibble = 8 Bits	=	1 Byte
1024 Byte	=	1 Kilobyte (KB)
1024KB	=	1 Megabyte (MB)
1024MB	=	1 Gigabyte (GB)
1024GB	=	1 Terabyte (TB)
1024TB	=	1 Petabyte (PB)

1024PB	=	1 Exabyte (EB)
1024 EB	=	1 Zetta byte (ZB)
1024 ZB	=	1 Yotta byte (YB)
1024 YB	=	1 Bronto byte
1024 Brontobyte	=	1 Geop Byte (Highest memory unit)

Software:

Software is **set of programs** which are designed to perform specific function.

2 Types of Software –

1) System Software-

It is a type of computer program that is designed to run computer's hardware and application software.

Four Types-

a) Operating System –

- Interface between user, computer hardware & application software.

- After boot program, OS manages all other programs in computer.

- Ex; - Ubuntu, Linux, Unix, Windows (-1, 3.1, 1995, 2000, XP, Vista, 7, 8, 8.1, 10), MAC OS, DOS, etc.

b) Utility Programs – Manage, maintain & control computer resources. (=service programs)

Ex; Antivirus software, backup software, disk clean, etc.

c) Device drivers – Enables interaction with hardware devices.

d) Language translators –

- Translates high-level language program into an equivalent machine language program.

- It also detects and reports the error during translation.

Types:

Assembler – It converts assembly language into machine language.

Compiler – It converts the program in a high-level language into low-level language. It translates all at once. C, C++ use compilers.

Interpreter – It converts the programs in a high-level language to low-level language. It translates line by line. It gives better error diagnostics than a compiler. Python, BASIC, and Ruby use interpreter.

2) Application Software- End-user programs.

a) **Basic / General Purpose Applications-** Ex; Microsoft Office.

b) **Special Purpose Applications-** Ex; audio/video editors, accounting software, air traffic control software, etc

Data Communication:

Transmission of digital data from one device to another.

Transmission modes/Communication channels:

- 1) **Simplex**- Unidirectional, only one device can transmit. Ex; TV, Fire alarm system.
- 2) **Half Duplex**- Bi-directional, both devices can transmit but not at same time.
Ex; Walkie-talkie.
- 3) **Full Duplex**- Bi-directional, Both devices can transmit simultaneously. Ex; Telephone network.

Transmission media:

1) Guided/Bounded Media:-

- a) **Twisted pair cable**- Used in **Digital Subscriber Line, telephone lines, local area networks**
- b) **Coaxial cable**- Used in amateur radio or low-loss cable television.
- c) **Fiber Optics**- Used in telecommunication services, such as internet, television and telephones.

2) Unguided Media: -

- a) **Microwave transmission**- Mobile phones, satellite communication
- b) **Radio wave transmission**- Radio, TV
- c) **Infrared transmission**- TV remote control



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Network:

It is a **system of interconnected computers**.

It allows computers to communicate with many other computers

ARPANET (Advanced Research Project Agency Network) is world's 1st operational computer network. It was created by USA in response to Soviet union's launching of Sputnik satellite in 1957.

Types:

LAN	MAN	WAN
Local Area Network	Metropolitan Area Network	Wide Area Network
Connects computers within limited geographic area such as office building, school, residence etc.	Covers geographical area larger than LAN but smaller than WAN. Ex; city, town.	Computer network that extends over large geographical area such as state, country, continent.
High bandwidth	Moderate bandwidth	Low bandwidth
High data transfer speed and rate	Moderate speed	Low data transfer speed & rate
Lower set up cost	Moderate set up cost	Higher set up cost

Other types: -

- **Personal Area Network (PAN)** –Connects electronic devices around an individual person. It can cover a network range of 30 feet (approx. 10 m). It can be constructed by using cables or it may be wireless. Ex; USB, Printer, Keyboard, Bluetooth, Wireless mouse, etc.
- **Campus Area Network (CAN)** - Computer network of interconnected local area networks. It is larger than a LAN but smaller than MAN or WAN. It can also stand for Corporate Area Network.
- **Storage Area Network (SAN)** - SAN is a high-speed special-purpose network. It supports data storage, retrieval, and sharing of data, multiple disk arrays, data migration from one storage device to another and uses Fibre Channel interconnection technology.

