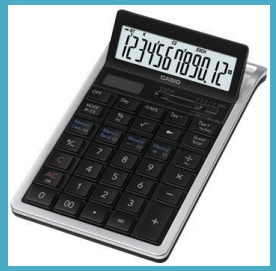
# Computer Hardware

## Introduction to computer System and its classifications

# Which of these is acomputer?



Calculator


ATM


Washing Machine

Mobile Phone

Laptop

# Computer

- Definition

  Versatile electronic device, which is programmable and process data according to a given set of instructions

- Characteristics
  - Accuracy
  - Speed
  - storage
  - Diligence
  - Versatility
  - reliability

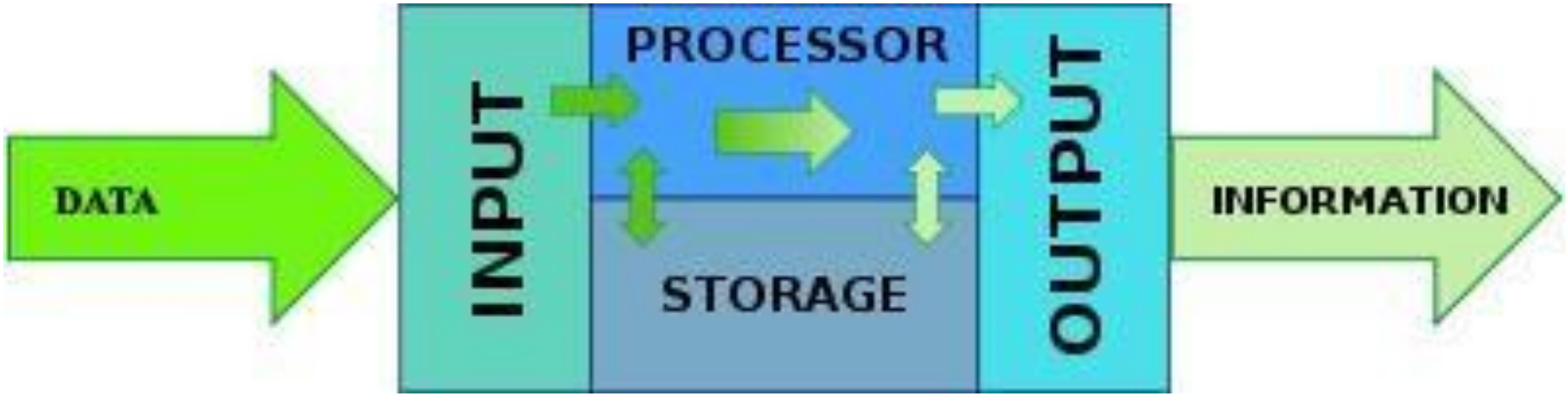
- Accuracy
  - Works on electrical pulses
  - Many decimal places in calculations
- Speed
  - Giga Hertz (GHz) – Billion clock cycles per second
  - Eg: 800MHz – 1 instruction in 0.00000000125 second
- Storage
  - Primary memory
  - Secondary memory
- Reliability
  - Maintain especially in repetitive tasks
  - Backup systems

