Table of Contents

What is Computer?....3
History of Computers:....3
Babbage 3
Use of Punched Cards by Hollerith 4
Electronic Digital Computers 5
The Modern Stored Program EDC 5
Advances in the 1950's 6
Advances in the 1960's 7
More Recent Advances 7
Evolution of Computers....8
EVOLUTION OF COMPUTER - TIMELINE....8
Generations of Computers:....12
Five Generations of Computers....12
The Zero Generation....13
The First Generation....13
The Second Generation....13
The Third Generation....14
The Fourth Generation....14
The Fifth Generation....14
Types of Computers:....14
Supercomputer....15
Mainframe....15
Midrange Server (formerly, Mini-computer)....15
Personal Computer, PC or Microcomputer....15
Enbedded Computers....15
Components or Parts of Computers:....15
Inside the Computer....16
CPU 16
RAM....16
Hard Disk Drive....16
Video Card....16
Sound Card....16
Modem....16
Network Card....17
Fans....17
Cables....17
Hardware Components – A Bit Detail:....17
Components of Computer System:....19
Hardware....19
Software....21

What is Computer?

A computer is a machine that manipulates data according to a list of instructions.

History of Computers:

The history of computers starts out about 2000 years ago, at the birth of the abacus, a wooden rack holding two horizontal wires with beads strung on them. When these beads are moved around, according to programming rules memorized by the user, all regular arithmetic problems can be done. Another important invention around the same time was the Astrolabe, used for navigation.
Blaise Pascal is usually credited for building the first digital computer in 1642. It added numbers entered with dials and was made to help his father, a tax collector. In 1671, Gottfried Wilhelm von Leibniz invented a computer that was built in 1694. It could add, and, after changing some things around, multiply. Leibniz invented a special stepped gear mechanism for introducing the addend digits, and this is still being used.
The prototypes made by Pascal and Leibniz were not used in many places, and considered weird until a little more than a century later, when Thomas of Colmar (A.K.A. Charles Xavier Thomas) created the first successful mechanical calculator that could add, subtract, multiply, and divide. A lot of improved desktop calculators by many inventors followed, so that by about 1890, the range of improvements included:

- Accumulation of partial results
- Storage and automatic reentry of past results (A memory function)
- Printing of the results

Each of these required manual installation. These improvements were mainly made for commercial users, and not for the needs of science.

Babbage

While Thomas of Colmar was developing the desktop calculator, a series of very interesting developments in computers was started in Cambridge, England, by Charles Babbage (left, of which the computer store "Babbages" is named), a mathematics professor. In 1812, Babbage realized that many long calculations, especially those needed to make mathematical tables, were really a series of predictable actions that were constantly repeated. From this he suspected that it should be possible to do these automatically.
He began to design an automatic mechanical calculating machine, which he called a difference engine. By 1822, he had a working model to demonstrate with. With financial help from the British government, Babbage started fabrication of a difference engine in 1823. It was intended to be steam powered and fully automatic, including the printing of the resulting tables, and commanded by a fixed instruction program.
The difference engine, although having limited adaptability and applicability, was really a great advance. Babbage continued to work on it for the next 10 years, but in 1833 he lost interest because he thought he had a better idea -- the construction of what would now be called a general purpose, fully program-controlled, automatic mechanical digital computer. Babbage called this idea an Analytical Engine. The ideas of this design showed a lot of foresight, although this couldn’t be appreciated until a full century later.

The plans for this engine required an identical decimal computer operating on numbers of 50 decimal digits (or words) and having a storage capacity (memory) of 1,000 such digits. The built-in operations were supposed to include everything that a modern general - purpose computer would need, even the all important Conditional Control Transfer Capability that would allow commands to be executed in any order, not just the order in which they were programmed.
The analytical engine was soon to use punched cards (similar to those used in a Jacquard loom), which would be read into the machine from several different Reading Stations. The machine was supposed to operate automatically, by steam power, and require only one person there.
Babbage's computers were never finished. Various reasons are used for his failure. Most used is the lack of precision machining techniques at the time. Another speculation is that Babbage was working on a solution of a problem that few people in 1840 really needed to solve. After Babbage, there was a temporary loss of interest in automatic digital computers. Between 1850 and 1900 great advances were made in mathematical physics, and it came to be known that most observable dynamic phenomena can be identified by differential equations (which meant that most events occurring in nature can be measured or described in one equation or another), so that easy means for their calculation would be helpful. Moreover, from a practical view, the availability of steam power caused manufacturing (boilers), transportation (steam engines and boats), and commerce to prosper and led to a period of a lot of engineering achievements. The designing of railroads, and the making of steamships, textile mills, and bridges required differential calculus to determine such things as:

- center of gravity
- center of buoyancy
- moment of inertia
- stress distributions

Even the assessment of the power output of a steam engine needed mathematical integration. A strong need thus developed for a machine that could rapidly perform many repetitive calculations.

Use of Punched Cards by Hollerith

A step towards automated computing was the development of punched cards, which were first successfully used with computers in 1890 by Herman Hollerith (left) and James Powers, who worked for the US. Census Bureau. They developed devices that could read the information that had been punched into the cards automatically, without human help. Because of this, reading errors were reduced dramatically, work flow increased, and, most importantly, stacks of punched cards could be used as easily accessible memory of almost unlimited size. Furthermore, different problems could be stored on different stacks of cards and accessed when needed.
These advantages were seen by commercial companies and soon led to the development of improved punch-card using computers created by International Business Machines (IBM), Remington (yes, the same people that make shavers), Burroughs, and other corporations. These computers used electromechanical devices in which electrical power provided mechanical motion -- like turning the wheels of an adding machine. Such systems included features to:

- feed in a specified number of cards automatically
- add, multiply, and sort
- feed out cards with punched results

As compared to today's machines, these computers were slow, usually processing 50 - 220 cards per minute, each card holding about 80 decimal numbers (characters). At the time,

however, punched cards were a huge step forward. They provided a means of I/O, and memory storage on a huge scale. For more than 50 years after their first use, punched card machines did most of the world's first business computing, and a considerable amount of the computing work in science.