Network Topology: Arrangement of network-

1) Physical Topology- Geometric layout of connected networks.

Types: BUS Topology, Ring topology, Star Topology, Tree topology(Expanded star topology), Mesh topology, Hybrid topology, etc.

2) Logical/signal Topography-Denotes how signals transmitted from node to node across system

Types: Broadcast topology-No need of instructions. Ex. Broadcast transmission.

Token Passing- Electronic token is passed to each node. When a token is received by the node, the node can send data on the network. Ex; Token Ring and Fibre Distributed Data Interface (FDDI).

Some Terms:

- **Server-** Main computer that manages resources to another computer to a network.
- **Nodes-** Connection point where either data transmission ends or redistribution starts.
- **Protocol-** Set of guidelines for exchanging data over a computer network.
- **Terminal-** A computer equipment at the end of link.
- **Dumb terminal-**Display & input devices which doesn't process data & input. Ex; Keyboard, Monitor.
- **Intelligent terminal-** Able to process data & input. Ex; CPU.

Internet:

It is the global computer network providing a variety of information and communication facilities, consisting of interconnected networks using standardized communication protocols (TCP/ IP).

In computer networks, reference models give conceptual framework that standardizes communication between networks. There are 2 popular reference models.

1) OSI Model – (Open System Interconnection Model)

- It is an intangible and logical arrangement that describes network communication between two systems by using different layer protocols.
- The OSI model developed by the International Standards Organization (ISO).
- Gives guidelines on how communication should be done.
- It has 7 layers to transmit data from one to another.

APPLICATION
PRESENTATION
SESSION
TRANSPORT
NETWORK
DATA LINK
PHYSICAL

Layers of OSI MODEL

2)TCP/IP Model (Transmission Control Protocol/Internet Protocol)

- It is a tangible, client-server model.
- TCP divides data in data packets for sending & receiving data. Rules for reassembling data & damage-free delivery are also specified.
- IP puts destination on such packets.
(IP Address- XXX.XXX.XXX.XXX – 8 bits in each octet. Total 32 bits of information in an IP address.)
- It can be used for communication over Internet as well as for private networks.
- Unlike the OSI model which comprises seven layers, the TCP/IP model is structured with four different layers. These four layers are:

1. Network Access Layer: This is the bottom-most layer of the TCP/IP model architecture. It is a combination of the Data Link and Physical Layer of the OSI model.

2. Internet Layer: Three different protocols- **(IP) Internet Protocol, (ARP) Address Resolution Protocol, (ICMP) Internet Control Message Protocol.**

3. Host to Host Layer: Two main protocols – **(TCP) Another integral part and (UDP) User Datagram Protocol.**

4. Application Layer: Multiple protocols are present in this layer like **(HTTP) Hypertext Transfer Protocol, (NTP) Network Time Protocol, (TELNET) Telecommunication Network, (FTP) File Transfer Protocol etc.**

Hardware for Internet:

Modem (Modulator-Demodulator) - It is a hardware component that allows a computer to connect to the Internet. It converts analog signal to digital signal & vice versa.

Hub – Connection point where data from many directions converge & then forwarded.

Bridge – Bridge is a network device that connects two or more networks that uses the same protocol.

Gateway - A gateway is a network node that connects two dissimilar networks using different protocols together.

Router – It is a hardware device which is responsible for routing traffic from one to another network. It is designed to receive, convert and move packets to another network.