# Data Processing

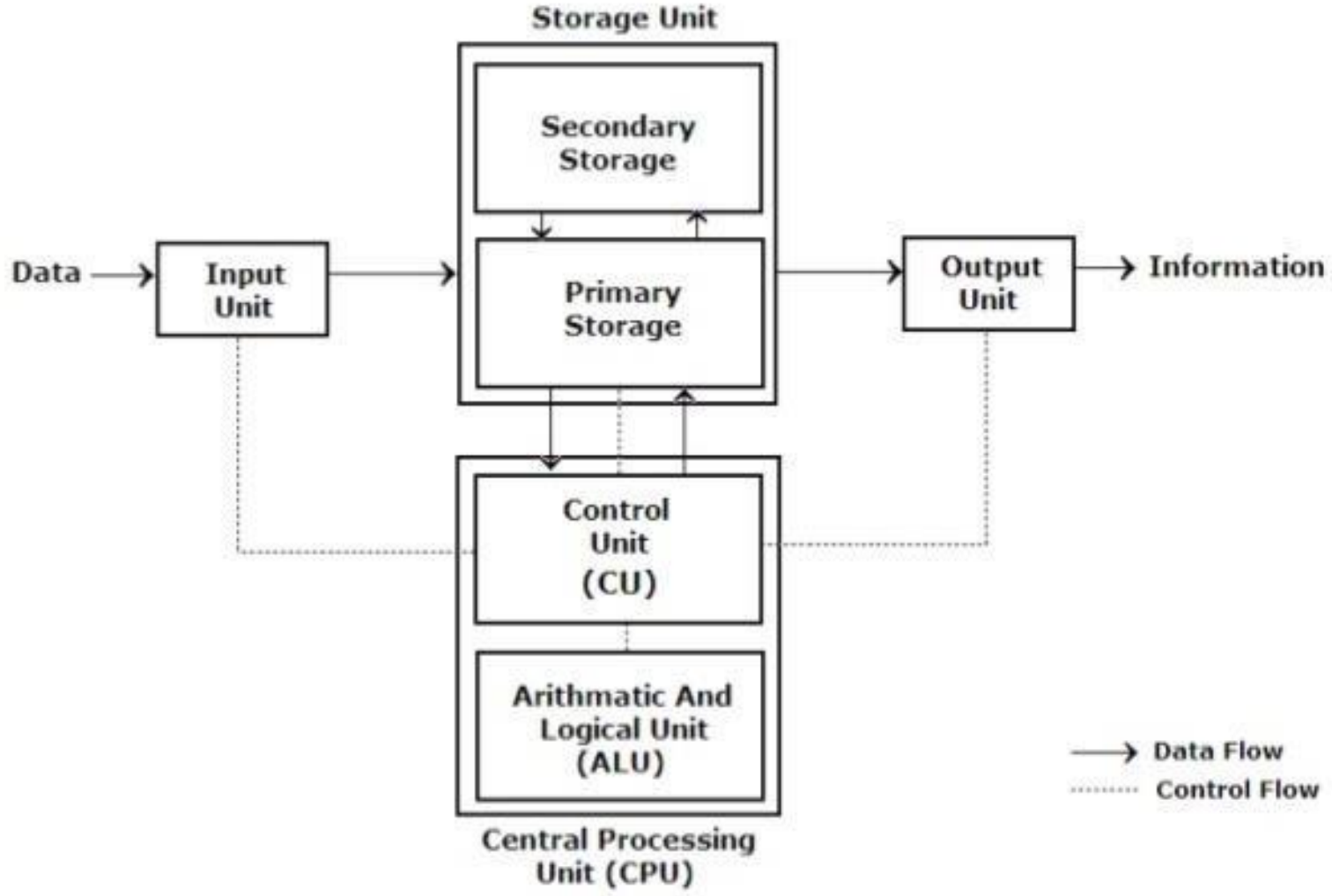
- Data
  - Collection of numbers, characters, symbols
  - Raw fats
  - Meaning less
- Information
  - Processed data
  - Meaning full
  - Useful for decision making
  - Valuable than data

# Computer

- Data processing



# Block diagram of computer



# Computer System - Components

- Liveware
  - Users
- Hardware
  - Tangible/physical components
- Software
  - Programs and data
- Firmware
  - Embedded instructions into electronic devices

# Computer Program

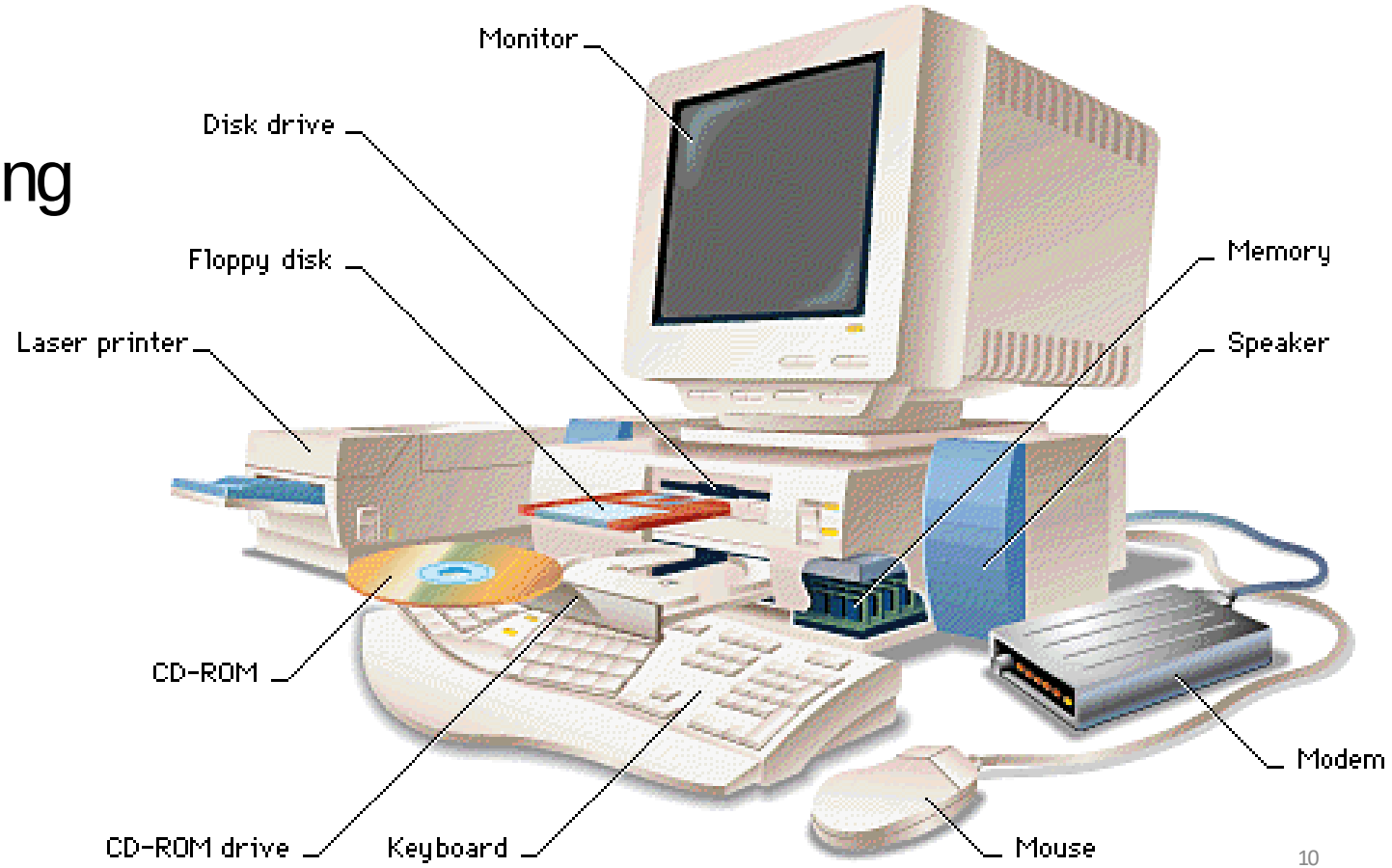
- A set of instructions
- Executed by processor
- Stored in memory