Electronic Digital Computers

The start of World War II produced a large need for computer capacity, especially for the military. New weapons were made for which trajectory tables and other essential data were needed. In 1942, John P. Eckert, John W. Mauchly (left), and their associates at the Moore school of Electrical Engineering of University of Pennsylvania decided to build a high - speed electronic computer to do the job. This machine became known as ENIAC (Electrical Numerical Integrator And Calculator)

The size of ENIAC's numerical "word" was 10 decimal digits, and it could multiply two of these numbers at a rate of 300 per second, by finding the value of each product from a multiplication table stored in its memory. ENIAC was therefore about 1,000 times faster then the previous generation of relay computers.

ENIAC used 18,000 vacuum tubes, about 1,800 square feet of floor space, and consumed about 180,000 watts of electrical power. It had punched card I/O, 1 multiplier, 1 divider/square rooter, and 20 adders using decimal ring counters, which served as adders and also as quick-access (.0002 seconds) read-write register storage. The executable instructions making up a program were embodied in the separate "units" of ENIAC, which were plugged together to form a "route" for the flow of information.

These connections had to be redone after each computation, together with presetting function tables and switches. This "wire your own" technique was inconvenient (for obvious reasons), and with only some latitude could ENIAC be considered programmable. It was, however, efficient in handling the particular programs for which it had been designed.

ENIAC is commonly accepted as the first successful high - speed electronic digital computer (EDC) and was used from 1946 to 1955. A controversy developed in 1971, however, over the patentability of ENIAC's basic digital concepts, the claim being made that another physicist, John V. Atanasoff (left) had already used basically the same ideas in a simpler vacuum - tube device he had built in the 1930's while at Iowa State College. In 1973 the courts found in favor of the company using the Atanasoff claim.

The Modern Stored Program EDC

Fascinated by the success of ENIAC, the mathematician John Von Neumann (left) undertook, in 1945, an abstract study of computation that showed that a computer should have a very simple, fixed physical structure, and yet be able to execute any kind of computation by means of a proper programmed control without the need for any change in the unit itself.

Von Neumann contributed a new awareness of how practical, yet fast computers should be organized and built. These ideas, usually referred to as the stored - program technique, became essential for future generations of high - speed digital computers and were universally adopted.

The Stored - Program technique involves many features of computer design and function besides the one that it is named after. In combination, these features make very - high - speed operation attainable. A glimpse may be provided by considering what 1,000 operations per second means. If each instruction in a job program were used once in consecutive order, no human programmer could generate enough instruction to keep the computer busy.

Arrangements must be made, therefore, for parts of the job program (called subroutines) to be used repeatedly in a manner that depends on the way the computation goes. Also, it would clearly be helpful if instructions could be changed if needed during a computation to make them behave differently. Von Neumann met these two needs by making a special type of machine instruction, called a Conditional control transfer - which allowed the program sequence to be stopped and started again at any point - and by storing all instruction programs together with data in the same memory unit, so that, when needed, instructions could be arithmetically changed in the same way as data.
As a result of these techniques, computing and programming became much faster, more flexible, and more efficient with work. Regularly used subroutines did not have to be reprogrammed for each new program, but could be kept in "libraries" and read into memory only when needed. Thus, much of a given program could be assembled from the subroutine library.
The all - purpose computer memory became the assembly place in which all parts of a long computation were kept, worked on piece by piece, and put together to form the final results. The computer control survived only as an "errand runner" for the overall process. As soon as the advantage of these techniques became clear, they became a standard practice.

The first generation of modern programmed electronic computers to take advantage of these improvements were built in 1947. This group included computers using Random - Access - Memory (RAM), which is a memory designed to give almost constant access to any particular piece of information. . These machines had punched - card or punched tape I/O devices and RAM's of 1,000 - word capacity and access times of .5 Greek MU seconds (.5*10-6 seconds). Some of them could perform multiplications in 2 to 4 MU seconds. Physically, they were much smaller than ENIAC. Some were about the size of a grand piano and used only 2,500 electron tubes, a lot less then required by the earlier ENIAC. The first - generation stored - program computers needed a lot of maintenance, reached probably about 70 to 80% reliability of operation (ROO) and were used for 8 to 12 years. They were usually programmed in ML, although by the mid 1950's progress had been made in several aspects of advanced programming. This group of computers included EDVAC (above) and UNIVAC (right) the first commercially available computers.

Advances in the 1950's

Early in the 50's two important engineering discoveries changed the image of the electronic - computer field, from one of fast but unreliable hardware to an image of relatively high reliability and even more capability. These discoveries were the magnetic core memory and the Transistor - Circuit Element. These technical discoveries quickly found their way into new models of digital computers. RAM capacities increased from 8,000 to 64,000 words in commercially available machines by the 1960's, with access times of 2 to 3 MS (Milliseconds). These machines were very expensive to purchase or even to rent and were particularly expensive to operate because of the cost of expanding programming. Such computers were mostly found in large computer centers operated by industry, government, and private laboratories - staffed with many programmers and support personnel. This situation led to modes of operation enabling the sharing of the high potential available.
One such mode is batch processing, in which problems are prepared and then held ready for computation on a relatively cheap storage medium. Magnetic drums, magnetic - disk packs, or magnetic tapes were usually used. When the computer finishes with a problem, it "dumps" the whole problem (program and results) on one of these peripheral storage units and starts on a new problem.
Another mode for fast, powerful machines is called time-sharing. In time-sharing, the computer processes many jobs in such rapid succession that each job runs as if the other

jobs did not exist, thus keeping each "customer" satisfied. Such operating modes need elaborate executable programs to attend to the administration of the various tasks.

