

Evolution and developments of computer technologies

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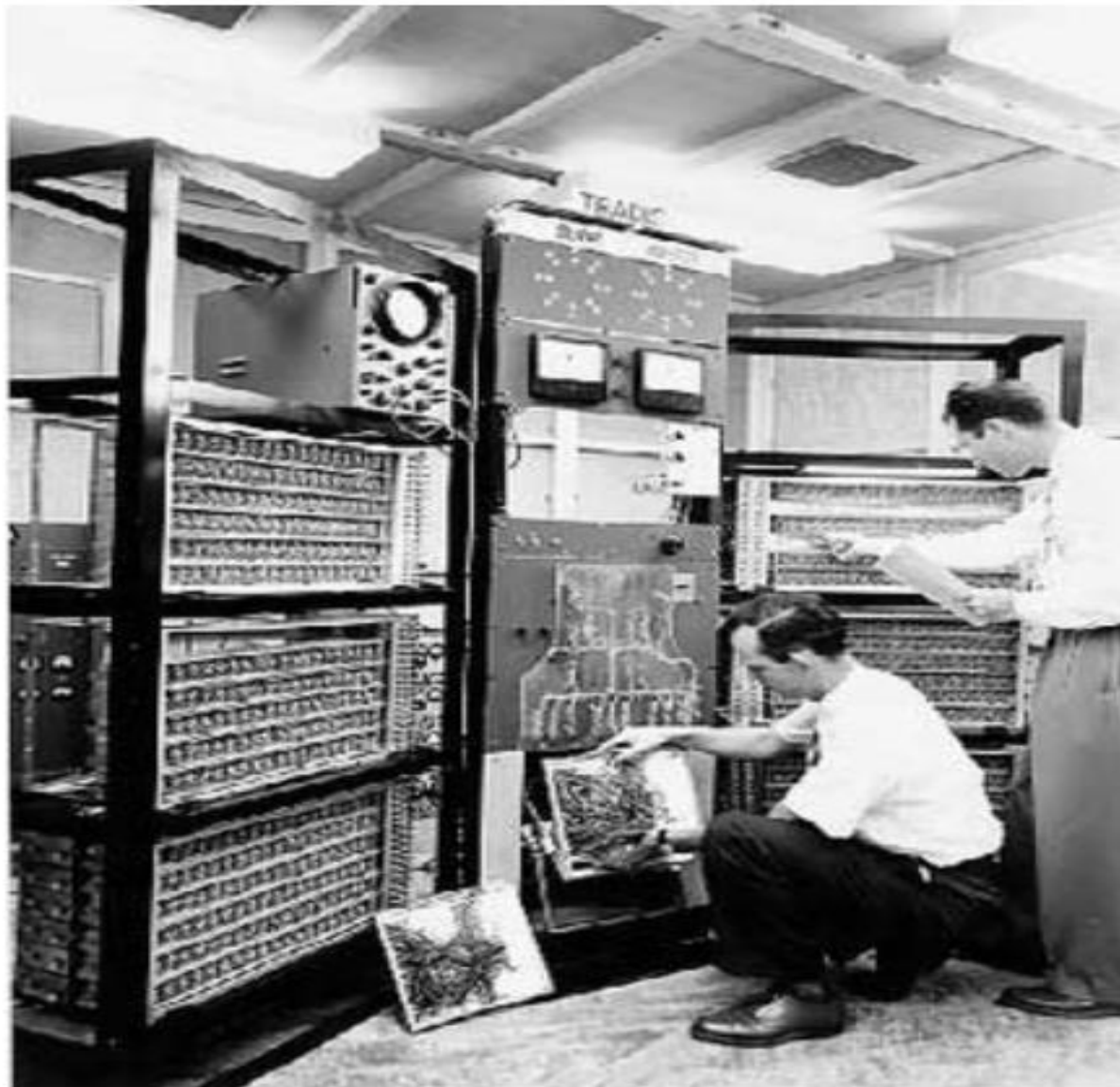
Recap

- Introduction to computers
 - ✓ Definition
 - ✓ Basic functions
 - ✓ Advantages and disadvantages
 - ✓ Uses of computers

Computer Generations (Evolution)

