Computer Concepts

CSIT-502

Computer Systems

- Electrical (electronic) Computers
  - Use electricity

- Non-electrical (electronic) Computers

What is a (electronic) computer system?

What is an electronic computer system?

- An electronic computer system is a collection of electronic and mechanical parts (the hardware)

- … that has been given a set of instructions (the software), that lets you store and manipulate information.

Non-electrical (electronic) Computers

- ➢ "Abacus", Roman times

- ➢ In the ancient world a mechanical computer

    (Antikythera Machine/Computer)

- ➢ The Pascaline

- ➢ …

Abacus

The abacus is an ancient calculating tool (2.300-2.700 B.C.) capable of performing the four basic arithmetic operations.
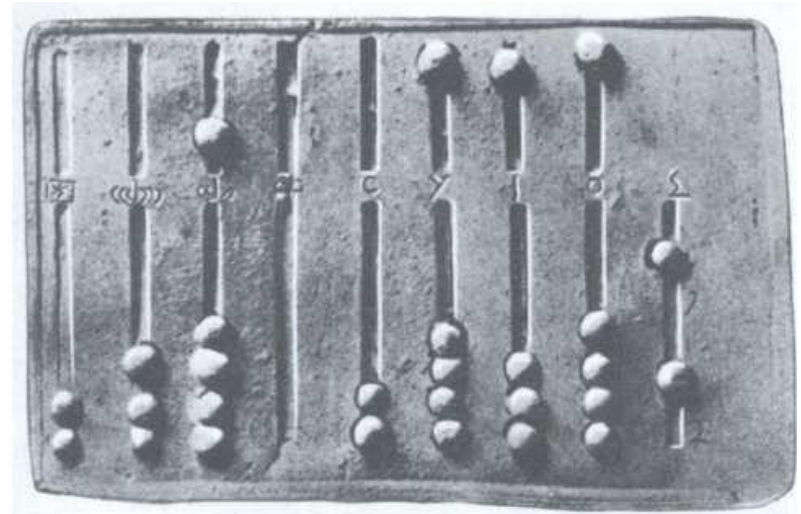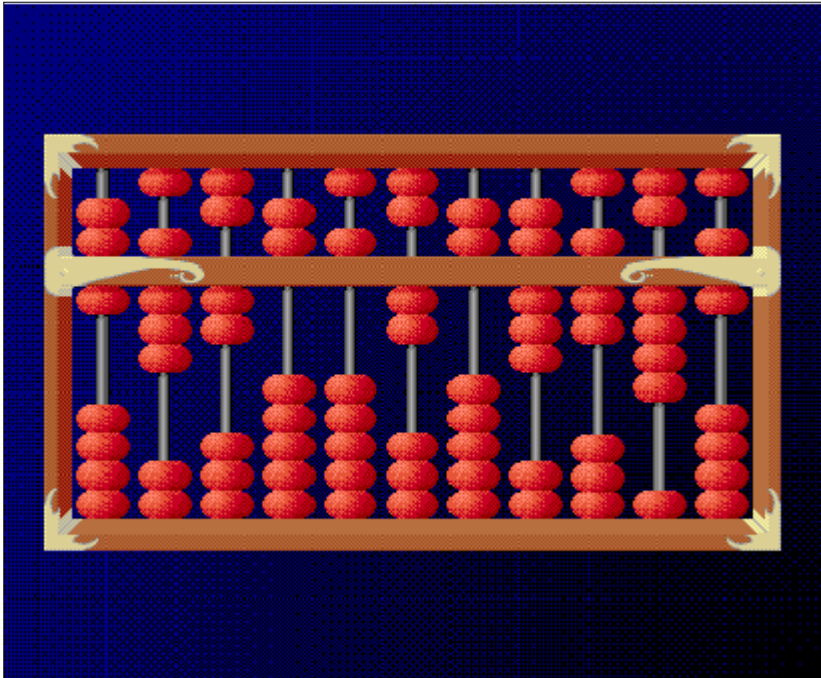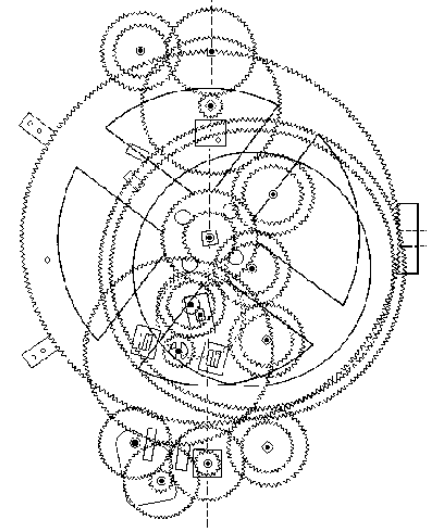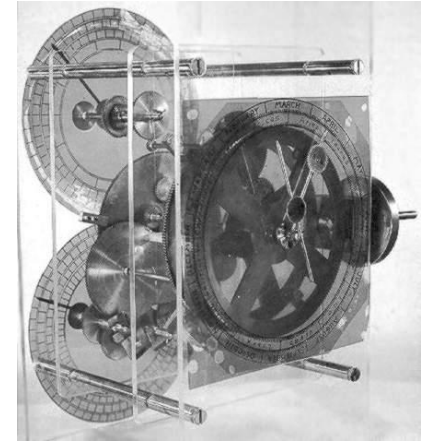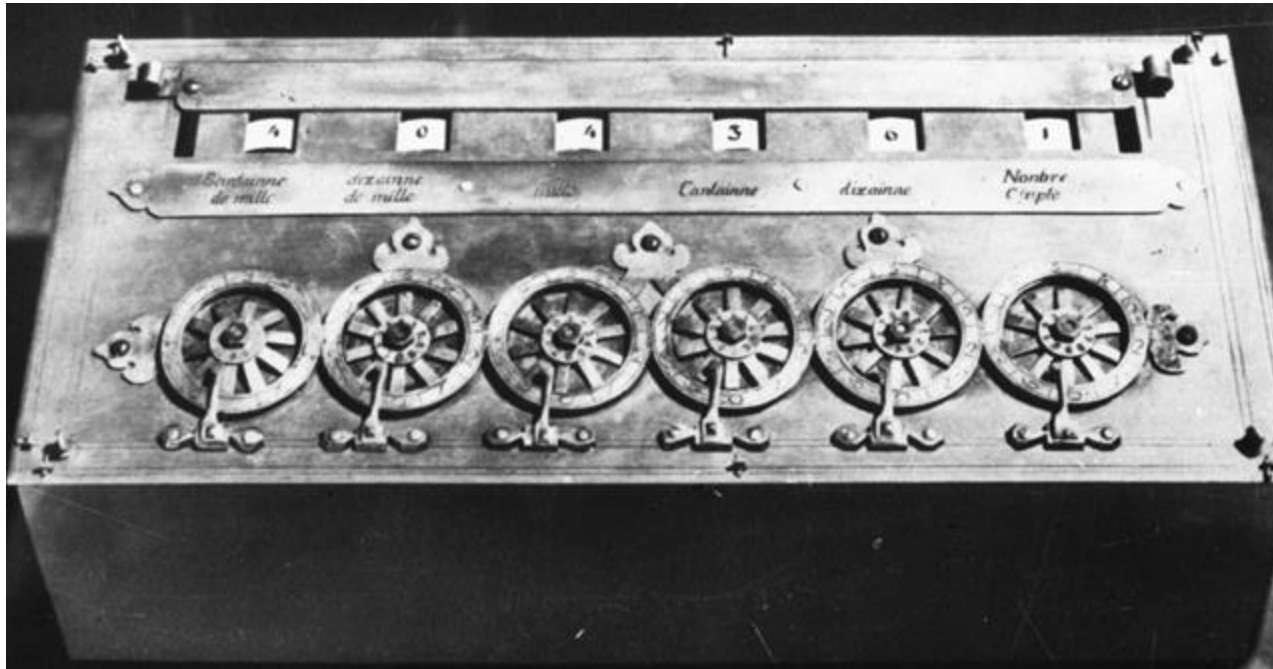
Abacus