Advances in the 1960's

In the 1960's, efforts to design and develop the fastest possible computer with the greatest capacity reached a turning point with the LARC machine, built for the Livermore Radiation Laboratories of the University of California by the Sperry - Rand Corporation, and the Stretch computer by IBM. The LARC had a base memory of 98,000 words and multiplied in 10 Greek MU seconds. Stretch was made with several degrees of memory having slower access for the ranks of greater capacity, the fastest access time being less then 1 Greek MU Second and the total capacity in the vicinity of 100,000,000 words.
During this period, the major computer manufacturers began to offer a range of capabilities and prices, as well as accessories such as:

- Consoles
- Card Feeders
- Page Printers
- Cathode - ray - tube displays
- Graphing devices

These were widely used in businesses for such things as:

- Accounting
- Payroll
- Inventory control
- Ordering Supplies
- Billing

CPU's for these uses did not have to be very fast arithmetically and were usually used to access large amounts of records on file, keeping these up to date. By far, the most number of computer systems were sold for the more simple uses, such as hospitals (keeping track of patient records, medications, and treatments given). They were also used in libraries, such as the National Medical Library retrieval system, and in the Chemical Abstracts System, where computer records on file now cover nearly all known chemical compounds.

More Recent Advances

The trend during the 1970's was, to some extent, moving away from very powerful, single - purpose computers and toward a larger range of applications for cheaper computer systems. Most continuous-process manufacturing, such as petroleum refining and electrical-power distribution systems, now used computers of smaller capability for controlling and regulating their jobs.
In the 1960's, the problems in programming applications were an obstacle to the independence of medium sized on-site computers, but gains in applications programming language technologies removed these obstacles. Applications languages were now available for controlling a great range of manufacturing processes, for using machine tools with computers, and for many other things. Moreover, a new revolution in computer hardware was under way, involving shrinking of computer-logic circuitry and of components by what are called large-scale integration (LSI) techniques. In the 1950s it was realized that "scaling down" the size of electronic digital computer circuits and parts would increase speed and efficiency and by that, improve performance, if they could only find a way to do this. About 1960 photo printing of conductive circuit boards to eliminate wiring became more developed. Then it became possible to build resistors and capacitors into the circuitry by the same

process. In the 1970's, vacuum deposition of transistors became the norm, and entire assemblies, with adders, shifting registers, and counters, became available on tiny "chips." In the 1980's, very large scale integration (VLSI), in which hundreds of thousands of transistors were placed on a single chip, became more and more common. Many companies, some new to the computer field, introduced in the 1970s programmable minicomputers supplied with software packages. The "shrinking" trend continued with the introduction of personal computers (PC's), which are programmable machines small enough and inexpensive enough to be purchased and used by individuals.

Many companies, such as Apple Computer and Radio Shack, introduced very successful PC's in the 1970s, encouraged in part by a fad in computer (video) games. In the 1980s some friction occurred in the crowded PC field, with Apple and IBM keeping strong. In the manufacturing of semiconductor chips, the Intel and Motorola Corporations were very competitive into the 1980s, although Japanese firms were making strong economic advances, especially in the area of memory chips. By the late 1980s, some personal computers were run by microprocessors that, handling 32 bits of data at a time, could process about 4,000,000 instructions per second.

Microprocessors equipped with read-only memory (ROM), which stores constantly used, unchanging programs, now performed an increased number of process-control, testing, monitoring, and diagnosing functions, like automobile ignition systems, automobile-engine diagnosis, and production-line inspection duties.

Cray Research and Control Data Inc. dominated the field of supercomputers, or the most powerful computer systems, through the 1970s and 1980s. In the early 1980s, however, the Japanese government announced a gigantic plan to design and build a new generation of supercomputers. This new generation, the so-called "fifth" generation, is using new technologies in very large integration, along with new programming languages, and will be capable of amazing feats in the area of artificial intelligence, such as voice recognition.

Progress in the area of software has not matched the great advances in hardware. Software has become the major cost of many systems because programming productivity has not increased very quickly. New programming techniques, such as object-oriented programming, have been developed to help relieve this problem. Despite difficulties with software, however, the cost per calculation of computers is rapidly lessening, and their convenience and efficiency are expected to increase in the early future.

The computer field continues to experience huge growth. Computer networking, computer mail, and electronic publishing are just a few of the applications that have grown in recent years. Advances in technologies continue to produce cheaper and more powerful computers offering the promise that in the near future, computers or terminals will reside in most, if not all homes, offices, and schools

Evolution of Computers

EVOLUTION OF COMPUTER - TIMELINE

The genesis of mechanical / digital computing can be traced back to Blaise Pascal and GW Liebnitz. Charles Babbage was the first to imagine a machine that could process data. He designed first a different engine, an analytical engine and an all purpose calculating machine.

Year 1904:

Discovery of thermionic valve.

Year 1938:

Konrad Zeus built the world's first binary digital computer, the Z1.

Year 1941:
Zeus completed the first fully functional program-controlled electromechanical digital computer, the Z3.
Year 1946:
The first glimpse of the ENIAC, a machine built by John Mauchly and J. Presper Eckert.
Year 1948:
Claude Shannon identified the bit as the fundamental unit of data and the basic unit of computation.
Year 1951:
The UNIVAC I developed.
Year 1952:
John von Neumann's IAS computer became operational.
Year 1953:
IBM shipped its first electronic computer, the 701.
Year 1955:
The first fully transistorized computer, TRADIC.
Year 1956:
Experiments began for direct keyboard input on computers. Doug Ross wrote a memo advocating direct access.
The era of magnetic disk storage dawned with IBM's shipment of a 305 RAMAC
TX-0, the first general-purpose, programmable computer built with transistors.
Year 1957:
FORTRAN enabled a computer to perform a repetitive task from a single set of instructions by using loops.
Commercial compiler for it's UNIVAC.
Year 1958:
Dataphone, the first commercial modem.
COBOL designed for business use.
LISP made its debut as the first computer language designed for writing artificial intelligence programs.
Year 1962:
SpaceWar!, considered the first interactive computer game.
Virtual memory emerged.
Year 1963:
ASCII developed.
Year 1964:
BASIC created.
Year 1965:
PDP-8, the first commercially successful minicomputer.
Year 1967:
LOGO as a computer language designed.
Year 1969:
The RS-232-C standard.
Year 1970:
The birth of ARPANET, the precursor to present internet.
Year 1971:
8-inch floppy diskette invented.
Ray Thomlinson sends first ever email.
Year 1972:
Intel's 8008 microprocessor made its debut.

