LECTURE 1

GETTING FAMILIAR WITH BASICS

COMPUTER

A computer is a machine that can be programmed to perform generic sets of operations and perform a wide range of tasks for the ease of users.

Definition of a Computer

Definition:
A computer is an electronic device that processes data, performs calculations, and executes instructions to produce output.

A computer can do nothing by itself, but once it is told how to do a job, it does it much faster then a human being.

ALL COMPUTERS HAVE THE FOLLOWING ESSENTIAL HARDWARE COMPONENTS:

Input – the component through which a user instructs a computer about what to do

Processor – the engine that processes the instructions given by the user

Memory – where the processor stores information that is required during its computations

Storage – where information that is required to be used much later is stored

Output – the component that communicates the results of a computation to the user

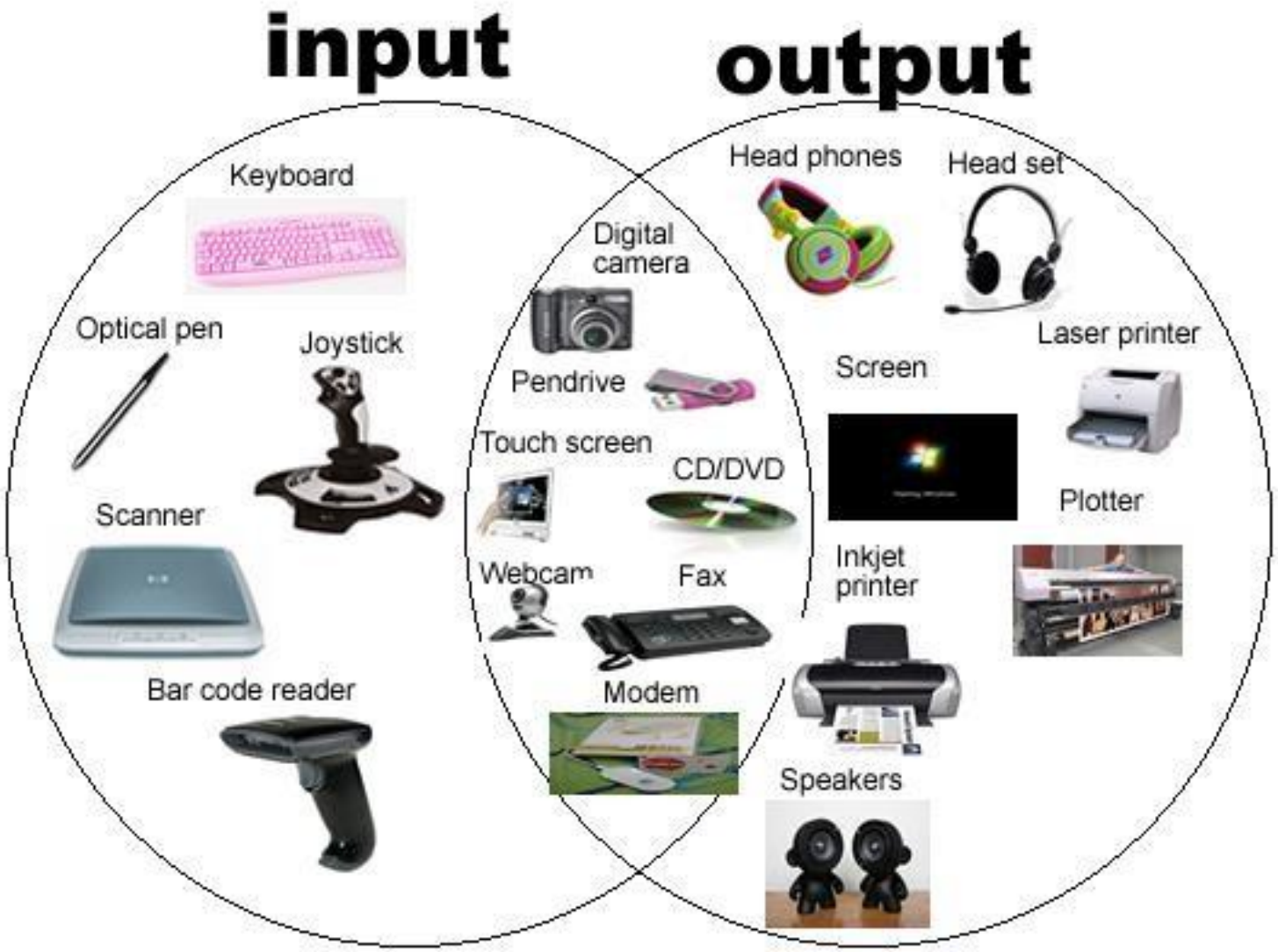
At the highest level, two things are required for computing

Hardware: The physical equipment in a computing environment such as the computer and its peripheral devices (printers, speakers, etc.)

