

Introduction to Computer Concepts

We will learn about:

- What is a Computer?
- What is inside a computer?
- Programming languages
- What does it take to become a programmer?

LEARNING OUTCOME

At the end of this unit, students should be able to:

- Understand the evolution of computing devices from ancient Babylonia to the twenty-first century.
- Understand the components that make up a typical computer system: the central processing unit, internal memory, mass storage, and input and output devices
- Know the levels of programming languages: machine language, assembly language, and high-level language

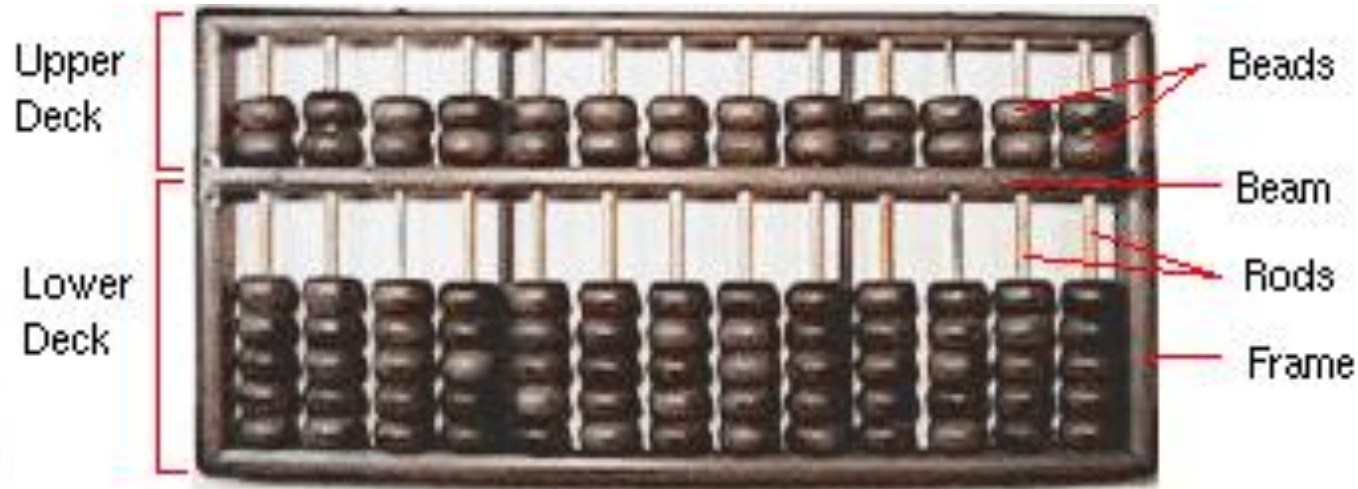
What is a computer?

- It is an electronic device that **stores** and **process data**.
- It is all around us
- It consists
 - Hardware
 - Example: Motherboard, mouse, keyboard, CPU & etc.
 - Software
 - Example: Window XP, MS Word...

History of Computers - Long, Long Ago

Abacus - 3000 BC

- beads on rods to count and calculate
- still widely used in Asia!



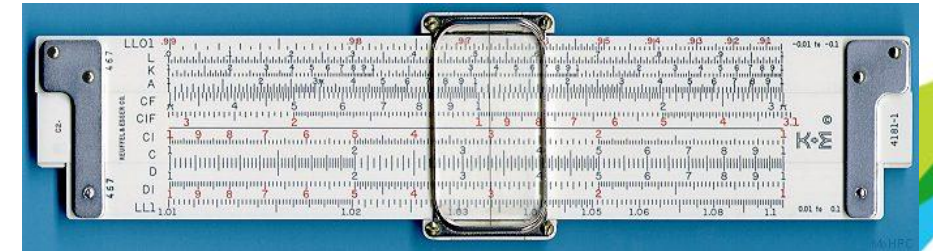
Napier's Bones

- John Napier invented **logarithms** in 1617, which allows multiplication to be performed via addition
- The Napier's Bones were invented to ease the calculation
- Napier's Bones led directly to the invention of slide rule (1632).
- Slide rule also used in Mercury, Gemini and Apollo space program by NASA