Year 1973:
Ethernet method of network connection devised.
Year 1975:
Telenet: the first commercially packet-switching network and civilian equivalent of ARPANET, was born.
Bill Gates and Paul Allen found Micro-Soft.
The first issue of BYTE magazine published.
Year 1976:
Steve Wozniak designed the Apple I, on a single-board computer.
The Cray I - the first commercially successful vector processor.
Steve Jobs and Steve Wozniak from the Apple Computer Company.
5 1/4" Flexible disk drive and diskette were introduced.
Year 1977:
Hashim Taylor born! It is the year's only invention! LOL!
Year 1978:
Epson announces the dot matrix printer.
Year 1979:
Emoticons bring life into otherwise boring computer newsgroups.
Year 1980:
The first hard disk drive for microcomputer.
The first optical data storage disk.
The first Winchester 5.25-inch hard disk drive announced.
Microsoft acquires SCP's DOS.
Year 1981:
Sony shipped the first 3 1/4" floppy disk and drive.
the MS-DOS released.
Year 1982:
Phillips created an erasable optical disk.
The first Cray XPM produced.
The first issue of PC Magazine printed.
Intel introduced the 6 MHz 80286 microprocessor.
Microsoft release MS-DOS 1.1 to IBM.
The first IBM PC clone, the MPC.
Compaq Portable PC introduced.
TCP/IP introduced and Internet's birth.
Year 1983:
Apple introduced its Lisa. The first personal computer with a graphical User Interface.
Compaq introduced first PC clone that used the same software as the IBM PC.
Lotus 1-2-3 v. 1.0 hit the market.
Iomega introduced the Bernoulli Box storage device.
SyQuest storage cartridge system launched.
Novell introduced the NetWare network OS.
Phillips and Sony develop the CD-ROM
Hewlett-Packard unveils microcomputer featuring optical touchscreen.
Microsoft Windows and MS-Word 1.0 released.
Borland int. releases Turbo Pascal programming language.
Year 1984:
Apple Computer launched the Macintosh, the first successful mouse-driven computer with GUI.
IBM release PC-AT with 286 chip and 16 bit bus and PC Jr.
Hewlett Packard introduced the LaserJet printer
The word "Cyberspace" used for the first time by William Gibson.

Year 1985:
Aldus announced it's PageMaker program for desktop publishing.
The C++ emerges as the dominant object-oriented programming language.
The first general-interest CD-ROM product released - Grolier encyclopedia.
The modern Internet gained support when NSF formed the NSFNET.
CD-ROM drives are introduced for computer use.
NEC Home Electronics introduced the first multisync monitor.
Microsoft shipped Windows 1.0.
Year 1986:
Apple designed HyperCard, a software tool for development of in-house applications.
IBM introduced its PS/2 machine based on a new architect called MicroChannel.
The first IBM to include Intel's 80386 chip, allowing the use of a mouse with IBMs for the first time.
Microsoft released OS/2 1.0.
Year 1988:
NeXT computer - recognized as an important innovation.
PC-clone makers developed EISA
Robert Morris' worm flooded the ARPANET.
Year 1989:
Virtual Reality, a computer generated 3-D environment that allows a user to interact with the realities developed.
Intel announced the 486 microprocessor.
Year 1990:
Microsoft shipped Windows 3.0.
The World Wide Web was born when Tim Berners-Lee, a researcher at CERN, Geneva, developed HTML.
Apple unveils and ships the Macintosh Classic.
Year 1991:
Linus Torvalds develops Linux, in Finland.
The NSF allowed commercial use of the Internet for the first time.
Intel introduced the PCI local-bus standard for personal computer systems.
IBM introduced ThinkPad 700C laptop computer.
Year 1993:
Intel introduced Pentium processor.
Microsoft comes up with Windows NT OS.
Creative's Sound Blaster 16 Card hit the market.
Apple launched Newton MessagePad - personal digital assistant.
The NCSA released Mosaic 1.0, first graphical www web browser.
Netscape Navigator 1.0, a www browser, born.
Iomega launched its Zip drive and Zip disks.
150 countries connected via internet and 50 million people got online.
Year 1995:
The NSF decommissioned the internet backbone, leaving the internet a self supporting industry.
IBM announced PC-DOS 7.
Microsoft hits the world with Windows 95.
I (Hashim Taylor) celebrated my 18th Birthday :P
Year 1996:
Corel purchased WordPerfect, Quattro Pro and the PerfectOffice application suite from Novell.
Microsoft released Windows NT 4.0

Microsoft unveils Windows CE operating system for handheld PCs.
CD-ReWritable (CD-RW) is announced.

Year 1997:

AMD introduced K6 processor.

Year 1998:

Celeron processor shipped
Steve Jobs introduced the iMac.
Microsoft released Windows 98.
America Online buys Netscape Communications.
Motorola officially introduced the G4 processor.

Year 1999:

Cyrix released the MII processor - beats PIII
Apple introduced the G3 PowerBook and the iBook.
AMD released the Athlon processor.
Apple released the Power Mac G4 compter (With Motorola G4)

Year 2000:

Microsoft unveils Windows 2000 OS and Windows ME.
BeOS v5 OS for PCs released.
Palm III c handheld computer released.
Microsoft launches the pocket PC that runs on Microsoft Windows CE 3.0.
Corel released WordPerfect Office 2000 for Linux.
Apple releases MAC X DR 4.
Compaq introduced the iPAQ Pocket PC handheld computer.
Intel announce Pentium 4.
Microsoft unveils it's C# (Called C Sharp) language.
Apple introduced the PowerMac G4 Cube.
AMD shipped 1.1 GHz Athlon processor.

Year 2001:

Intel announced hyper-threaded P4 capable of working as two processor.
Napster closes down.

Year 2001 ONWARD...

We are all aware what happened after year 2001! Soon I'll add the hot happenings of rest of the years.

The Bytes Measurement: a simple chart

	Bytes			
Kilobyte	1,024	Kilobytes		
Megabyte	1,048,576	1,024	Megabytes	
Gigabyte	1,073,741,824	1,048,576	1,024	Gigabytes
Terabyte	1,099,511,627, 776	1,073,741,824	1,048,576	1,024

Generations of Computers:

Five Generations of Computers

There have been many transformations within the world of computer design and technology. These transformations have included the use of vacuum tubes, transistors,

integrated circuits, and microprocessors. Each transformation is considered an individual generation of computer design. Even though the four generations of computers differ, they are merely the building blocks of advancement in the technological age.