Software: The set of instructions that operates various parts of the hardware. Also termed as “computer program”

SECTION 1: HARDWARE REVIEW

INPUT & OUTPUT DEVICES


input
output
Keyboard
Optical pen
Joystick
Scanner
Bar code reader
Digital camera
Pendrive
Touch screen
CD/DVD
Webcam
Fax
Modem
Head phones
Head set
Screen
Laser printer
Plotter
Inkjet printer
Speakers

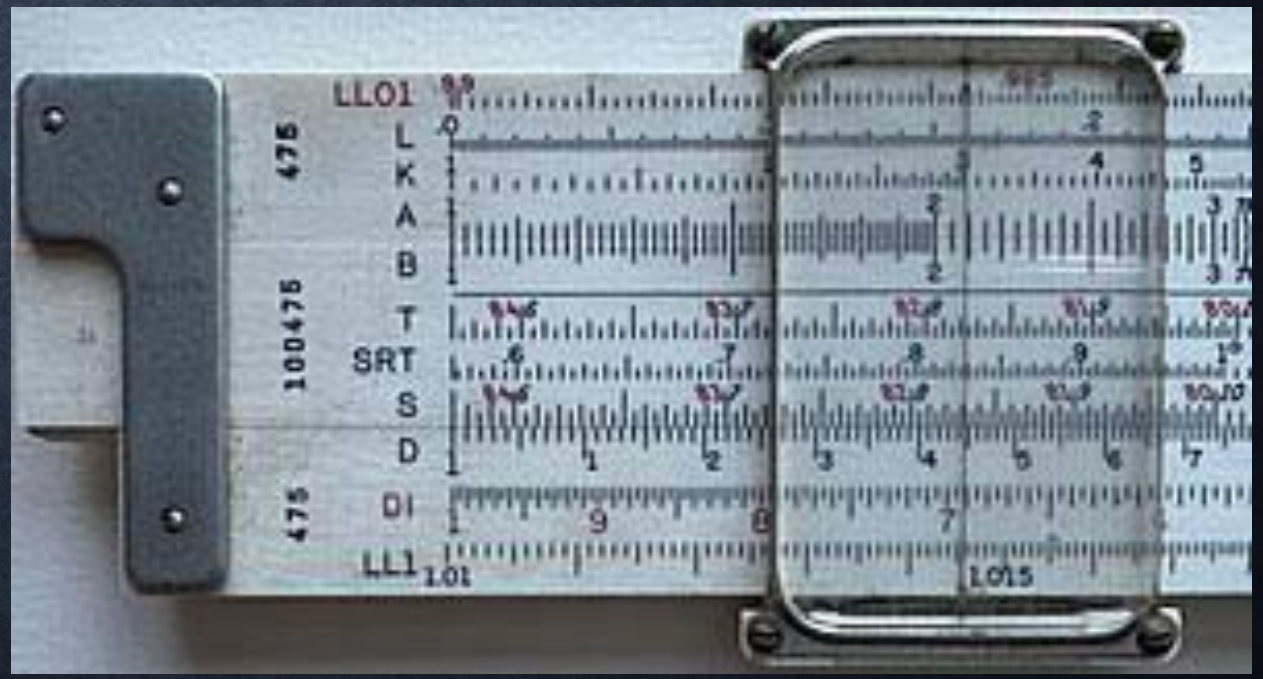
Brief History and Evolution of Computers

Early Mechanical Devices:

- Abacus (2700 BC)
- Most probably invented by Sumerian Civilization

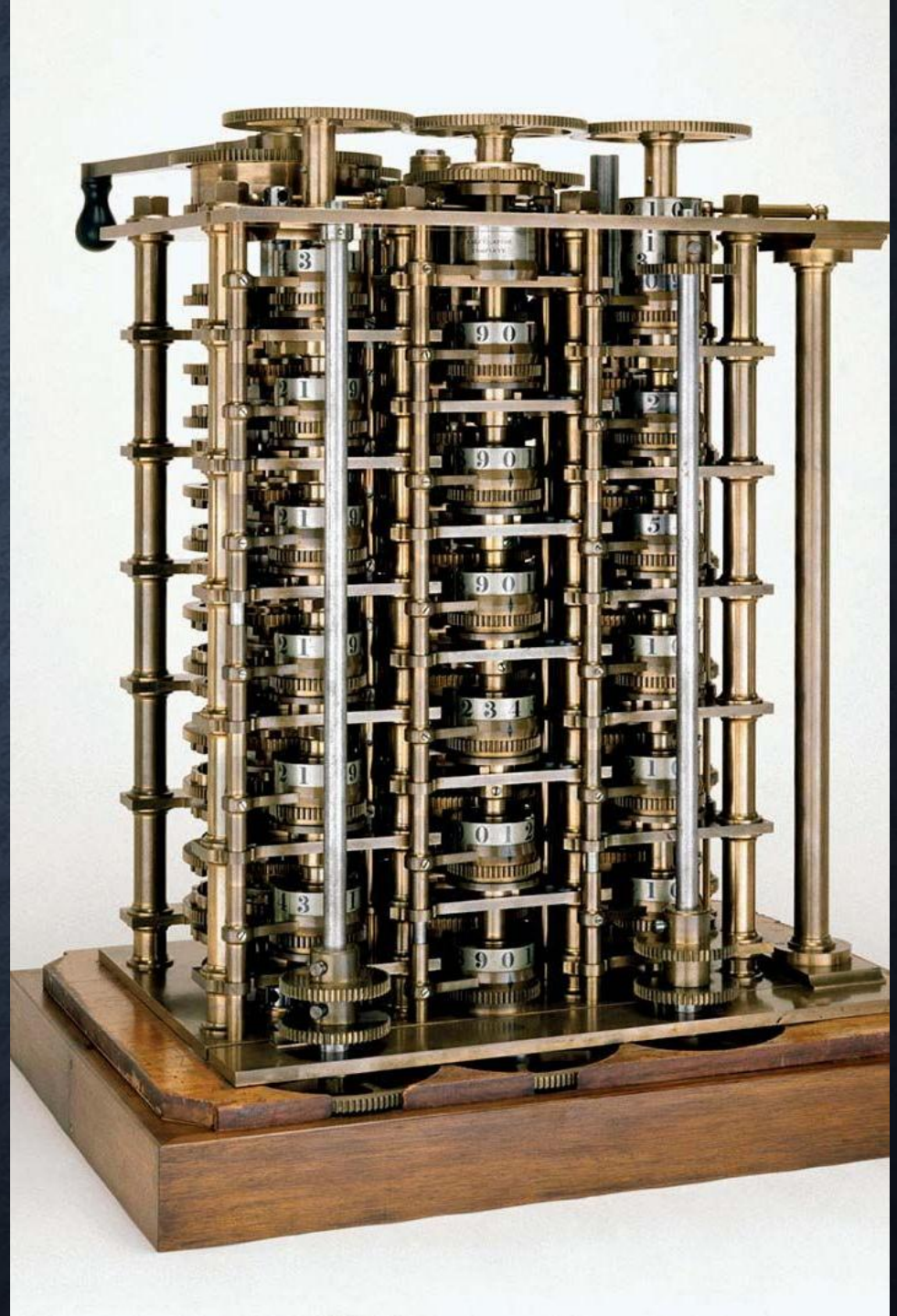
Slide Ruler

Invented in 1600 by
William Oughtred
Used to compute
complex solutions
Difficult to use

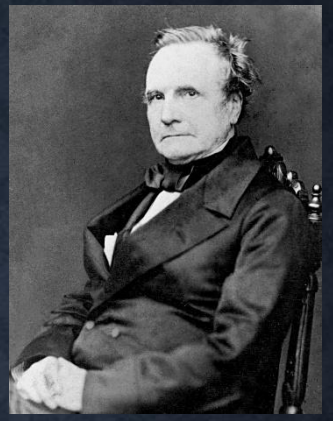


Difference Engine

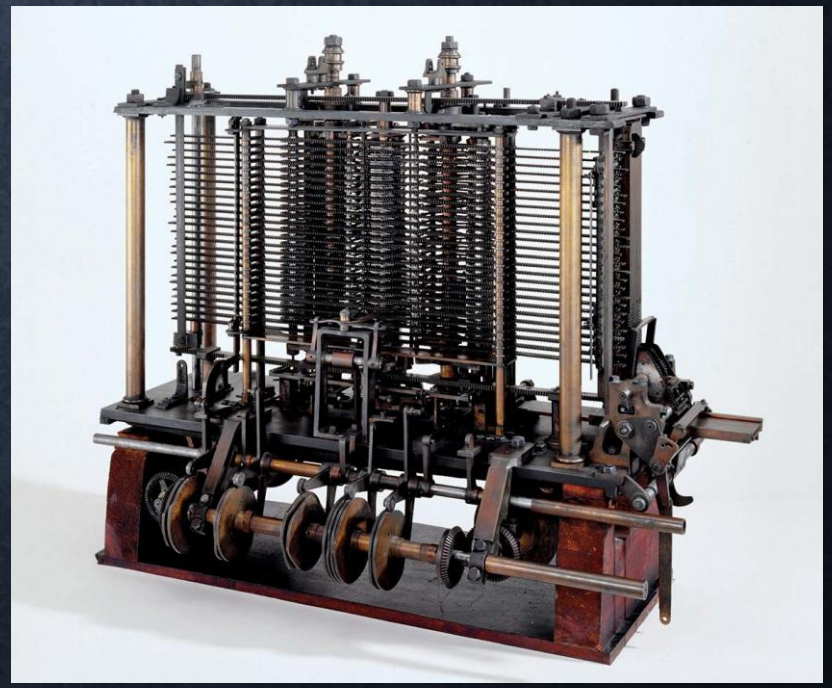
Automatic mechanical calculator designed to tabulate polynomial functions.
It was designed in the 1820s, and was first created by Charles Babbage



Analytical Engine



Charles Babbage's Analytical Engine (1834-1871)
Due to insufficient budget the machine wasn't built properly



Analytical engine

Used arithmetic and logic unit, memory and programming concepts
Used the concept today
Used punch card
Called father of computer
Due to funds insufficiency , this project wasn’t completed

Analytical engine

- In 1910, His son named Hennery Babbage completed this machine
- This machine commercially available in 1910.
- Manual run