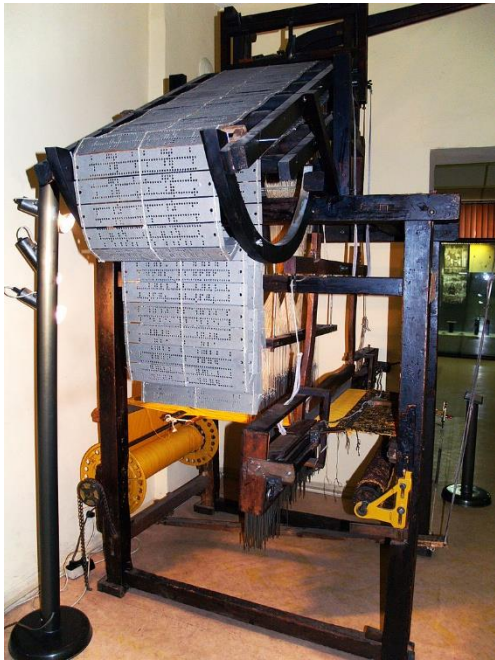
Napier's Bones

• [CC BY-SA 4.0](#)



Slide Rule

History of Computers - 19th Century



Jacquard Loom - 1801

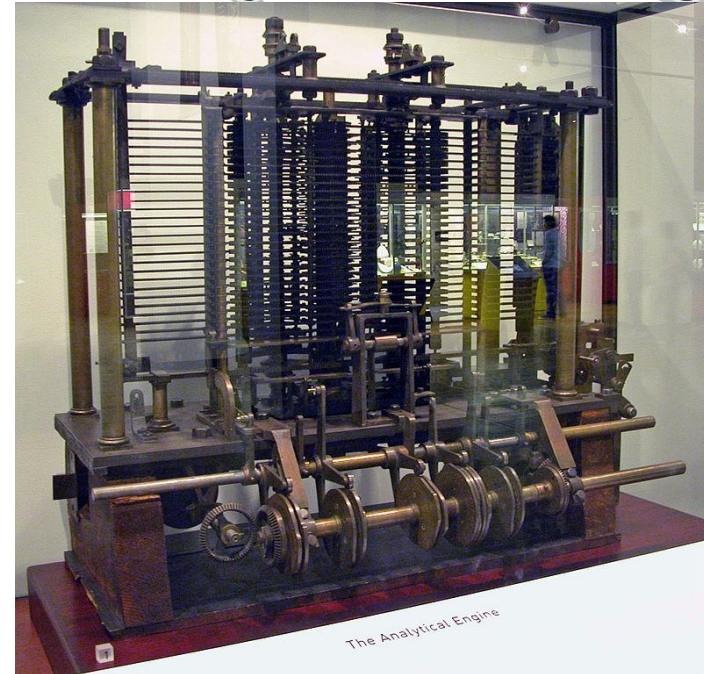
- first stored program - metal cards
- first computer manufacturing
- still in use today!

By Edal Anton Lefterov - Own work, CC BY-SA 3.0,
<https://commons.wikimedia.org/w/index.php?curid=11959365>

Charles Babbage - 1792-1871

- ▶ Difference Engine c.1822
 - huge calculator, never finished
- ▶ Analytical Engine 1833
 - could store numbers
 - calculating “mill” used punched metal cards for instructions
 - powered by steam!
 - accurate to six decimal places

Analytical Engine



By Bruno Barral (ByB), CC BY-SA 2.5,
<https://commons.wikimedia.org/w/index.php?curid=6839854>

Modern Computer

Vacuum Tubes - 1941 - 1956

- ▶ **First Generation Electronic Computers** used Vacuum Tubes
- ▶ Vacuum tubes are glass tubes with circuits inside.
- ▶ Vacuum tubes have no air inside of them, which protects the circuitry.