The Zero Generation

This generation contains the machines based on mechanical operations. There was no electrical circuit present in the machine. Like Abacus, pascaline etc.

The First Generation

The first generation was from 1951 through to 1958. This generation is defined through the use of vacuum tubes in computers. A computer was made up of thousands of vacuum tubes. These tubes function similar to light bulbs. The difference is that vacuum tubes mainly transmit electric currents rather than produce light (News Flash). These currents act as an amplifier or switch. They act as an amplifier by strengthening the weak electronic signals. The switch works by starting and stopping the flow of electricity. Just like light bulbs, vacuum tubes give off a large amount of heat.

Some of the first generation computers consisted of the UNIVAC (universal automatic computer, the ENIAC (electronic numerical integrator computer), and the EDVAC (electronic discrete variable computer) (IT history Outline2). These computers were approximately the size of a large classroom, thus very costly because of the size. They were built large because they were composed of thousands of vacuum tubes. Considering vacuum tubes gave off a large amount of heat, large air conditioner units were needed to prevent the vacuum tubes from over heating. Despite the technician's best efforts a large amount of vacuum tubes would over heat and break on a daily basis. Due to the over heating vacuum tubes, these first generation computers were not efficient and constantly broke.

Another characteristic of first generation computers is that they used punch cards to input data. These punch cards consisted of a heavy weight paper with holes punched through it. When the cards were inserted into the computers, the punched out holes were read to obtain data. The data would be stored on large magnetic drums. These drums would spin inside the computer and had sections that were either magnetized or demagnetized, depending on the information being stored.

The Second Generation

The second generation of computers lasted from 1959 to 1964. Unlike the first generation computers, the second generation was made up of transistors. These computers were also built smaller. They were the size of a closet rather than a classroom. The transistors were smaller than vacuum tubes but were also used to start and stop the flow of electric signals. According to Webster's Dictionary, a transistor is "an electronic device similar to the electron tube in use, and consists of a small block of a semiconductor that has at least three electrodes." The first computer built using transistors was the IBM 1400.

The reason transistors were being used rather than vacuum tubes was that transistors proved to be faster, more reliable, smaller, and cheaper. One transistor's power was equivalent to approximately 40 vacuum tubes. The transistors gave off very little heat compared to the vacuum tubes and were made of silicon. Therefore, large air conditioner units were not required and transistors wouldn't blow like the vacuum tubes. Therefore these computers were more reliable and failed less often.

The transistor-based computer continued using punch cards to input information into the computer's internal memory. However, the devices used to store the internal memory were

different. Magnetic cores are “small donut-shaped magnets that could be polarized in one of two directions to represent data” (IT History Outline 2) which were strung on a wire within the computer. As for the external storage devices, magnets, tapes, and floppy disks began being used.

The Third Generation

The third generation of computers was 1965 through to 1979. This generation used integrated circuits rather than transistors. Again the size of computers decreased and became significantly smaller. This time, the common IBM 360 would fit on top of a standard desk. By definition, “An integrated circuit incorporated a large number of transistors placed with in a path of electric current on one wafer of silicon” (Webster’s dictionary, IT History Outline2). The electronic circuits were also known as the semiconductor chip.
There were a few, yet significant advantages to using the integrated circuit compared to a single transistor. The use of integrated circuits lowered cost, increased power within the computer, and was significantly smaller. The other advantages of a new computer design were with in the memory. External storage devices were still magnetic tapes and floppy however these tapes and disks were used to input data into the computer rather than using punch cards. The internal memory was MOS (metal Oxide Semiconductor) memory.

The Fourth Generation

The fourth generation of computers was 1979 through to today. Unlike the third generation these computers all had processing information on a single silicon chip. These are referred to as microcomputers or the brain of the computer. This brain is the CPU (Central Processing Unit). This was the beginning of desktop and laptop computers. The integration process started with several thousand transistors on a single chip. This was referred to as LSI or Large Scale Integration. During the generation this evolved to VSLI or Very Large Scale Integration where millions of transistors were put onto integrated circuits.

There were definite advantages as Apple –Mac (1984) and IBM’s personal computer (1981) were released. These advantages consisted of the processor performing at much greater speeds and being able to perform more calculations without failing. IBM came out with MS-DOS (Microsoft disk operating System) when it built the Personal Computer. Microsoft started to take off with MS Windows starting in 1983 to 1990. At that point Windows became a common operating system for the computers. As the Windows operating system improved, GUI‘s (Graphical User Interfaces) started to develop. These interfaces allowed the computers to become user friendly.

The Fifth Generation

The evolution of the computer has come a long way. We saw that the first generation only used punch cards. During the end of the second generation we started to see high-level programming languages such as C that lead to the creation of BASIC. This is also the time when Microsoft started the company with Bill Gates at the head of the corporation. Though there is some debate as to whether we’ve entered the fifth generation, the general consensus is that the fifth generation will begin with AI (artificial intelligence). AI is when a computer can think and make decisions all by it’s self without any human input. At this point there are no known computers that truly posses artificial intelligence. The question as to if there ever will be artificial intelligence continues to be on the minds of every computer genius down to the average computer user.

Types of Computers:

Supercomputer

A very large and fast computer, optimized for high-speed computing. Used for predicting the weather, digital imaging such as is used on computer animation, engineering techniques such as CFD (Computational Fluid Dynamics) and FEA (Finite Element Analysis) and simulating molecules in chemistry and biology. The microcomputer of today is as powerful as the supercomputers of one to two decades ago.

Mainframe

A large computer serving thousands of users, suitable for a large corporation or government. Performs the same functions as a minicomputer.

Midrange Server (formerly, Mini-computer)

A larger computer suitable for a small business or a department in a large company, serving up to hundreds of users, sharing files and printers, and storing central information such as personnel and financial accounts, and client or patient information.