Mark 1

Howard A Aiken invented fully automated machine in 1937
Mark I was in operation between 1944 and 1959

Computer Generations

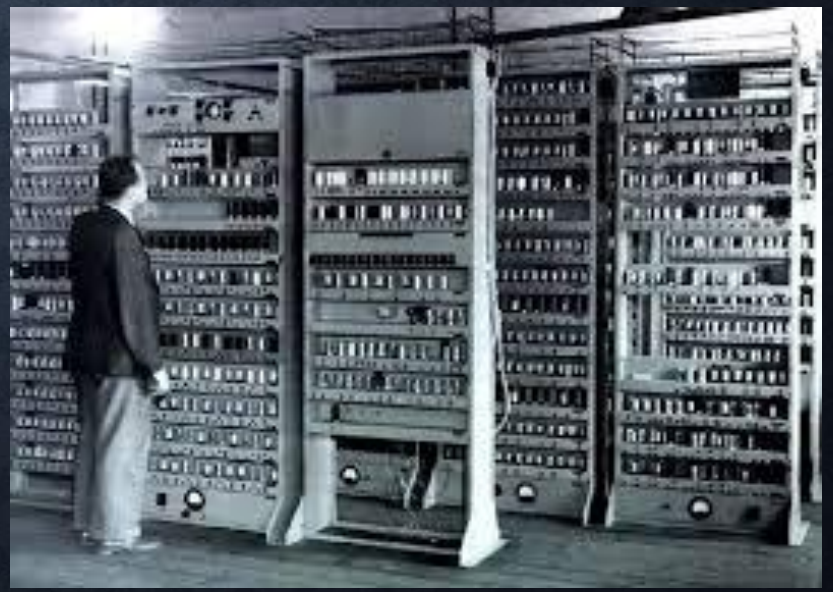
The development of computers can be divided into five generations.

Each Generation represents a significant leap in technology, from hardware to software.

First generation computers

(1942-1955)

- Based on **vacuum tubes** for circuitry.
- Used magnetic drums for memory.
- Large, slow, expensive, and generated a lot of heat.
- **Example**: ENIAC, UNIVAC



Second Generation

- In bell laboratories (1955-1964)
- Replaced vacuum tubes with transistors.
- Smaller, faster, more energy-efficient, and more reliable.
- Introduction of **assembly language** and early versions of programming languages like COBOL and FORTRAN.
- **Example**: IBM 1401

3rd Generation

In 3 years the ic has been developed

Used integrated circuits (ICs) instead of transistors.

Significant size reduction and increased speed and efficiency.

Introduction of **keyboards** and **monitors** instead of punch cards and printouts.

Example: IBM System/360

4th generation

1971

Micrprocessor

Faster and smaller

Microprocessor chips became the core of the computer system.

Birth of personal computers (PCs).

Development of graphical user interfaces (GUI), the mouse, and widespread use of programming languages.

Example: Apple II, IBM PC

Fifth Generation (Present & Beyond)

- **Title**: 5th Generation: Artificial Intelligence
- **Content**:
  - Focus on AI, machine learning, quantum computing, and natural language processing.
  - Development of technologies such as robotics, neural networks, and voice recognition.
  - Modern computers continue to shrink while becoming more powerful.

Significance of the Fifth Generation

Key Features:

- AI (Artificial Intelligence): Ability to learn and adapt, autonomous decision-making
- Quantum Computing: Exploiting quantum mechanics to solve complex problems faster
- Natural Language Processing: Machines that understand human language

Applications:

- Self-driving cars
- Advanced robotics
- AI-based decision-making systems

Impact on Society:

- Enhanced automation in industries
- Revolutionary developments in healthcare, science, and security