Software for Internet:

HTTP –Hypertext Transfer Protocol

FTP – File Transfer Protocol

SMTP – Simple Mail Transfer Protocol

HTML – Hypertext Markup Language

SGML – Standard General Markup Language

URL – Uniform Resource Locator

IMAP – Internet Message Access Protocol

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Computer Hacking:

Botnet – Botnet is a set of networks connected computers/devices that are used for malicious purposes. Each computer in a botnet is called Bot. It is also known as Zombie.

Various malwares: -

Adware - Software designed to display advertisements on the computer screens.

Spyware- Software that is installed with or without your permission. It collects user's information, browsing habits, etc. Ex; CoolWebSearch, Gator, Zlob

Worms- Self-replicating software program which affects the functions of software and hardware programs. Ex; ILOVEYOU, MSBlast, Stuxnet, Code Red

Ransomware - Malware program that infects and takes control of a system. It infects a computer with the intention of extorting money from its owner. Ex; WannaCry, Locky, Petya

Trojanhorse –Malware that presents itself as legitimate software but take control your computer. It may perform actions on a computer that is genuine but will install malware actions. Ex; CryptoLocker

Malware - Malicious software designed to cause damage to a computer, server or network.

Phishing – E-mail fraud method that trick the email recipient into believing that the message is received from real companies to harvest the recipient's personal & financial details.

Smurfing - It is a type of denial-of-service attack that relies on flooding a network with a large volume of traffic through the manipulation of IP addresses in that network.

Spoofing – Technique used to gain unauthorised access to computers, whereby intruder sends message to computer indicating that message is coming from trusted host.

Types of Hackers –

Ethical Hacker (White hat): Security hacker who gains access to systems with view to fix the identified weaknesses.

Cracker (Black hat): Hacker who gains unauthorised access to computer system to steal data, transfer fund, violate privacy right, etc.

Grey Hat: (Between White & Black hat)Who breaks into computer system without authority with a view to identify weaknesses.

Phreaker: People who specialize in attacks on telephone system.

Recent malwares – EventBot, ShadowPad, Shopper, Pegasus, BlackRock Android malware, etc.

Terms / Facts/ Abbreviations –

Cold Boot – (Cold start/ Hard Boot/ Dead start)- Process of starting computer from shutdown or powerless state and setting it to normal conditions.

Warm Boot – (=Soft Boot) Restarting a computer.

Cache Memory – Very high-speed semiconductor memory which can speed up CPU. It acts as buffer between CPU & main memory. EX; Registers.

Clock Speed – Speed of CPU [Computer is composed of tiny devices that can put on & off to indicate 1 or 0. At any moment several such devices change their state. CPU uses internal clock to synchronize these changes. With every tick of this clock all switches that need to change their positions do so in perfect harmony. Larger the number of ticks per second, faster the speed. Measured in megahertz & gigahertz.]

Toggle Keys – Key that is used to change the input mode of the keys. Ex; Caps Lock, Num lock, Scroll Lock.

Modifier Keys - It is a special key (key combination) that temporarily modifies the normal action of another key when pressed together. Ex; Shift, Alt, Ctrl, Fn.

Versions of IP address – IPv4 (32 bits). It is written in decimal and separated by periods(.).

IPv6 (128 bits). It is written in Hexadecimal and separated by colons(:).

Carbon copy (CC) in email indicates those who receive copy of message addressed primarily to another. List of CCed recipients is visible to all other recipient of message.

Blind Carbon Copy (BCC) – It allows sender to hide person entered in BCC field from other recipients.

1st Super Computer in the world - Cray CDC 6600

1st Super Computer of India - PARAM Shivay

Fastest Super Computer in India –PARAM Siddhi-AI

Fathers of Internet- Vinton Cerf & Bob Kahn

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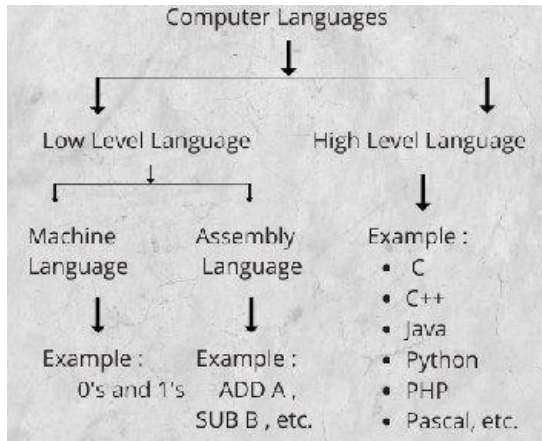
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Computer languages

A computer language is a group of instructions that are used to create computer programs.