UNIVAC - 1951

- ▶ first fully electronic **digital** computer built in the U.S.
- ▶ Created at the University of Pennsylvania
- ▶ ENIAC weighed 30 tons
- ▶ contained 18,000 vacuum tubes
- ▶ Cost a paltry \$487,000



- Was an American Computer Scientist
- Programmed UNIVAC
- Recipient of Computer Science's first "Man of the Year Award"

Grace Hopper



Second Generation – 1956-1963

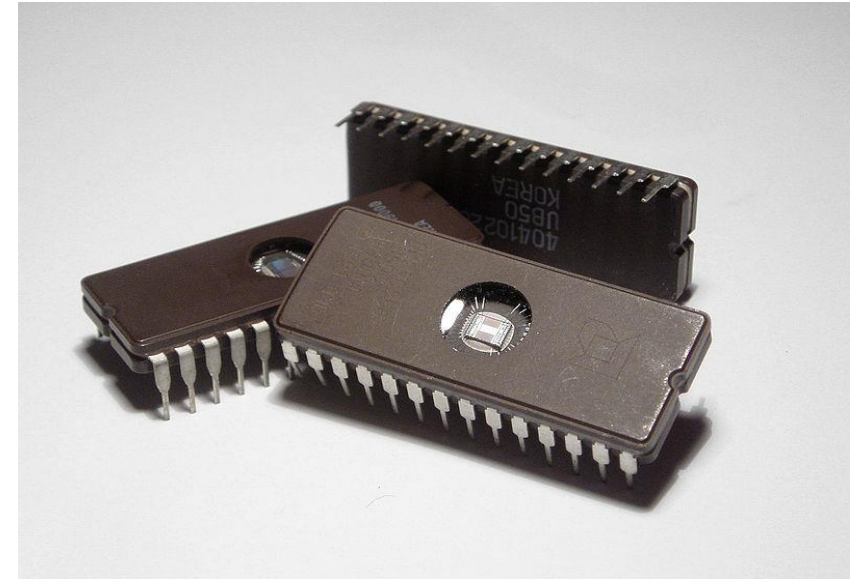
- 1956 – Computers began to incorporate *Transistors*
- A transistor is a semiconductor device used to amplify or switch electronic signals and electrical power.
- Replaced vacuum tubes with Transistors



By Transisto at English
Wikipedia - Own
work, CC BY-SA 3.0,
<https://commons.wikimedia.org/w/index.php?curid=11885148>

Third Generation – 1964-1971

- Third Generation Computers used Integrated Circuits (chips).
- Integrated Circuits are transistors, resistors, and capacitors integrated together into a single “chip”
- Getting smaller, cheaper

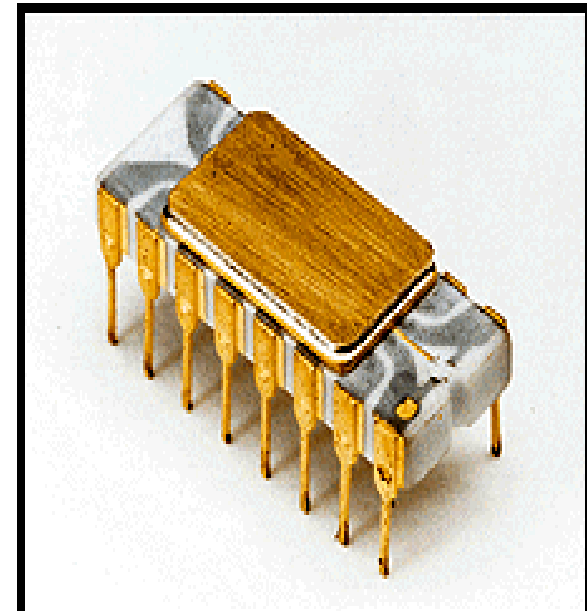


By The original uploader was Zephyris at English Wikipedia - Transferred from en.wikipedia to Commons by TenIslands using CommonsHelper., CC BY-SA 3.0, <https://commons.wikimedia.org/w/index.php?curid=4560427>

The First Microprocessor – 1971

Intel 4004 Microprocessor

- The 4004 had 2,250 transistors
- four-bit chunks (four 1's or 0's)
- 108Khz
- Called “Microchip”



The Intel 4004, it was supposed to be the brains of a calculator. Instead, it turned into a general-purpose microprocessor as powerful as ENIAC.

What is a Microchip?

- Very Large Scale Integrated Circuit (VLSIC)
 - Transistors, resistors, and capacitors
- 4004 had 2,250 transistors
- Pentium IV has 42 MILLION transistors
 - Each transistor 0.13 microns (10^{-6} meters)

4th Generation – 1971-present

- MICROCHIPS!
- Getting smaller and smaller, but we are still using microchip technology

Birth of Personal Computers - 1975

MITs Altair

- ▶ 256 byte memory (not Kilobytes or Megabytes)
- ▶ 2 MHz Intel 8080 chips
- ▶ Just a box with flashing lights
- ▶ cost \$395 kit, \$495 assembled.