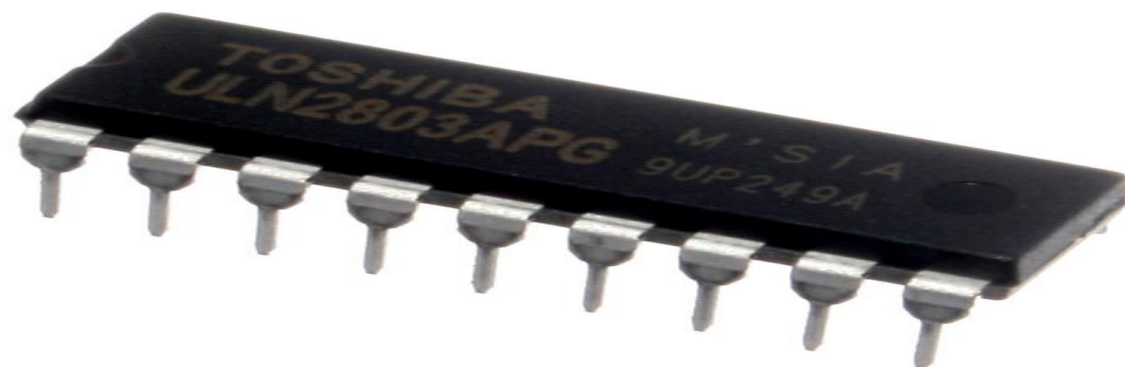
- Generation in computer terminology is a change in technology a computer is/was being used.
- Initially, the generation term was used to distinguish between varying hardware technologies but nowadays, generation includes both hardware and software, which together make up an entire computer system
- There are five computer generations known till date

- First generation
 - ✓ 1946-1959 - Vacuum tube based computers
 - ✓ Used vacuum tubes as the basic components for memory and circuitry for CPU (Central Processing Unit)
 - ✓ These tubes, like electric bulbs, produced a lot of heat and the installations used to fuse frequently
 - ✓ They were very expensive and only large organizations were able to afford it.



- The main features of the first generation are:
 - ✓ Vacuum tube technology
 - ✓ Unreliable
 - ✓ Supported machine language only
 - ✓ Very costly
 - ✓ Generated a lot of heat
 - ✓ Slow input and output devices
 - ✓ Huge size
 - ✓ Need of AC
 - ✓ Non-portable due to their weight and size
 - ✓ Consumed a lot of electricity

- Second generation was from 1959-1965
 - ✓ In this generation, transistors were used to replace vacuum tubes
 - ✓ Consumed less power, more compact in size
 - ✓ More reliable and faster than the first generation machines made of vacuum tubes
 - ✓ In this generation, magnetic cores were used as the primary memory and magnetic tape and magnetic disks as secondary storage devices



- The main features of second generation are –
 - ✓ Use of transistors
 - ✓ Reliable in comparison to first generation computers
 - ✓ Smaller size as compared to first generation computers
 - ✓ Generated less heat as compared to first generation computers
 - ✓ Consumed less electricity as compared to first generation computers
 - ✓ Faster than first generation computers
 - ✓ Still very costly
 - ✓ AC required

- Third generation was from 1965-1971
 - ✓ The computers of third generation used Integrated Circuits (ICs) in place of transistors
 - ✓ A single Integrated Circuit has many transistors, resistors, and capacitors along with the associated circuitry.



- The main features of third generation are –
 - ✓ Microchips or integrated circuits were used, making it possible to create smaller, cheaper, and much faster computers
 - ✓ More reliable in comparison to previous two generations
 - ✓ Smaller size
 - ✓ Generated less heat
 - ✓ Faster
 - ✓ Less maintenance
 - ✓ Costly
 - ✓ AC required
 - ✓ Consumed less electricity
 - ✓ Supported high-level language

- Fourth generation was from 1971-1980
 - ✓ Computers of fourth generation used Very Large Scale Integrated (VLSI) circuits
 - ✓ VLSI circuits having about 5000 transistors and other circuit elements with their associated circuits on a single chip made it possible to have microcomputers of fourth generation.
 - ✓ Fourth generation computers became more powerful, compact, reliable, and affordable. As a result, it gave rise to Personal Computer (PC) revolution.
 - ✓ In this generation, time sharing, real time networks, distributed operating system were used.
 - ✓ All the high-level languages like C, C++, DBASE etc., were used in this generation.



- The main features of fourth generation are –
 - Very Large Scale Integrated (VLSI) technology used
 - Very cheap
 - Portable and reliable
 - Use of PCs
 - Very small size
 - No AC required
 - Concept of internet was introduced
 - Great developments in the fields of networks
 - Computers became easily available

- The period of fifth generation is 1980-till date.
 - ✓ In the fifth generation, VLSI technology became ULSI (Ultra Large Scale Integration) technology, resulting in the production of microprocessor chips having ten million electronic components.
 - ✓ This generation is based on parallel processing hardware and Artificial Intelligence software
 - ✓ Artificial Intelligence is an emerging branch in computer science, which interprets the means and method of making computers think like human beings
 - ✓ All the high-level languages like C and C++, Java, .Net, Python, etc., are used in this generation.