Personal Computer, PC or Microcomputer

A small computer suitable for a single person. Examples: desktop, laptop, PDA. But microcomputers are so powerful today (processor and networking speed, memory and storage capacity) that similar computers can be used as web servers, sharing web pages over the Internet, and file servers, sharing files over a network.
Mobile Communications Device. Mobile phone, Pager or similar device with Processing and Internet capability.

Enbedded Computers

"The computer that is not a computer." These are the processors inside a wide variety of devices, such as digital clocks watches, digital cameras, radios and TVs with digital tuners, garage door openers, computer printers, copiers, VCRs and video storage/replay devices (e.g. Tivo), digital thermostats and appliances, and your car, to name only a few. Embedded computers generally do not have screens, keyboards or hard drives. Since we are in Detroit, the use in cars and other vehicles is of special interest. Today, one or more processors control the engine and transmission. ABS systems have one additional processor for each wheel, and the instrument panel is often controlled by another, even if you have analog instruments. For the engine, the microprocessor in the engine or powertrain controller measures the amount of air in the cylinder ("stepping on the gas" is really "stepping on the air"), calculates the matching amount of fuel, fires the fuel injector to deliver that amount of fuel, and decides when to fire the park plug. Without the level of control offered by the microprocessor, it would be impossible to meet emission and mileage standards in a car that had any kind of performance at all. If you think about the number of digital devices in your home and car, it is probably at least twenty, and often up to fifty. Clearly, there are more embedded computers than there are any of the other types.

Components or Parts of Computers:

Components of a Computer System

- Computer Case
- Monitor
- Speakers
- Keyboard
- Mouse
- Printer
- Scanner
- Web camera
- Floppy drive
- CD or DVD drive

Inside the Computer

Some parts you will not see because they are inside:

CPU

The CPU (Central Processing Unit) is the brains behind your computer. The CPU is responsible for performing calculations and tasks that make programs work. The faster the CPU, the quicker programs can process computations and commands.

RAM

A fast CPU is useless without an adequate amount of RAM (Random Access Memory). RAM is usually referred to as a computer's memory -- meaning it stores information that is used by running programs or applications. More memory lets you run more applications at the same time without degrading your system's performance.

Hard Disk Drive

The hard disk drive (HDD) of the computer is where permanent information is stored. Documents, databases, spreadsheets, and programs are all stored on the hard disk. The larger the hard disk, the more you can fit on the drive. The size of the HDD does not affect the speed at which a program can run, but the HDD speed can affect how fast you can access your files.

Video Card

The video card is a board that plugs into the PC motherboard to give it display capabilities. New video cards come with their own RAM and processor to help speed up the graphics display. Many computers come with video chips built in. That makes a separate video card unnecessary, unless the computer is going to be used for high-end multimedia work or to play video games.

Sound Card

Like video cards, sound cards are expansion boards used for enabling a computer to manipulate sound. Most sound cards give you the power to plug in speakers and a microphone. Some even give you the jacks for hooking your computer up to a common stereo. As with video cards, many computers come with sound chips, making it unnecessary to buy a separate card, unless you need higher sound quality for your work.

Modem

The modem allows your computer to use a telephone line to communicate and connect to the Internet.

Network Card

A network card allows your computer to be connected either to other computers or to the Internet if you are using a fast Internet connection such as cable or dsl.

Fans

One or more fans inside the computer keep air moving and keep your computer cool.

Cables

Numerous wires and flat, ribbon-like cables provide power and communication to the various parts inside your computer.

Hardware Components – A Bit Detail:

Microcomputers, laptops, and Personal Digital Assistants (PDAs) are made up of a number of separate hardware components. With experience you will be in a position to replace or upgrade many of these components. Read through the table below. It will help you identify many of the common components found in the computer field.

Power Supply

This is the power supply that provides power to all the hardware components on the workstation. P4 computers should have a minimum of a 400W power supply. The power supply must also match the motherboard and the components you are attaching to it. Newer power supplies may only have power connections for Serial ATA hard drives and may not be compatible with older drives that require a molex connector.

Hard Disk Drive (HDD)

The hard disk drive is known as the secondary storage area. When you save data to the hard disk it saves information from RAM (primary storage) so it can be retrieved at a later time. Hard disks are non-volatile, which means that if the power goes out, data remains on the hard disk. Hard disks range in size and speed. Typical hard drives today are measured in Gigabytes or billions of bytes (1,000,000,000 bytes). However, new Terabyte (trillions of bytes) drives are now available. Typical spin speeds are approximately 7,200 RPM.

Floppy Disk Drive (FDD)

The floppy disk drive is slowly being replaced by other media types. The 3.5 inch floppy disk will only store 1.44MB of data and is very slow. The floppy disk is magnetic media and subject to a high failure rate.

Random Access Memory (RAM)

RAM is known as the primary storage area and is very fast. All data going to and from the CPU will go through RAM. If purchasing RAM you have to make sure it is compatible with your motherboard in terms of physical size, capacity and speed. RAM is volatile. This means that if the power goes out all data in RAM will be erased. The most common RAM used today is DDR2 (Double Data Rate.)

Central Processing Unit (CPU)

This is the main chip in the computer and acts like the brain of the workstation. Most of the calculations are done through the CPU. Clock speeds in the CPU are measured in Hertz (Hz). A common speed today is 3.3 Gigahertz (3.3 billion hertz). Faster clock speeds indicate the ability to process more information faster. New computers may only read as 2.0 GHz, however, they are often dual or quad core. This means that each core runs at that speed.

Motherboard

The motherboard is where all the hardware components are connected. RAM, HDD, FDD, CD/DVD, CPU, Video/Audio, Network, Power Supply, etc. are all attached to the motherboard. Each motherboard has its own unique capabilities and characteristics and the components attached to it must be compatible.

Compact Disc (CD) Drive

The compact disc (CD) drive has been a standard in computers since 1995. There are a number of different types of CD drives. These drives are referred to as optical drives because they use laser light to read the data. Common drives will allow you to burn and rewrite CDs. It is impossible to tell the features looking at this small image. However, by looking at the drive you will see letters indicating what type of drive it is. If the CD drive has CD-R/RW then it will play normal CDs, record to blank CDs, and even create rewritable CDs. A CD disk can hold as much as 700MB of data.