By Swtpc6800 en:User:Swtpc6800 Michael Holley - Transferred from en.wikipedia, Public Domain,
<https://commons.wikimedia.org/w/index.php?curid=3185062>

IBM PC - 1981



By Rama & Musée Bolo - Own work, CC
BY-SA 2.0 fr,
<https://commons.wikimedia.org/w/index.php?curid=36757134>

- ▶ IBM-Intel-Microsoft joint venture
- ▶ First wide-selling personal computer used in business
- ▶ 8088 Microchip - 29,000 transistors
 - 4.77 Mhz processing speed
- ▶ 256 K RAM (Random Access Memory) standard
- ▶ One or two floppy disk drives

Apple Computers



- ▶ Founded 1977
- ▶ Apple II released 1977
 - widely used in schools
- ▶ Macintosh (left)
 - released in 1984, Motorola 68000 Microchip processor
 - first commercial computer with graphical user interface (GUI) and pointing device (mouse)

Generations of Electronic Computers

	First Generation	Second Gen.	Third Gen.	Fourth Gen.
Technology	Vacuum Tubes	Transistors	Integrated Circuits (multiple transistors)	Microchips (millions of transistors)
Size	Filled Whole Buildings	Filled half a room	Smaller	Tiny - Palm Pilot is as powerful as old building sized computer

1990s: Pentiums and Power Macs

- ▶ Early 1990s began penetration of computers into every niche: every desk, most homes, etc.
- ▶ Faster, less expensive computers paved way for this
- ▶ Windows 95 was first decent GUI for “PCs”
- ▶ Macs became more PC compatible - easy file transfers
- ▶ Prices have plummeted
 - \$2000 for entry level to \$500
 - \$6000 for top of line to \$1500

21st Century Computing

- Great increases in speed, storage, and memory
- Increased networking, speed in Internet
- Widespread use of CD-RW
- PDAs
- Cell Phone/PDA
- WIRELESS!!!

What is inside a computer?

► Hardware

- Central Processing Unit (CPU)
 - Intel Duo Core, AMD& etc
- Memory
 - Hard disc, RAM
- Storage Devices
 - Pen Drive, CD, DVD, Diskert
- Input Devices
 - Key Board, Mouse, Scanner...
- Output Devices
 - Monitor, projector, speaker...
- Communication Devices
 - Modem, Wireless card, Switches and Hub, router...