- Some computer types of this generation are –
 - ✓ Desktops
 - ✓ Laptops
 - ✓ NoteBooks
 - ✓ UltraBooks
 - ✓ ChromeBooks
 - ✓ Smart phones, etc

- Sixth Generation (Emerging)???????? Are we still in the fifth generation???
- ✓ We are **POSSIBLY** in the early stages of the sixth generation of computing
- ✓ This era is defined by advancements in areas like
 - Artificial intelligence (AI)
 - Quantum computing
 - Nanotechnology
 - Parallel processing
 - Increased integration of AI into various aspects of computer systems.
- ✓ **AI Integration:** Enhanced machine learning and deep learning algorithms are now embedded in everything from smartphones to industrial systems, allowing real-time decision-making and automation.

- ✓ **Quantum Computing:** This era is marked by the emergence of quantum computers that can solve complex problems far beyond the reach of classical computers, though widespread use and fully practical quantum computing are still developing.
- ✓ **Nanotechnology:** The miniaturization of processors and circuits has advanced to the nanoscale, leading to faster, more efficient hardware that supports the intense computational requirements of AI and machine learning.
- ✓ **Parallel Processing and Distributed Systems:** Massive parallel processing allows computers to tackle large datasets and complex calculations. Distributed systems, especially cloud computing, provide the infrastructure to support such advanced processing.
- ✓ **Biocomputing and Neuromorphic Engineering:** Some experimental developments aim to mimic the human brain's structure and functionality for enhanced computational power and energy efficiency.

Computer Classifications/Types

- Historically computers were classified according to processor types because development in processor and processing speeds were the developmental benchmarks
- Earliest computers used vacuum tubes for processing, were huge and broke down frequently
 - ✓ However, as vacuum tubes were replaced by transistors and then chips, their size decreased and processing speeds increased

- All modern computers and computing devices use microprocessors whose speeds and storage capacities are skyrocketing day by day
- The developmental benchmark for computers is now their size and speed.
 - ✓ Computers are now classified on the basis of their use or size

- Desktop

- ✓ Desktop computers are personal computers (PCs) designed for use by an individual at a fixed location
- ✓ IBM was the first computer to introduce and popularize the use of desktops
- ✓ A desktop unit typically has a CPU (Central Processing Unit), monitor, keyboard and mouse
- ✓ Introduction of desktops popularized the use of computers among common people as it was compact and affordable



- Laptop

- ✓ Despite its huge popularity, desktops gave way to a more compact and portable personal computer called laptop in 2000s
- ✓ Laptops are also called notebook computers or simply notebooks
- ✓ Laptops run using batteries and connect to networks using Wi-Fi (Wireless Fidelity) chips
- ✓ They also have chips for energy efficiency so that they can conserve power whenever possible and have a longer life
- ✓ Modern laptops have enough processing power and storage capacity to be used for all office work, website designing, software development and even audio/video editing



- Tablet

- ✓ After laptops computers were further miniaturized to develop machines that have processing power of a desktop but are small enough to be held in one's palm
- ✓ Keyboard is also displayed virtually whenever required and used with touch strokes



- Server
 - ✓ Servers are computers with high processing speeds that provide one or more services to other systems on the network.
 - ✓ They may or may not have screens attached to them
 - ✓ Servers have high processing powers and can handle multiple requests simultaneously



- Most commonly found servers on networks include
 - ✓ File or storage server
 - ✓ Game server
 - ✓ Application server
 - ✓ Database server
 - ✓ Mail server
 - ✓ Print server

- Mainframe

- A mainframe is a computer capable of rapidly processing massive amounts of data at high speeds
- Used by large organizations to handle millions and trillions of online transactions per second. Important features of mainframes are :-
 - ✓ Big in size
 - ✓ Hundreds times Faster than servers, typically hundred megabytes per second
 - ✓ Very expensive
 - ✓ Use proprietary OS provided by the manufacturers
 - ✓ In-built hardware, software and firmware security features

- Supercomputer
 - ✓ Supercomputers are the fastest computers on Earth.
 - ✓ They are used for carrying out complex, fast and time intensive calculations for scientific and engineering applications.
- Most common uses of supercomputers include –
 - ✓ Molecular mapping and research
 - ✓ Weather forecasting
 - ✓ Environmental research
 - ✓ Oil and gas exploration
 - ✓ Artificial intelligence
 - ✓ weapons research and development