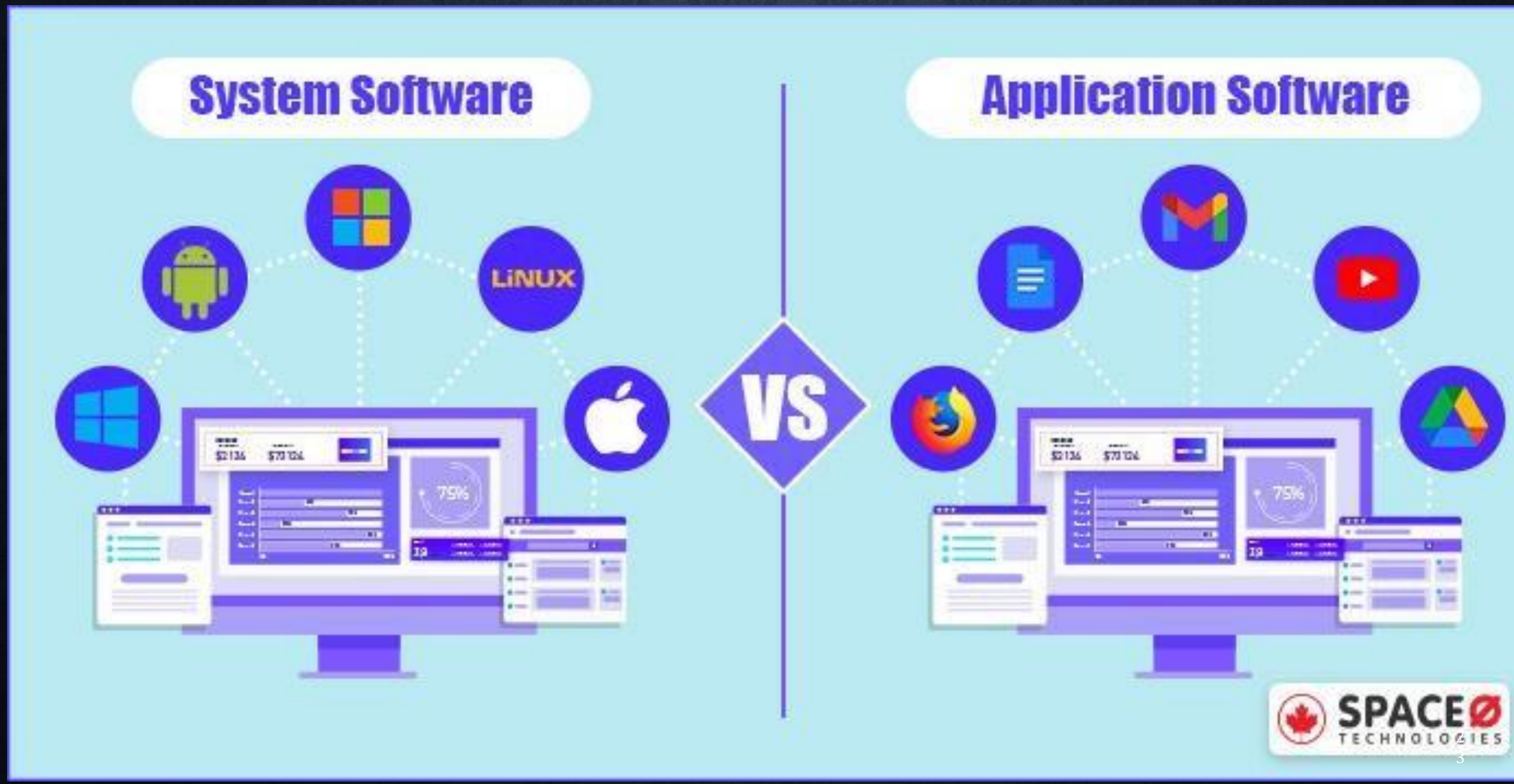
SECTION 2: SOFTWARE REVIEW

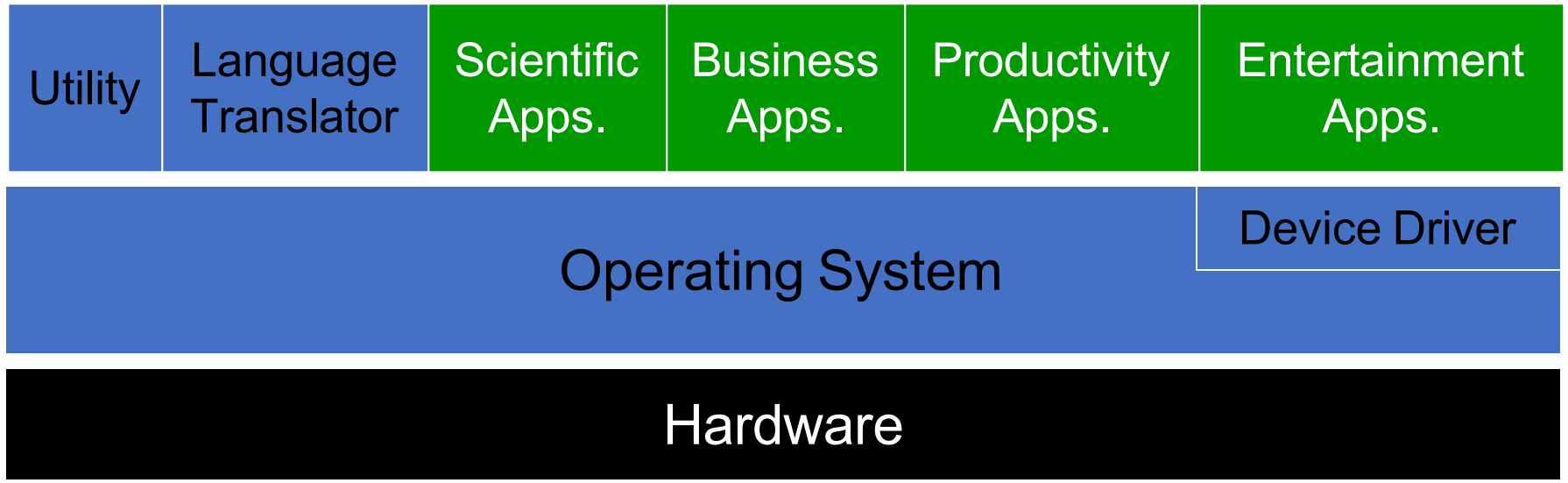
System SW

Programs that generally perform the background tasks in a computer. These programs, many times, talk directly to the HW, e.g. (Operating System)