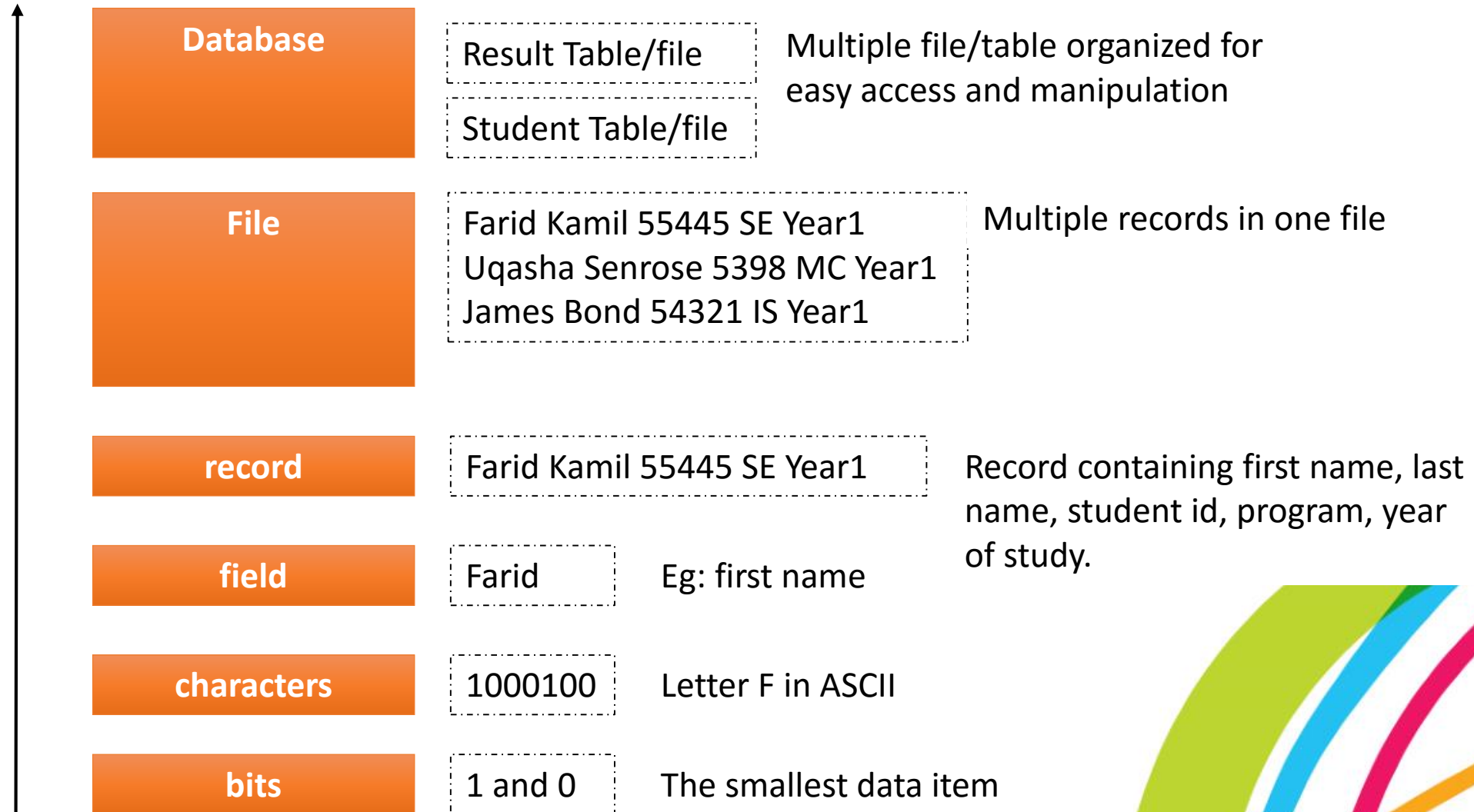
What is inside a computer? (cont')

- Software
 - Also known as computer programs
 - A collection of instruction for computer to operate
 - Can be written in many types of languages
 - Collections of important program to operate the basic operation of a computer is Operating System
 - Example of OS: Microsoft Windows, DOS, OS X (MAC), UNIX and etc