- Definition

  Computer Program is a set of stored instructions and data given to a computer to carry out a process

# Computer Hardware Device clarification

- Input
- Output
- Processing
- Storage



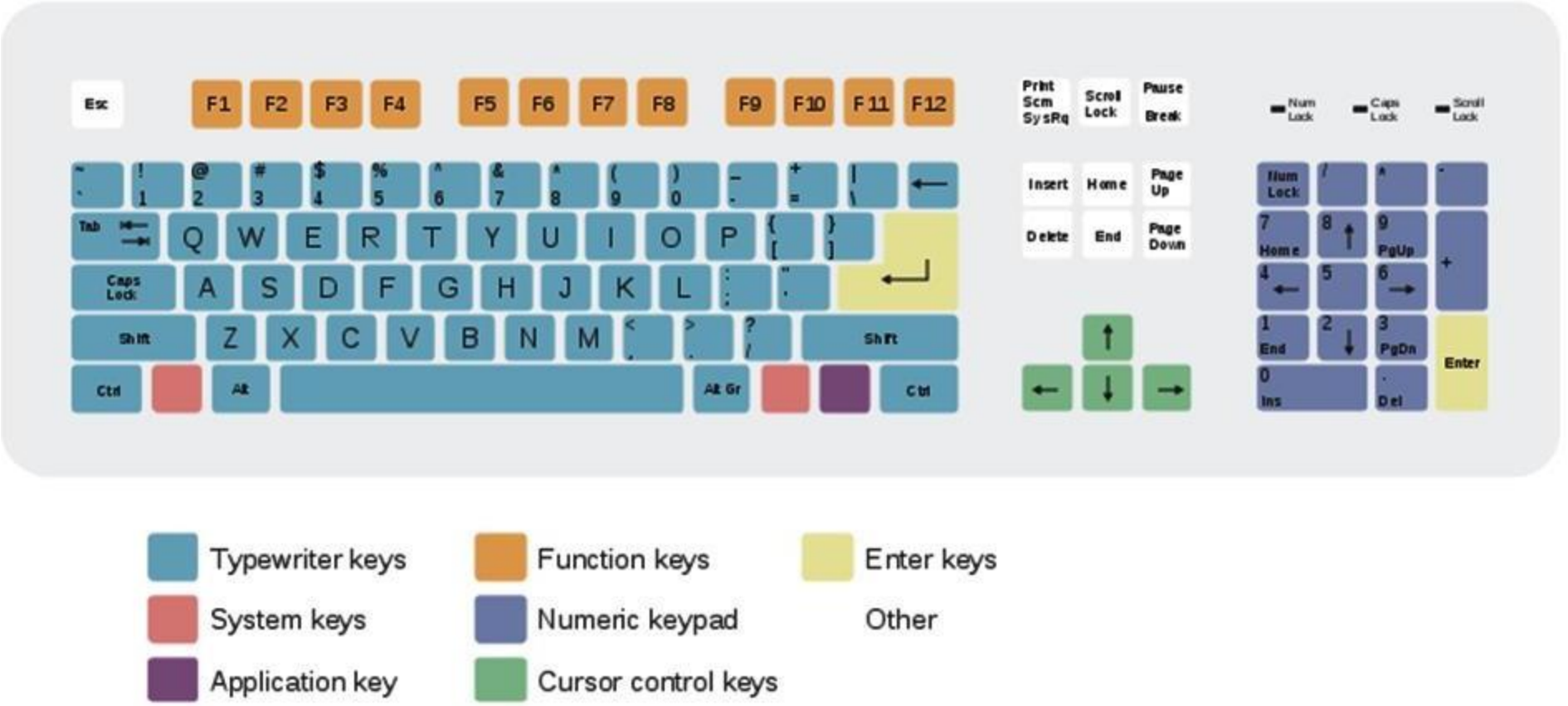
# Computer Hardware Input devices

- Devices used to feed data into computer system
  - Key board
    - Indirect entry device
    - Character input
    - The standard keyboard has 101 keys