Digital Versatile Disc (DVD)

DVD Drives look similar to the CD Drive. However, the pickup laser beam is half the thickness of a traditional laser beam. This means it can store 4 times the amount of data than the CD. Newer DVD drives come with the ability to burn DVDs. DVD capacity can be over 17 GB with the right drive and DVD.

Monitor

The 17 inch Cathode Ray Tube (CRT) monitor is a common type of monitor sold with computers. However, the flat panel LCD monitors are a popular choice because they are lighter, energy efficient, take up less room and the prices continue to drop. LCD monitors are now often standard when purchasing a system from places such as Dwll, MGD, Future Shop, etc.

Keyboard

The keyboard is the most common input device used on the computer. This QWERTY keyboard will use a PS/2 connection. However, the PS/2 connector is being phased out and is being replaced by the USB port.

Cable/DSL Modem

Over half the households with computers in them have some form of high speed Internet access. In order to get a computer on the Internet using a high speed connection you require a special Cable or DSL (digital subscriber line) modem. The computer connects to the modem through a standard network connection or USB port.

Peripheral Devices

To extend the functionality of your computer or laptop, you can add peripherals to the computer. The picture to the left is a PCMCIA card for a laptop that provides wireless connection to a network. Other PCMCIA (person computer memory card international association) cards can give a computer modem functionality or even added storage capacity.

Bus Architecture

The bus architecture is located on the motherboard. The electrical circuitry seen on the motherboard is in fact the bus. This circuitry joins the components together. There are typically 4 types of busses on the motherboard each designed for a specific purpose. There is a specific bus for transferring electricity or power to the components; transferring control signals; transferring memory addresses; and transferring data.

Scanner

Scanners are used to transfer images and text information into a computer. Scanners usually connect to computers through the USB port, although in the past the parallel port was quite often used.

Modem

The traditional modem will connect a computer to a network using the telephone line. This is often referred to as a dial-up connection. Speeds are significantly slower than DSL or Cable modems. Maximum speed is 56 Kbs (kilobits per second)

Web Cam

The Web camera usually connects through a computer's USB port. It is an easy method of getting a small amount of windowed video into the computer. It can also be used with video conferencing using applications like MSN or NetMeeting. Most Web cameras have a built in microphone.

Personal Digital Assistants (PDAs)

PDAs are growing in popularity because they are very small and portable. The increased processing power and longer battery life can run more complex PDA applications. PDS's are different from devices that are categorized as Smartphones; such as the Blackberry

Components of Computer System:

- Hardware
- Software
- Data
- User

Hardware

As we learned in the Overview portion of the study guide, a computer system has two basic parts: hardware and software. The equipment associated with a computer system is the hardware. Computer hardware is responsible for performing four basic functions: input, processing, output, and storage. Let's go back to the basic definition of a computer. A computer is an electronic device that is programmed to accept data (input), process it into useful information (output), and store it for future use (storage). The processing function is under the control of a set of instructions (software); we will explore this later.

The four primary components of a computer system are:

Input	Input devices send data and instructions to the central processing unit.
Output	Central processing unit executes computer instructions. Memory holds data and programs temporarily.
Processing	Output devices make processed data available to the user.
Secondary Storage	Secondary storage devices store data and programs permanently.

In order to function properly, a computer system must have all four types of hardware: input, processing, output, and storage.

In this example, the mouse and keyboard are the input devices and the monitor and speakers are output devices. The processor is contained inside the tower unit and the

storage devices are the hard drive, CD-ROM drive and the diskette drive. Let's explore each of the devices in detail.
Input devices accept data in a form that the computer can utilize. Also, the input devices send the data or instructions to the processing unit to be processed into useful information. There are many examples of input devices, but the most commonly used input devices are shown below:

The input device feeds data, raw unprocessed facts, to the processing unit. The role of the processing unit or central processing unit is to use a stored program to manipulate the input data into the information required. In looking at the computer system below, the Central Processing Unit, CPU, is not exactly visible. The CPU is found inside the tall, vertical unit, called a tower, located just to the right of the monitor.

The CPU is the brain of the computer. The CPU consists of electronic circuits that interpret and execute instructions; it communicates with the input, output, and storage devices. The CPU, with the help of memory, executes instructions in the repetition of machine cycles.
A machine cycle consists of four steps:

- The control unit fetches an instruction and data associated with it from memory.
- The control unit decodes the instruction.
- The arithmetic/logic unit executes the instruction.
- The arithmetic/logic unit stores the result in memory.

The first two instructions are called instruction time, I-time. Steps 3 and 4 are called execution time, E-time. The speed of computer is measured in megahertz, MHz. A MHz is a million machine cycles per second. A personal computer listed at 500 MHz has a processor capable of handling 500 million machine cycles per second. Another measure of speed is gigahertz (GHZ), a billion machine cycles per second. A third measure of speed is a megaflop, which stands for one million floating-point operations per second. It measures the ability of the computer to perform complex mathematical operations.
Memory, or primary storage, works with the CPU to hold instructions and data in order to be processed. Memory keeps the instructions and data for whatever programs you happen to be using at the moment. Memory is the first place data and instructions are placed after being input; processed information is placed in memory to be returned to an output device. It is very important to know that memory can hold data only temporarily because it requires a continuous flow of electrical current. If current is interrupted, data is lost. Memory is in the form of a semiconductor or silicon chip and is contained inside the computer.

There are two types of memory: ROM and RAM. ROM is read only memory. It contains programs and data that are permanently recorded when the computer is manufactured. It is read and used by the processor, but cannot be altered by the user. RAM is random access memory. The user can access data in RAM memory randomly. RAM can be erased or written over at will by the computer program or the computer user. The amount of RAM has increased dramatically in recent years.
Memory is measured in bytes. A byte is usually made up of 8 bits and represents one character—a letter, digit, or symbol. The number of bytes that can be held is a measure of the memory and storage capacity. Bytes are usually measured in groups of kilobytes, megabytes, gigabytes, and terabytes. The following chart defines each term.