Data Hierarchy

- Data items processed by computers based on **data hierarchy**

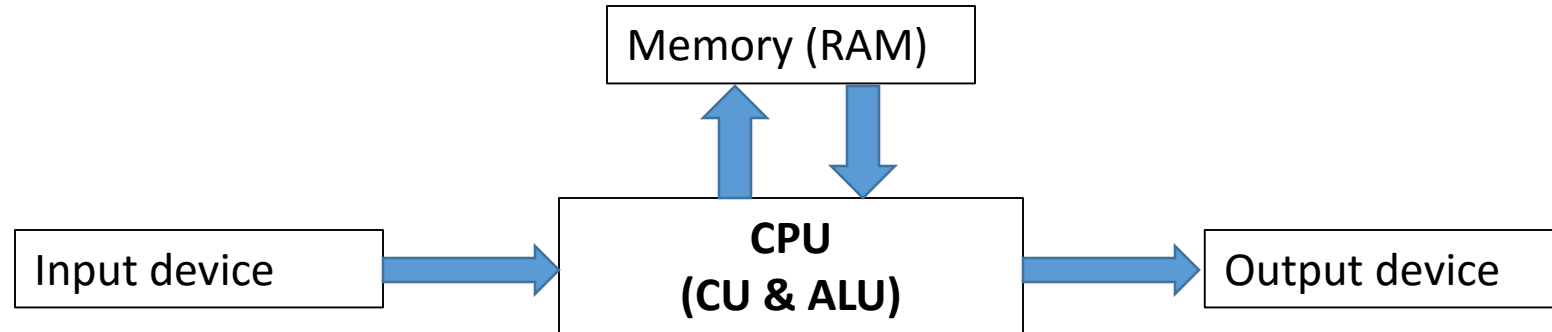
Data becomes
larger and more
complex



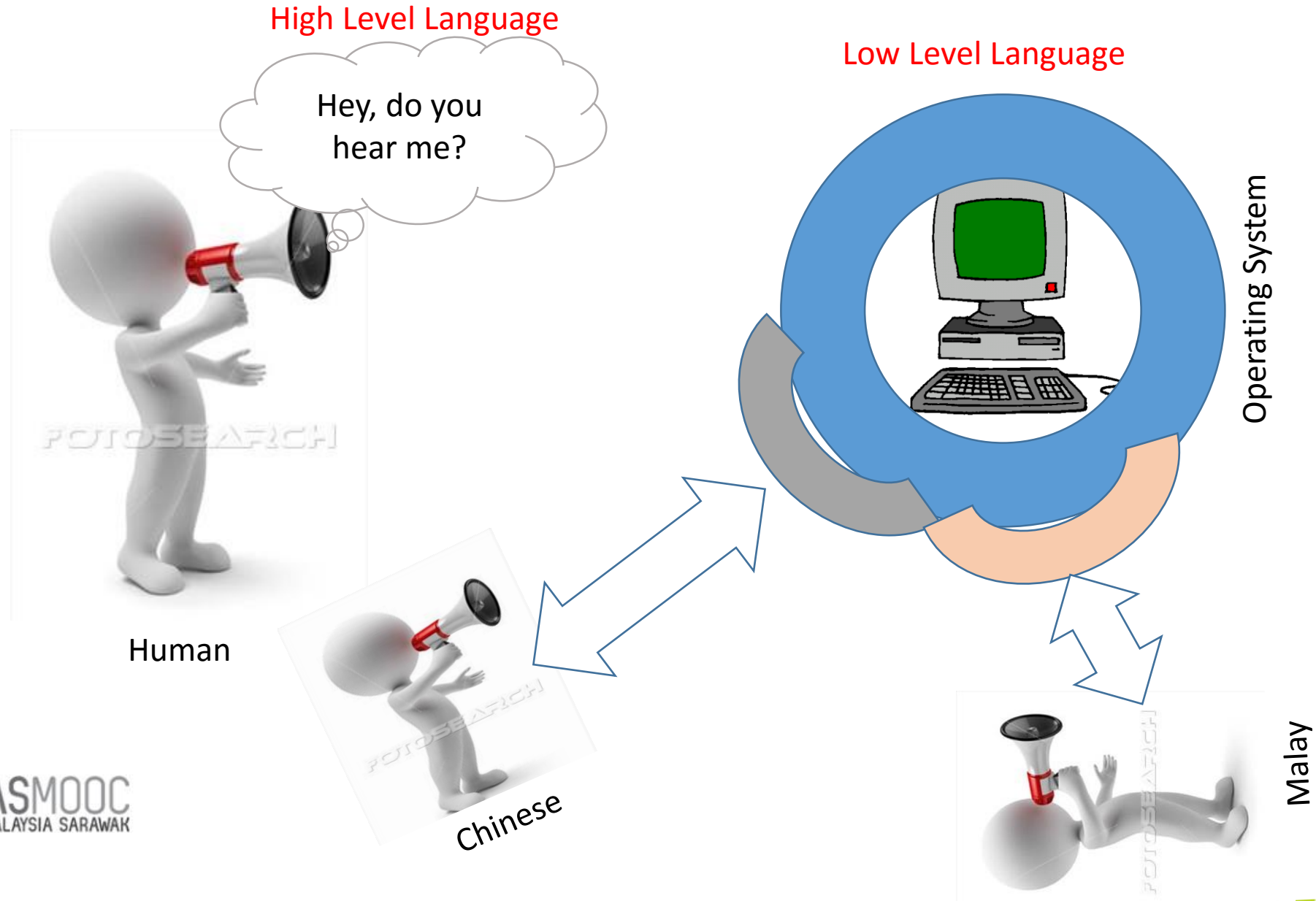
Programming Languages

- A programming language is a machine –readable **artificial language** to express computations that can be performed by a machine.
- In simple term, the **language that can instruct computer to perform certain operation!**