# Keyboard

- Standard keyboard
  - Typewriter keys
  - Function keys
  - Numeric & Punctuation keys
  - Arrow keys
  - Navigation keys
    - Home, End, PgUp, PgDown
  - Num Lock button
  - Numeric pad
  - Enter key

# 104 key Keyboard



# Multi Mediakeyboard

# Ergonomic keyboard

# Computer Hardware
# Input Devices

- Mouse
  - Pointing device
  - Movements are translated into digital signals
  - Types
    - Traditional mouse
      - Rubber ball & a sensor
    - Optical mouse
      - It uses a light & an optical sensor

- Microphone
  - Convert sound in to digital signals
  - Video conferencing

- Camera
  - Converts still /moving images into digital signals
  - Video conferencing
  - Chatting

- Scanner
  - Convert text or images into digital signals
  - Scanners are commonly available as flatbed and handheld

- Optical character recognition (OCR)
  - Convert text image into characters.
  - Scanners often come with OCR software
  - These software are very accurate for printed materials like books but not so accurate for handwritten documents

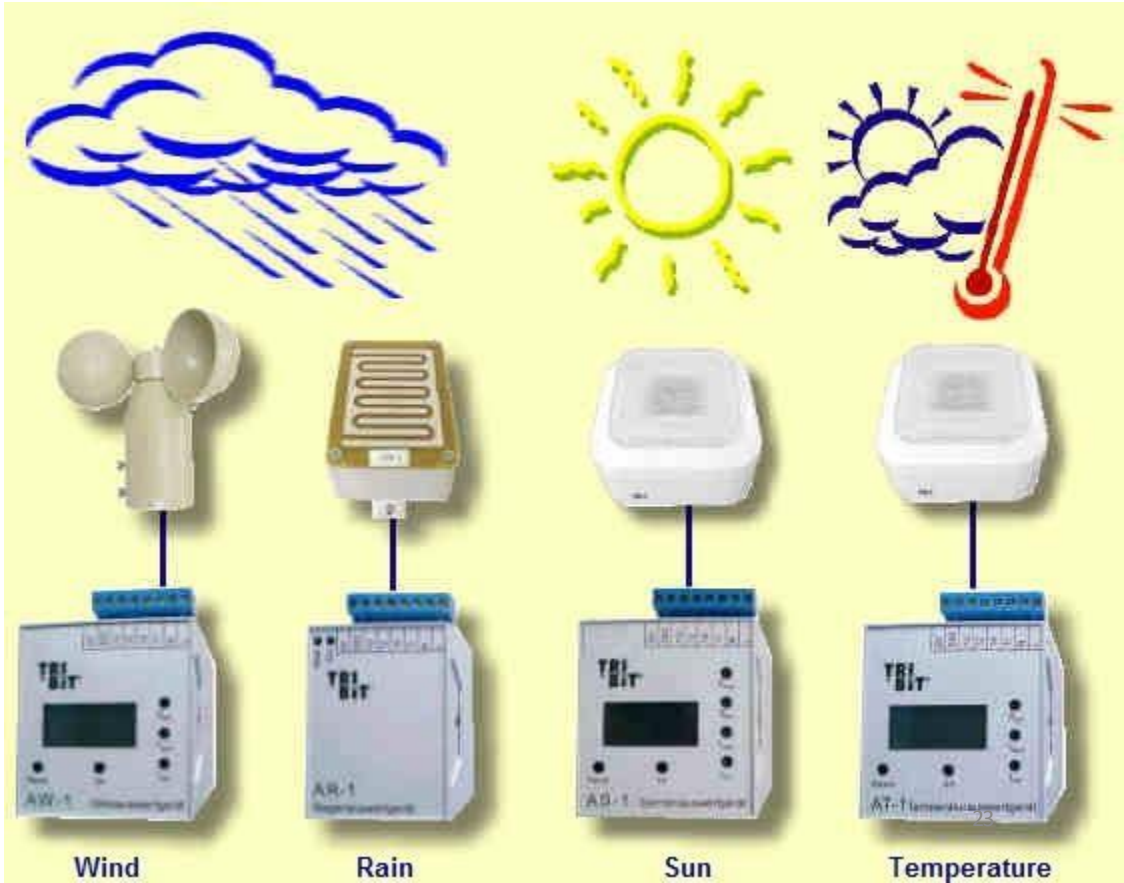
# Scanners

# Computer Hardware
# Input Devices

- Fingerprint reader
  - capture the fingerprint pattern
  - Convert into digital format data

- Magnetic Ink Character Recognition (MICR)
  - Recognize characters printed in special magnetic ink into digital format
    - cheques
    - money

- Environment Sensors
  - Heat/ Temperature
  - Humidity
  - Vibration
  - Wind
    - Speed
    - Direction
  - Motion