Application SW

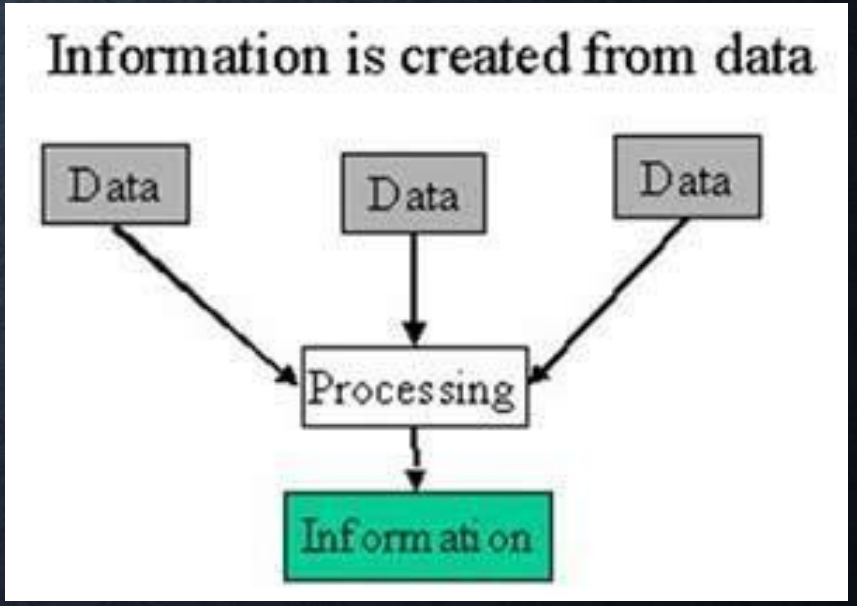
Programs that generally interact with the user to perform work that is useful to the user. These programs generally talk to the HW through the assistance of system SW


System Software
LiNUX
VS
Application Software
SPACE
TECHNOLOGIES

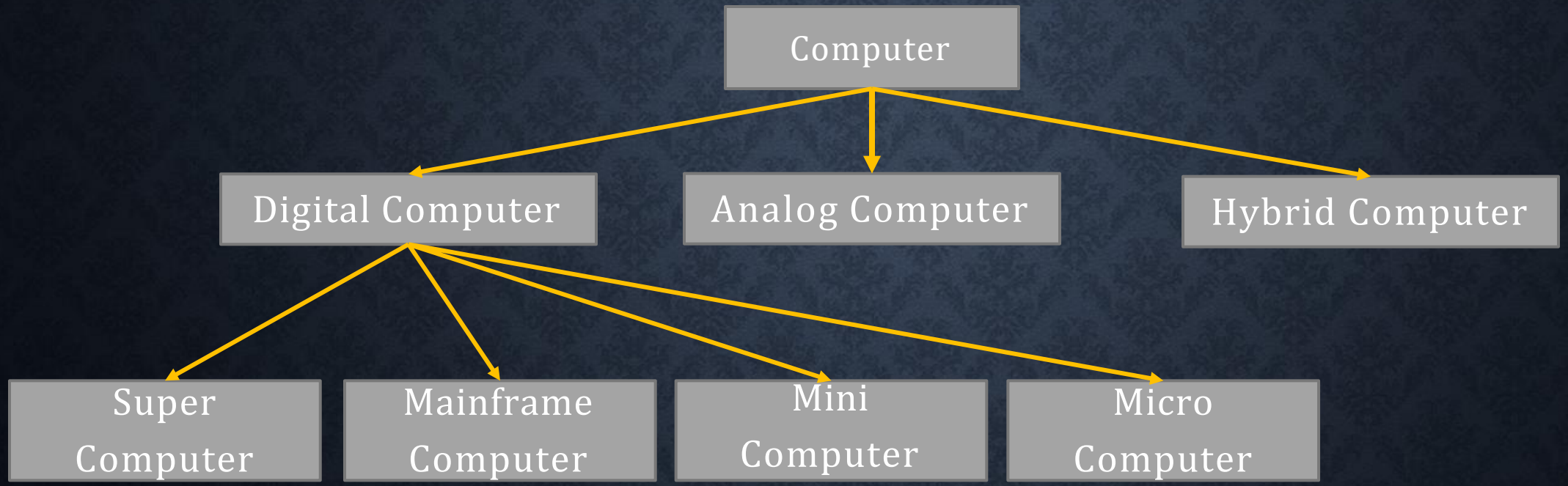

Utility
Language Translator
Scientific Apps.
Business Apps.
Productivity Apps.
Entertainment Apps.
Operating System
Device Driver
Hardware
System software
Application software

DATA VS. INFORMATION

- **Data**
  - Raw, unorganized facts
  - Can be in the form of text, graphics, audio, or video
- **Information**
  - Data that has been processed into a meaningful form
- **Information processing**
  - Converting data into information