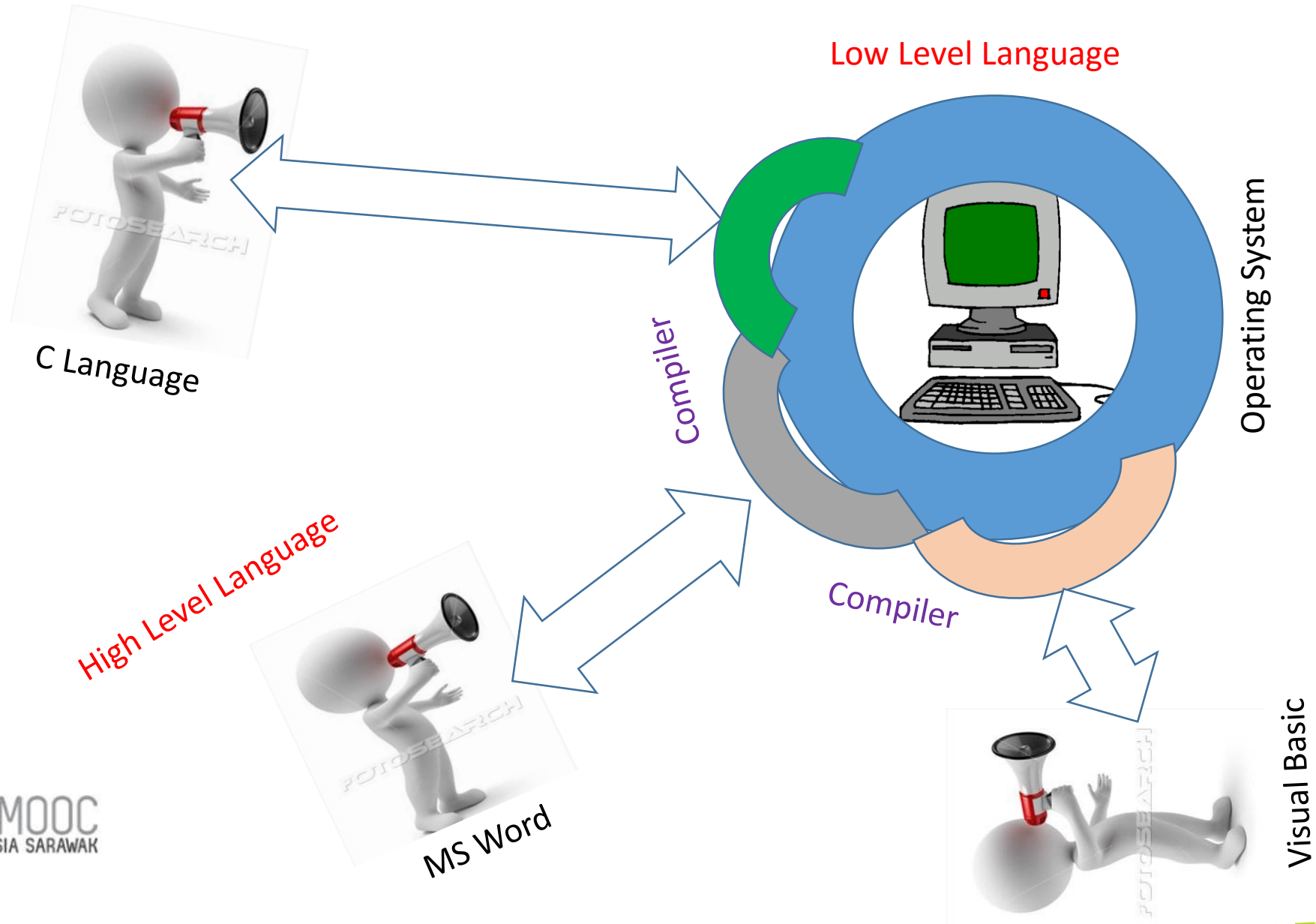
How Computer Works?



How Computer Interacts?