# Computer Hardware
# Output Devices

- Translate processed information into human readable format

- Monitor/ Display unit
  - CRT/LCD/LED
- Printer
  - Impact /non impact
- Speaker

# Processing Devices

- CPU – Central Processing Unit
- Microprocessor
  - Multipurpose, programmable Integrated circuit accepts digital data as input and processes according to given instructions and provides output
- One small chip consists number of circuits

# Storage Devices

- Store
  - Data , Software
- Categorizations
  - Primary storage and Secondary storage
  - Volatile and non-volatile
  - Mutable and immutable

# Storage Devices- Volatility

- Volatile memory
  - computer storage that only maintains its data while the device is powered
  - Requires constant power
  - Fast
  - Expensive
  - Cache, Main memory
- Non-volatile memory
  - Retain stored information even without electric power
  - long-term storage of information
  - Relatively cheaper
  - HD, CD, DVD, Tape drive

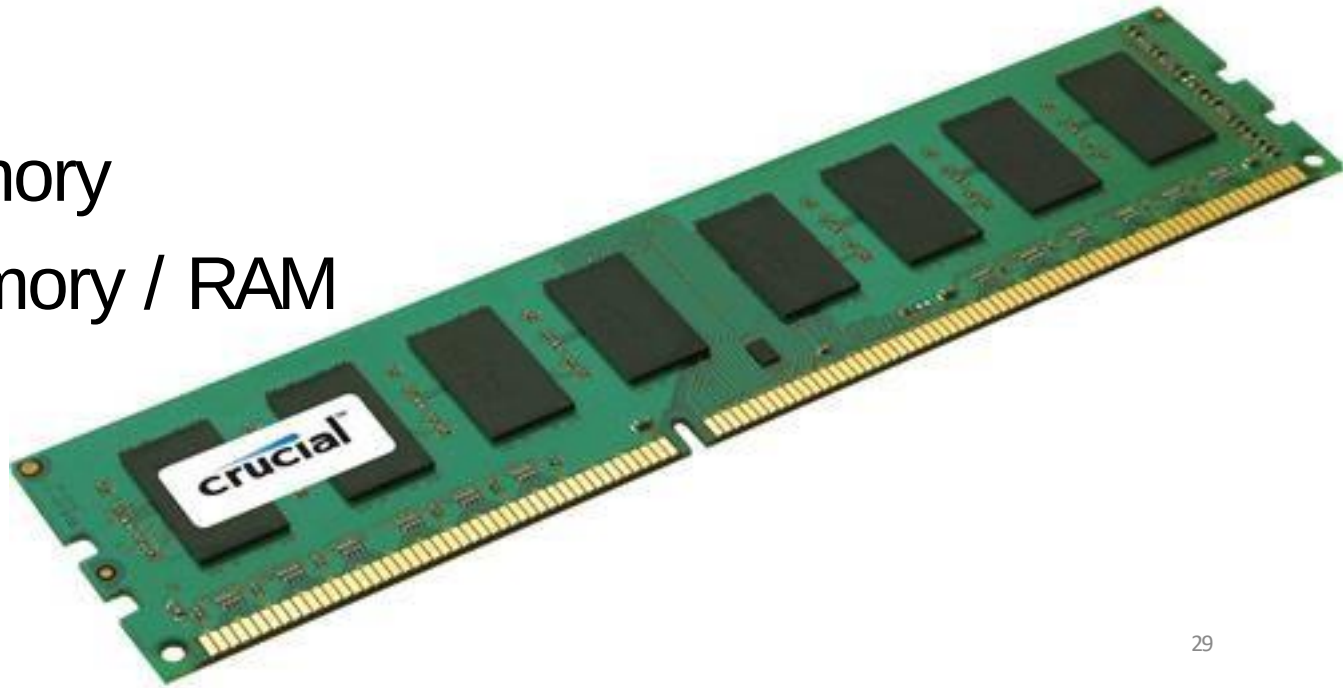
# Storage Devices- Mutability

Ability to overwritten

- Mutable
  - Read & write
  - HD, RAM, Cache
- Immutable
  - Read only
  - Slow writing
  - CD, DVD,
  - ROM