Kilobyte	**KB**	**Roughly 1,000 bytes**

Megabyte	**MB**	**Roughly 1,000,000 bytes**
Gigabyte	**GB**	**Roughly 1,000,000,000 bytes**
Terabyte	**TB**	**Roughly 1,000,000,000 bytes**

Memory is usually measured in Megabytes; a typical personal computer will have 64MB or more. Storage is usually measured in Gigabytes.
Since we have said that memory is in the form of chips and must maintain a constant flow of electricity, there must be a more permanent form of storage that does not depend on a constant flow of electricity. That form of storage is called secondary or auxiliary storage. The benefits of secondary storage are large space capacity, reliability, convenience and economy.
Magnetic disk storage is a very popular type of secondary storage—the floppy disk drive is an external disk drive, while a hard disk drive is an internal disk drive. The floppy disk drive is usually a 3 ½" drive and uses a diskette made of flexible mylar and coated with iron oxide, a substance that can be magnetized. A diskette records data as magnetized spots on the tracks of its surface. A floppy disk can hold 1.44 MBs, or a 'Zip' drive can hold 100 MBs.
A hard disk, an internal disk, is a metal platter coated with magnetic oxide that can be magnetized to represent data. Hard disks come in a variety of sizes and can be assembled into a disk pack. Hard disks for personal computers are 3 ½" disks in sealed modules. A hard disk is capable of holding a great deal more than floppy disks. Hard disks for personal computers are measured in gigabytes. (Remember, a gigabyte is roughly a thousand megabytes or a thousand floppy disks.)
While the size or data capacity of a hard drive is very important, the speed of accessing that data is equally as important. Files on hard drives can be accessed significantly faster and more conveniently than floppy drives.

Hard Drive

The ever-demanding need for storage has required even better storage capacity than that of magnetic disks. Optical disk technology meets that need. Included in the list of this type of technology is the optical disk, the CD-ROM or DVD-ROM. The CD-ROM, compact disk read-only memory can hold up to 660 MBs per disk or the equivalent of more than 400 standard 3 ½" diskettes. The new storage technology that outpaces all others is called DVD-ROM, digital versatile disk. The DVD has a 4.7 GB capacity, which is about seven times that of the CD-ROM.
In order to protect the data on your hard drive, you should have a backup system. A backup system is way of storing data in more than one location. Magnetic tape is usually used for this purpose. Magnetic tape is an inexpensive type of storage; it looks like the tape used in audiocassettes.
Finally, the last component of a computer system is the output device. An output device displays the processed information to the user. The two most popular forms of output devices are the printer and the monitor. The monitor produces output that is temporary—the output is lost when it is rewritten or erased or when power is lost. Monitor output is called softcopy. The printer displays output in a permanent manner; it is called hardcopy. Other types of output devices include voice output and music output devices.

Software

As important as hardware devices may be, they are useless without the instructions that control them. These instructions used to control hardware and accomplish tasks are called software. Software falls into two broad categories— applications and systems software.

Applications software allows you to perform a particular task or solve a specific problem. A word processor is the most widely used example of applications software; it can be used to create a letter or memo or anything else you need to type. Other examples include games, spreadsheets, tax preparation programs, typing tutor, etc. Applications software can be purchased in stores and is called packaged or commercial software. In other words, it is prewritten. However, there may be situations that require a specific type of software that is not available. It would then be necessary to design and write a program; this software is called custom software. Most often, personal computers utilize packaged software.
When packaged software is purchased, it will come with written instructions for installation and use. These instructions are documentation. Packaged software can be purchased, or in some cases, it is available for no cost. Freeware is software considered to be in the public domain, and it may be used or altered without fee or restriction. Another form of somewhat free software is shareware. The author of shareware hopes you will make a voluntary contribution for using the product.

MICRO SOFT 2000

Task-oriented software is sometimes called productivity software, because it allows you to perform tasks that make you more productive. The major categories of productivity software are word processing, spreadsheet, database management, graphics, and communications. Most often these categories of software are bundled together and sold as a single package. This is called an office suite. A suite is designed to work together. This is very important because this allows you to share files. Another advantage in using suites is that the software looks similar and reduces your learning curve. Microsoft Office is the most popular office suite for the personal computer today. Two other important office suite products are Corel's WordPerfect Office Suite and Sun's Star Office Suite.

The most important applications software categories included in office suites are described in the table below:

Software Category	Function
Word Processor	Provides the tools for entering and revising text, adding graphical elements, formatting and printing documents.
Spreadsheets	Provides the tools for working with numbers and allows you to create and edit electronic spreadsheets in managing and analyzing information.
Database Management	Provides the tools for management of a collection of interrelated facts. Data can be stored, updated, manipulated, retrieved, and reported in a variety of ways.
Presentation Graphics	Provides the tools for creating graphics that represent data in a visual, easily understood format.
Communication Software	Provides the tools for connecting

	one computer with another to enable sending and receiving information and sharing files and resources.
Internet Browser	Provides access to the Internet through a service provider by using a graphical interface.

As important as applications software may be, it is not able to directly communicate with hardware devices. Another type of software is required operating systems software. Operating Systems software is the set of programs that lies between applications software and the hardware devices.
Think of the cross section of an onion. The inner core of the onion represents the hardware devices, and the applications software represents the outside layer. The middle layer is the operating systems software. The instructions must be passed from the outer layer through the middle layer before the reaching the inner layer.

The onion example

All computers, regardless of size, require the operating systems software. As soon as your personal computer is turned on, the operating systems software is loaded into RAM in order to use your computer devices and other software. A few short years ago, personal computers used an operating system call MS-DOS, Microsoft Disk Operating System. This was a command-driven program in which you needed to know command names and syntax. The need for a more user-friendly system brought about Microsoft Windows operating systems software. Icons or pictures, requiring no knowledge of spelling or syntax, drive Windows operating systems software. Windows is a GUI, graphical user interface. A GUI uses graphic symbols, icons, in its interface. Further, Windows allows you to multitask, which means that you may use more than one program at the same time. The newest version of Windows is Windows 2000.

Some notable features of the Windows 2000 are

- Internet/intranet browsing capabilities
- Support for state-of-the-art hardware
- Support for huge disk drives
- Wizards

In summary, the components of a computer include hardware and software that work together to perform the task necessary to transform raw data into useful information.