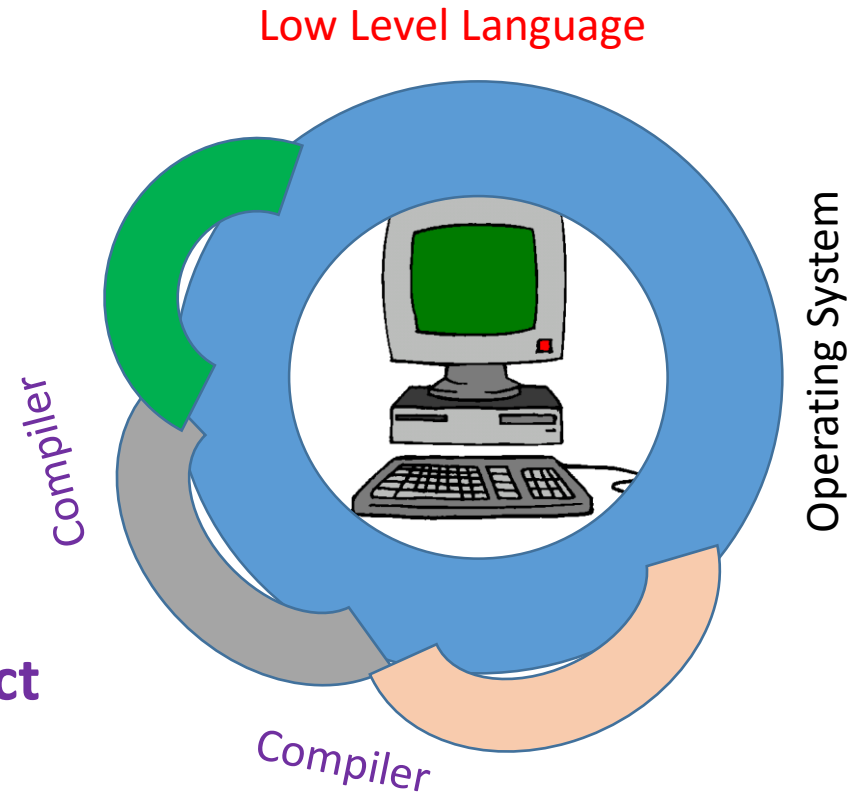


How Computer Interacts?



How Computer Interacts?

- Computer alone → Dead
- Computer+OS → Alive
- Computer+OS+Compiler → Interact



Types of Programming Languages

- Basically there are 3 types of programming language:
 - Machine languages
 - Assembly languages
 - High-level languages

Machine Languages

- Basically machine cannot understand human language.
- Computer only understand numbers.(Digital format)
- Machines languages are machine-dependents, but it generally consists string of numbers (eventually will reduce to 1s and 0s)
- Example:
 - 1000100111 (Binary system)

Assembly languages

- ▶ Machine language is hard to understand and write.
- ▶ An English-like abbreviations formed the basic languages.
- ▶ A translator program called assemblers will later convert the assembly language to machine language
- ▶ Example of assembly languages syntax:
 - LOAD
 - ADD
 - STORE

High-level language

- ▶ Assembly language is easier to use and learn compare to machine language, but it is still very tedious to write a complex program which involve a lot of operation.
- ▶ High-level languages are developed, where single statements can accomplish substantial tasks.
- ▶ It make programming more easier and fun.
- ▶ Translator programs called **compiler** convert **high-level language to machine language**
- ▶ Example of High-level language
 - C, C++, JAVA, FOTRAN, COBOL, PYTHON, PHP....

Summary View

Computer Languages	Sample	Translator Program
Machine Languages	1001111001011111011111 1111010010010110000101 0100100101111010101110 1010100010101010111111	-
Assembly Language	LOAD BASEPAY ADD OVERPAY STORE GROSSPAY	Assembler
High level languages	grossPay = basePay + OverTimePay	Compiler

Newer Programming Languages

- Graphical-based programming language with scripts
- Only simple knowledge on logic is needed in programming
- Example:
 - Visual .NET (C, C++, C#, Basic)
 - JAVA
 - WEB Programming
 - Multimedia programming (FLASH...)

What does it take to become a programmer?

- ▶ Need to know **Math**?
 - Yes & No, you only need to know the **simple arithmetic operation**. The **analytical skill** is more important
- ▶ The Importance of **Design**
 - You need to design a solution for a problem
- ▶ Importance of **Patience**
 - Programming may be frustrating but very rewarding (in term of satisfactory and monetary)
- ▶ Importance of **precision**
 - You need to be able to **think logically, precisely** and in **rigorous** way!
- ▶ Framing Problems Correctly
 - Become a **good problem solver**, **not a problem creator**!

4 ways to learn programming faster

- Look at **example code**
- After **reading** it, **code** it, and **run** (execute) it, and then **modify** it!!
- Write **your own code** ASAP!!
- Seek out **more sources**

Thank You😊