# Primary Storage

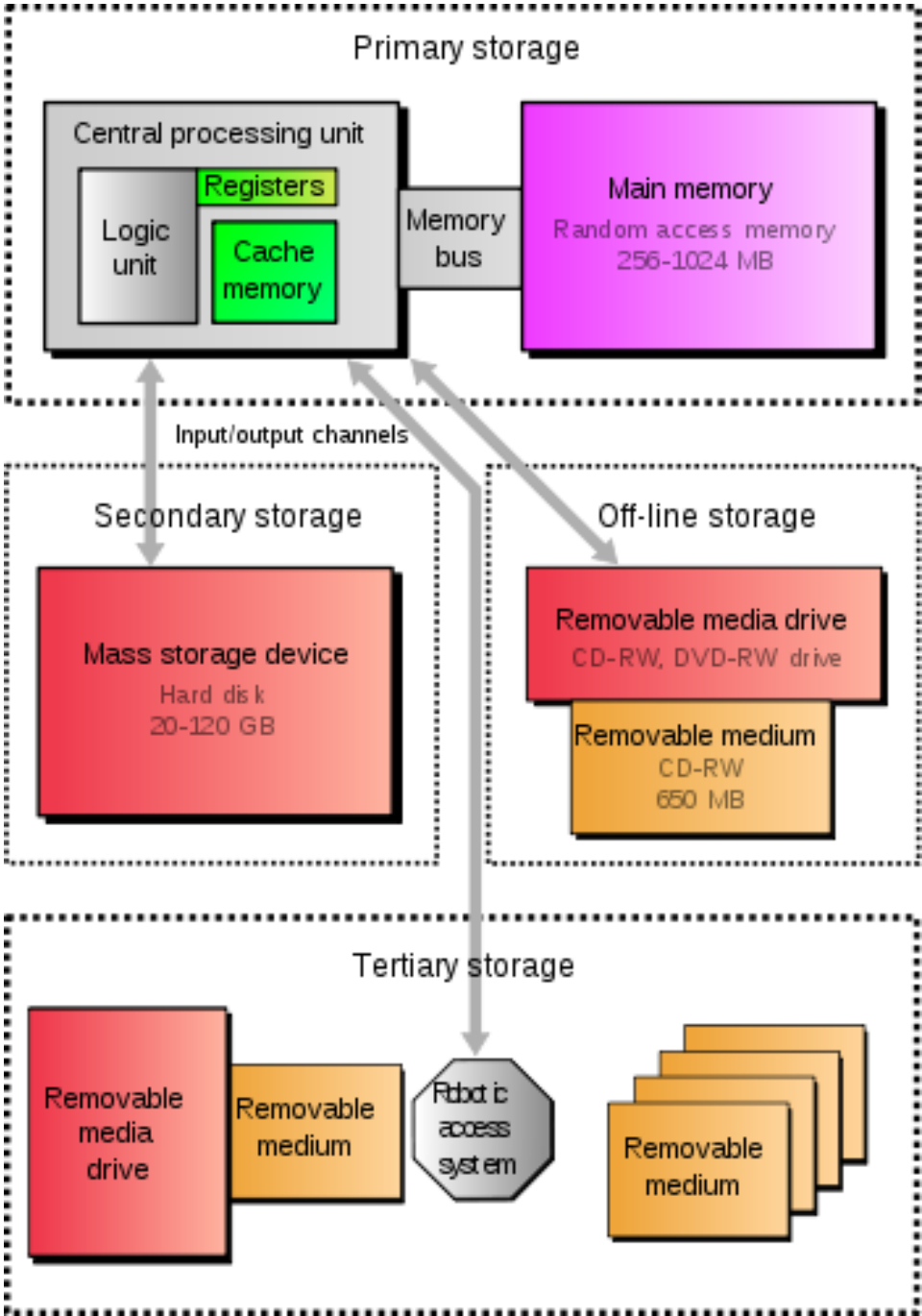
- Directly accessible to CPU
- Location which CPU find instructions to execute
  - Registers
  - Cash memory
  - Main memory / RAM