TYPES OF COMPUTER



DIGITAL COMPUTER

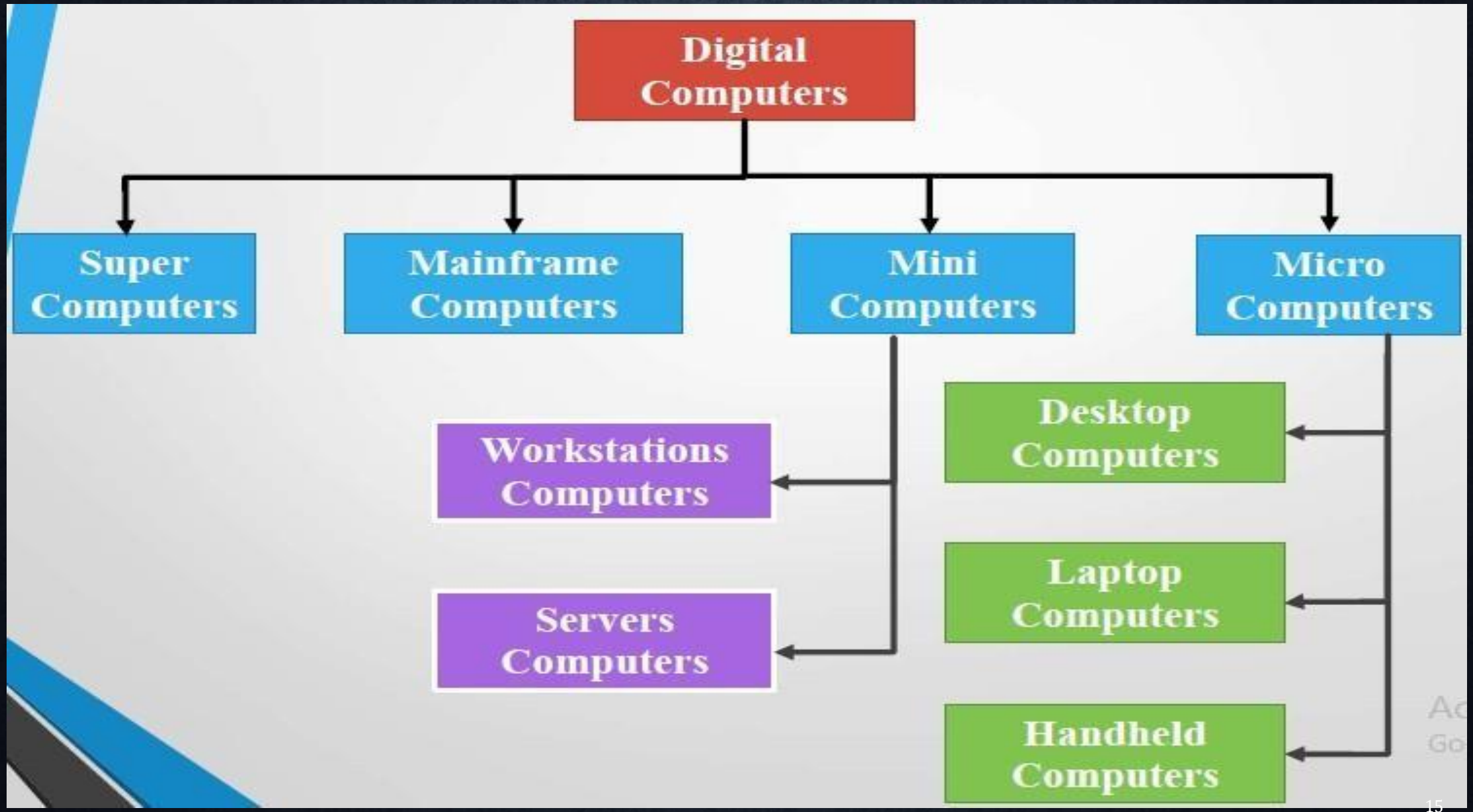
- Digital computer are specialized in counting
- The input data is represented by a number
- There are used for logical and arithmetic operations
- All commonly used computers are digital

ANALOG COMPUTER

- Analog computers were commonly used for scientific and engeneering problem
- These types of computers are rarely use in current world
  - Electric current meter
  - Fuel pump station meter

HYBRID COMPUTER

- The combination of features of analog and digital computer is called Hybrid computer
- Used in Various area of engineering,
  - space vehicle simulation
  - Training of Astronauts


Digital Computers
Super Computers
Mainframe Computers
Mini Computers
Micro Computers
Workstations Computers
Servers Computers
Desktop Computers
Laptop Computers
Handheld Computers

MICRO COMPUTER

- The term micro-computer is generally synonymous with personal computer (PC).
- Micro-computers are designed to be used by individuals.
- These computers are low in cost
- Examples of microcomputers are
  - Desktop Computer
  - Laptop Computer
  - Tablet

MINI COMPUTER

- Mini Computers are also called Mid-range computer.
- A minicomputer is a type of computer that possesses most of the features and capabilities of a large computer but is smaller in physical size
- They are generally more powerful; and most useful as compared to micro-computer
- They are used in small business