Types of Computer Languages



1. Low Level Language:

A Low-level computer language includes only 1's and 0's. This language was used in first and second generation computers.

A. Machine language: It is considered to be the oldest computer language. It is developed by only using binary numbers i.e., 0 and 1. Ex. 1010100

B. Assembly Language: It has evolved with the advancements in the machine language. Assembly language uses symbols, which are popularly known as mnemonics in computer terminology to write the instructions. EX. LOAD r2, a; CLR

2. High Level Language:

High Level computer languages are the advanced development languages in the evolution of computer languages. It uses words and commands along with symbols and numbers. Ex JAVA

Important Terms Used in Computer Languages

Syntax: Syntax is the structured arrangement of statements.

Compiler: It also translates the program from high level language to machine language. It is very fast because it converts the whole program into machine language.

Loader: It loads the code which is translated by translator into the main memory and makes it ready to execute.

Debug: Debugging is the process of finding and removing errors from a code.

Language processor/Translator: It convert program into a machine language so translator do this work.

Assembler: An Assembler is a computer program designed in such a way that it converts mnemonics to 0's and 1's.

Statement: A statement is telling a computer on how to do a desired action using words or instructions.

Binary numbers: Binary numbers are a way of expressing data. The numbers 1 and 0 are called binary numbers.

Linker: It is used to combine all the object files and convert them into a final executable program.

Interpreter: It converts high level language program into machine language. It is very slow because it convert program line by line.

FORTTRAN: it is known as formula translation. It is used for scientific application.

COBOL (Common Business Oriented Language): used for record keeping and data management in business organizations.

BASIC (Beginner's All Purpose Symbolic Instruction Code): first language designed for non-professional programmers. **PASCAL:** it is developed as a teaching tool for programming concepts.

Simula: It was the first object-oriented programming language. Java, Python, C++, Visual Basic .NET and Ruby are the most popular Object Oriented Programming languages.

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Shortcut Keys:

JPEG – Join Photographic Expert Group

GIF – Graphic Interchangeable Format

GPRS – General Packet Radio Service

DHTML - Dynamics Hyper Text Mark-up Language

HTTPS - Hyper Text Transfer Protocol Secure

DVDR - Digital Versatile Disk Recordable

BIOS - Basic Input Output System

BIS - Business Information System

USB – Universal Serial Bus

WWW - World Wide Web

OMR-Optical Mark Reader

HTML- Hypertext Markup Language

SQL- Structured Query Language

DBMS- Database Management System

PNG-Portable Network Graphics

COBOL- Common Business Oriented Language

SMTP- Simple Mail Transfer Protocol

WORM- Write Once, Read Many

PROM- Programmable read-only memory

ALU- Arithmetic Logic Unit

DOS- Disk Operating System

NIC- Network Interface Card

UDP- User Datagram Protocol

DNS- Domain Name System

WIFI- Wireless Fidelity

PDF- Portable Document Format

KEY	Description
Ctrl + A	Select All
Ctrl + B	BOLD
Ctrl + C	COPY
Ctrl + I	ITALICS
Ctrl + K	HYPERLINK
Ctrl + S	SAVE
Ctrl + U	UNDERLINE
Ctrl + W	Close File
Ctrl + X	CUT
Ctrl + Y	Redo
Ctrl + Z	Undo
F1	HELP
F2	Edit/Rename
F4	Properties
F5	GO TO
F7	Spell Check
F12	Save As