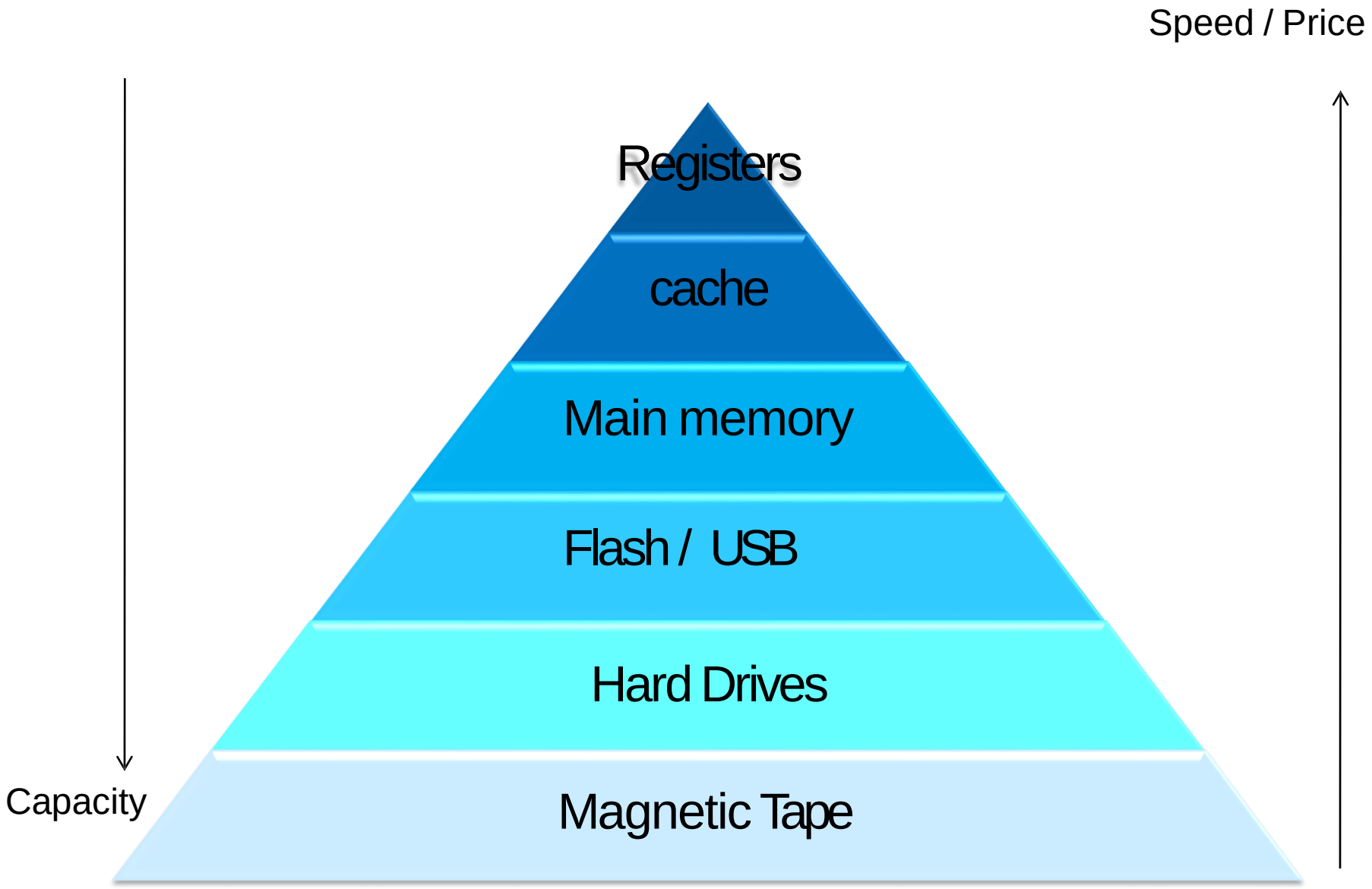
# Secondary/Auxiliary Storage

- Not directly accessible by the CPU
- Non-volatile memory
  - does not lose stored data when the device is powered down