MAINFRAME COMPUTER

- Mainframe computers are those computers that offer faster processing and greater storage area
- Different people can operate these computers at the same time
- Memory in GB’s and storage in TB’s
- Use in large business

SUPER COMPUTER

- Super computers are largest, fastest and expensive computers
- Super Computer are those computer which are designed for scientific job like weather forecasting and artificial intelligences
- A super computer contains a number of CPU which operate in parallel to make it faster

CLASSIFICATION OF COMPUTERS

Super Computers

Mainframe Computers

Workstation

Server

Desktop

Laptop

Tablet

COMPUTERS TO FIT EVERY NEED

- **Six basic categories of computers:**
  - Embedded computers
  - Mobile devices
  - Personal computers
  - Midrange servers
  - Mainframe computers
  - Supercomputers

COMPUTERS TO FIT EVERY NEED

- **Embedded computer**
  - Embedded into a product and designed to perform specific tasks or functions for that product
  - Cannot be used as general-purpose computers
- **Mobile device**
  - A very small device with some type of built-in computing or Internet capability
  - Typically based on mobile phones
- **Personal computers**
  - A small computer designed to be used by one person at a time
  - Also called a microcomputer

COMPUTERS TO FIT EVERY NEED

- **Notebook (laptop) computers**
  - Typically use clamshell design
  - Tablet computers
    - Can be slate tablets or convertible tablets
  - Netbooks
    - Small notebooks; rapidly growing type of PC
  - Ultra-mobile PCs (UMPCs)
    - Handheld computers
- **Midrange server**
  - A medium-sized computer used to host programs and data for a small network

COMPUTERS TO FIT EVERY NEED

- **Mainframe computer**
  - Powerful computer used by several large organizations to manage large amounts of centralized data
  - Standard choice for large organizations, hospitals, universities, large businesses, banks, government offices
  - Also called high-end servers or enterprise-class servers
- **Supercomputer**
  - Fastest, most expensive, most powerful type of computer
  - Commonly built by connecting hundreds of smaller computers, supercomputing cluster

Note: Supercomputers are used for large and complex mathematical computations. While Mainframe computers are used as a storage for large database and serve as a maximum number of users simultaneously. Supercomputer's speed is more than Mainframe computer. It can execute billions of instructions within a second.

COMPUTERS IN YOUR LIFE

- **Before 1980**
  - Computers were large, expensive
  - Very few people had access to them
  - Computers were mostly used for high-volume processing tasks

- **Microcomputers in the early 80s**
  - Inexpensive personal computers
  - Computer use increased dramatically

- **Today**
  - More than 80% of US households include a computer, and most use computers at work
  - Electronic devices are converging into single units with multiple capabilities

COMPUTER IN SOCIETY

- How important are computers in our society?
  "COMPUTERS HAVE CHANGED OUR WORLD"
- Manage your schedule on a daily or hourly basis
- Manage a list of Contacts
- Send Faxes and Email
- Carry your data with you
- Be able to work anywhere
- Communicate and share data from anywhere

WHY ARE COMPUTERS SO IMPORTANT

- Home
  - Communication
  - Bussines Work done at home
  - Schoolwork
  - Entertainment
  - Finances
- Edcation
- Healtcare

COMPUTERS IN THE HOME

- **Computers used for a variety of tasks:**
  - Looking up information and news
  - Exchanging e-mail
  - Shopping and paying bills
  - Watching TV and videos
  - Downloading music and movies
  - Organizing digital photographs
  - Playing games

- **Smart appliances**
  - Traditional appliances with built-in computer
- **Smart homes**
  - Household tasks are monitored and controlled by a main computer in the house

COMPUTERS IN EDUCATION

- **Colleges and universities are now more computer oriented and integrated**
  - Wireless hotspots allow usage of personal laptops to connect to the college network
  - Some colleges require a computer for enrollment/ online assessments

- **Distance learning**
  - Students participate from locations other than the traditional classroom setting using computers and Internet access

WHY ARE COMPUTERS SO IMPORTANT

- Industry
  - Design
  - Shipping
  - Process Control
- Government
  - Population
  - Taxes
  - Military
  - Police

COMPUTERS ON THE JOB

- **Computers have become a universal on-the-job tool for decision-making, productivity, and communication**
  - Used by all types of employees
  - Used for access control and other security measures
  - Use by service professionals is growing
  - Used extensively by the military
  - Employees in all lines of work need to continually refresh their computer skills

COMPUTERS ON THE GO

- **Computers are encountered in nearly every aspect of daily life**
  - Consumer kiosks
  - ATM transactions
  - POS systems at retail stores
  - Portable computers or mobile devices

QUICK ASSESSMENT

1. A tablet PC is an example of a(n) _____.
   a. Desktop computer
   b. Portable PC
   c. Supercomputers
2. True or False: The terms mainframe computer and supercomputer are interchangeable; both refer to the largest, most powerful computers.
3. A smartphone is an example of a(n) _____.

Answers: 1) b; 2) False; 3) mobile device

Conclusion

Recap:

- ICT plays a vital role in modern society through computers and networks.
- Looking Ahead: Next session will explore computer architecture and key concepts in more depth.