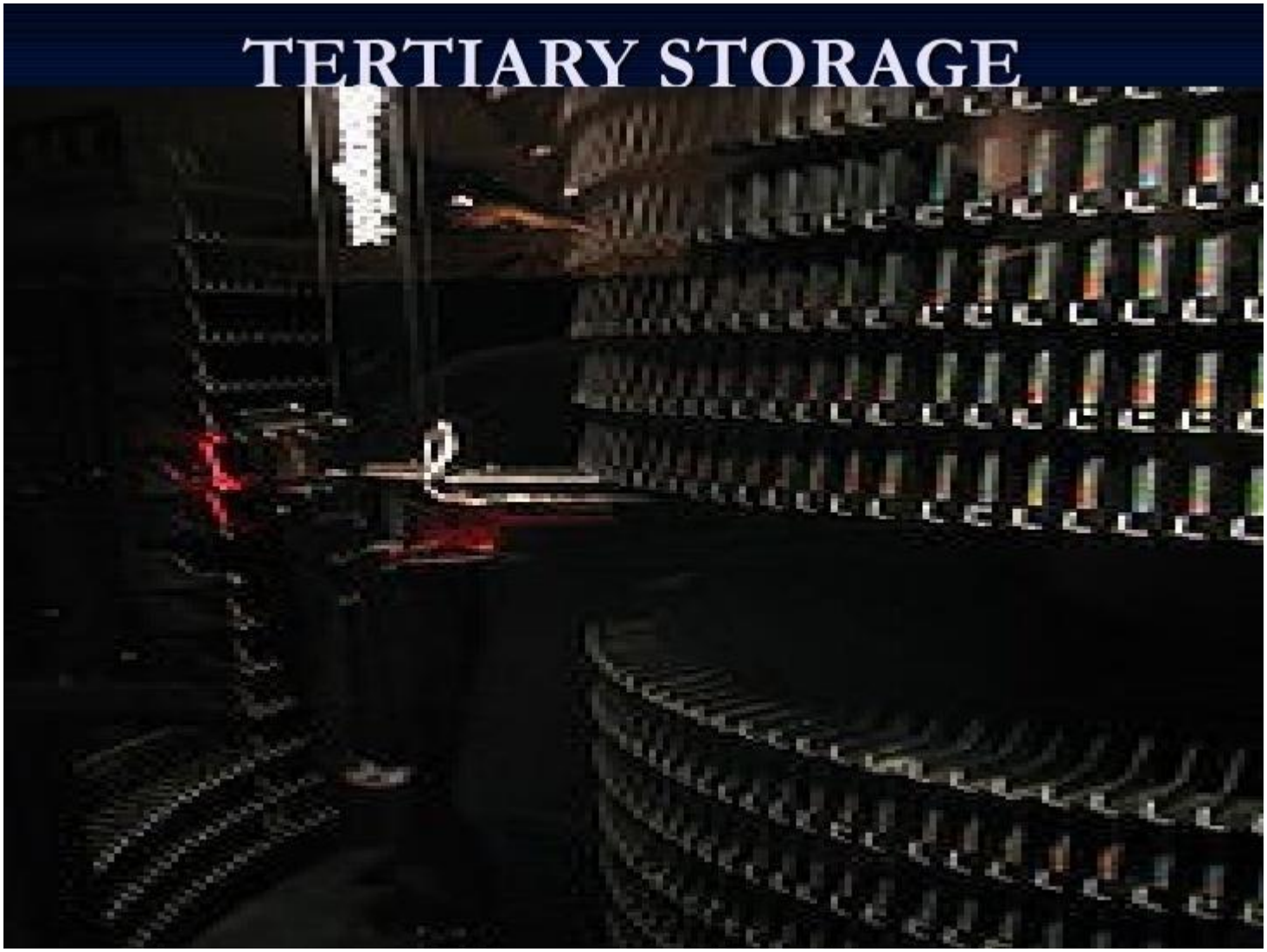
# Storage Devices



# Memory hierarchy



# TERTIARY STORAGE



# A Brief History

| | |
|---|---|
| 1801 | Weaving Loom |
| 1833 | Difference Engine |
| 1940-1956 | First Generation Computers |
| | Vacuum tubes, magnetic drum memory, punched card |
| | ENIAC,EDVAC,UNIVAC |
| 1956-1963 | Second Generation Computers |
| | Transistors |
| | Assembly Language |
| 1964-1971 | Third Generation Computers |
| | Semiconductor memories |
| | High Level Languages |

| | |
|---|---|
| 1972-1991 | Forth Generation computers |
| | Microprocessors |
| | development of GUIs |
| | |
| | |
| 1991-Beyond | Fifth Generation Computers |
| | Artificial Intelligence |

1

2

3

4


Microsoft Reader
7:50a
Library
by Title , showing All
The Adventures of Tom Sa...
Around the World in 80 Days
A Book of Five Rings
Business at the Speed of T...
The Call of the Wild
Dracula
Encarta® Pocket Dictionary
THE ENTROPY EFFECT
The Innocence of Father Br...
Library Guidebook Return

5

# Classifications

- Computational Method
  - Analog computer
  - Digital computer
  - Hybrid computer
- Size & capability
  - Super computer
  - Mainframe computer
  - Mini computer
  - Micro computer
- Purpose
  - General purposes computers
  - Special purposes computers

# Classification
# Computational Method

- Analog computers
  - Use analog signals
    - Data read
    - Process
    - Early computers
- Digital computers
  - Use digital signals
    - Data read
    - Process
    - Store
- Hybrid computers
  - Use analog and digital signals
    - Data read – analog/ digital
    - Process - digital
    - Store – analog/ digital

# Classification
## Size & Capability

- Super Computers
- Mainframes
- Mini computers
- Micro computers /personal computers
  - Desktop
  - Laptop
  - Palmtop

# Super computers

- Larger
- Faster
- Higher performances
- Expensive
- Power consumption is high

IBM's Blue Gene/P

- Large number of users can work concurrently
- Number of tasks can perform concurrently

# Mainframes

- Larger
- Faster
- Higher performances
- Expensive


IBM System z9 (2005)

# Mini Computers

- Larger than desktop
- Faster than desktop
- Higher performances than desktop
- Expensive

PDP-8 (1965)

# Micro computers

- Desktop
  - Placed on a desk
  - Upgrade and expansion capability
    - Capable of adding additional circuitries for additional functionalities
  - Introduced by IBM
  - Later came IBM clones
    - Similar computers by other vendors
      - Dell
      - HP
  - Apple introduced Mac

# Micro computers

- IBM PC
  - 1981
  - IBM BASIC, PC-DOS 1
  - 4 MHz Intel 8088
- IBM PC/XT
  - 1983
  - 4 MHz Intel 8088
  - IBM BASIC, PCDOS 2.0
- IBM PC/AT
  - 1984
  - 6 MHz Intel 80286
  - PCDOS,OS/2

# Micro computers

- Apple Mac
  - Motorola 6809E
- Apple II
  - 1977
  - MOS 6502
- Apple III
  - 1980
  - MOS 6502
  - Apple SOS

# Micro computers

- Tower case
  - Less square area space on desk

on capability

# Tower case

- Full tower
  - 36" high
  - Better cooling
- Mid tower
  - 17-20 inches high
- Mini tower
  - 14” high
  - cools better than a desktop (but not much)

# Laptop

- Smaller
- Compact
- Cooling is less efficient
- No Expansion and upgradin

# Palmtop

- Smaller
- Compact devices
- Portable
- Low power consumption
- Special purposes

# Categorizing based on Purpose

- General purposes
  - Programmable to any task
  - Personal computer
    - Word processing
    - Graphic processing
    - Data analyzing

# Categorizing based on Purpose

- Special purposes
  - Designed to used for special task
  - Instructions are embedded to HW
    - Space center
    - Warfare
    - traffic lights control system
    - navigational system in an aircraft
    - weather forecasting
    - satellite launch / tracking
    - oil exploration
    - automotive industries