Today … Beijing, China

Antikythera Computer (140 B.C)

Was build in ancient Greece the year 140 B.C. The Antikythera Mechanism was able to align the number of lunar months with years and display where the sun and the moon were in the zodiac. {CNN.com}
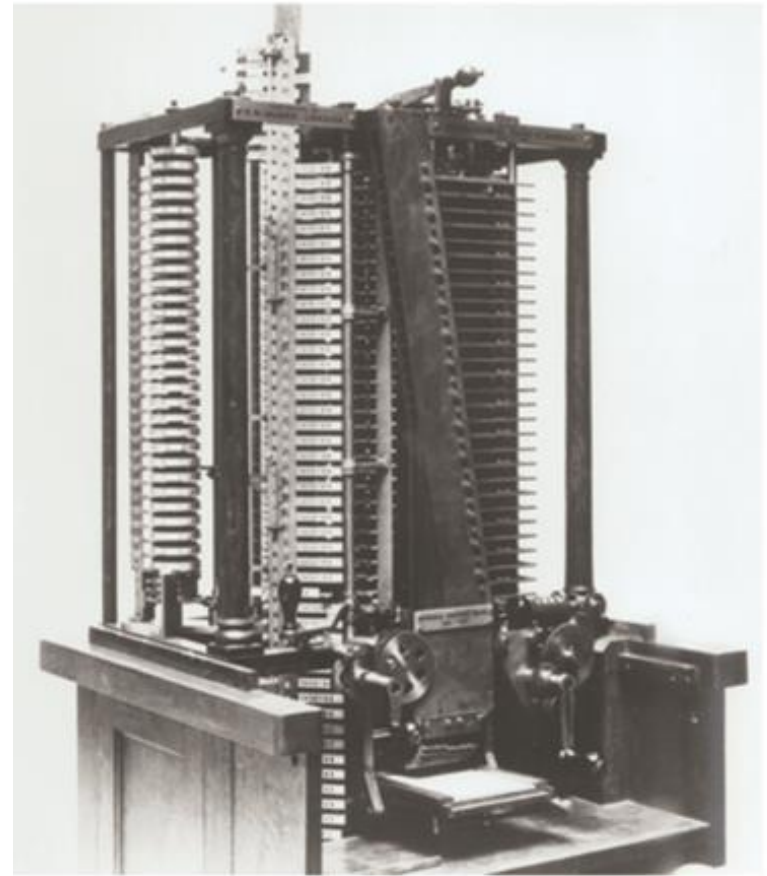
The Pascaline (1642)

Pascal invented and build the "Pascaline" to help his father, a tax collector.

Analytical Engine-1822, (Charles Babbage)

An Engine (mechanical computer) to compute mathematical tables, such as logarithmic and trigonometric functions.
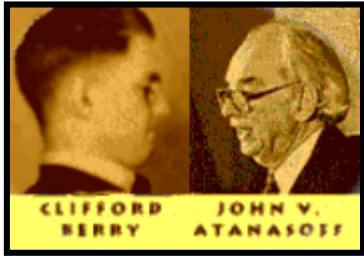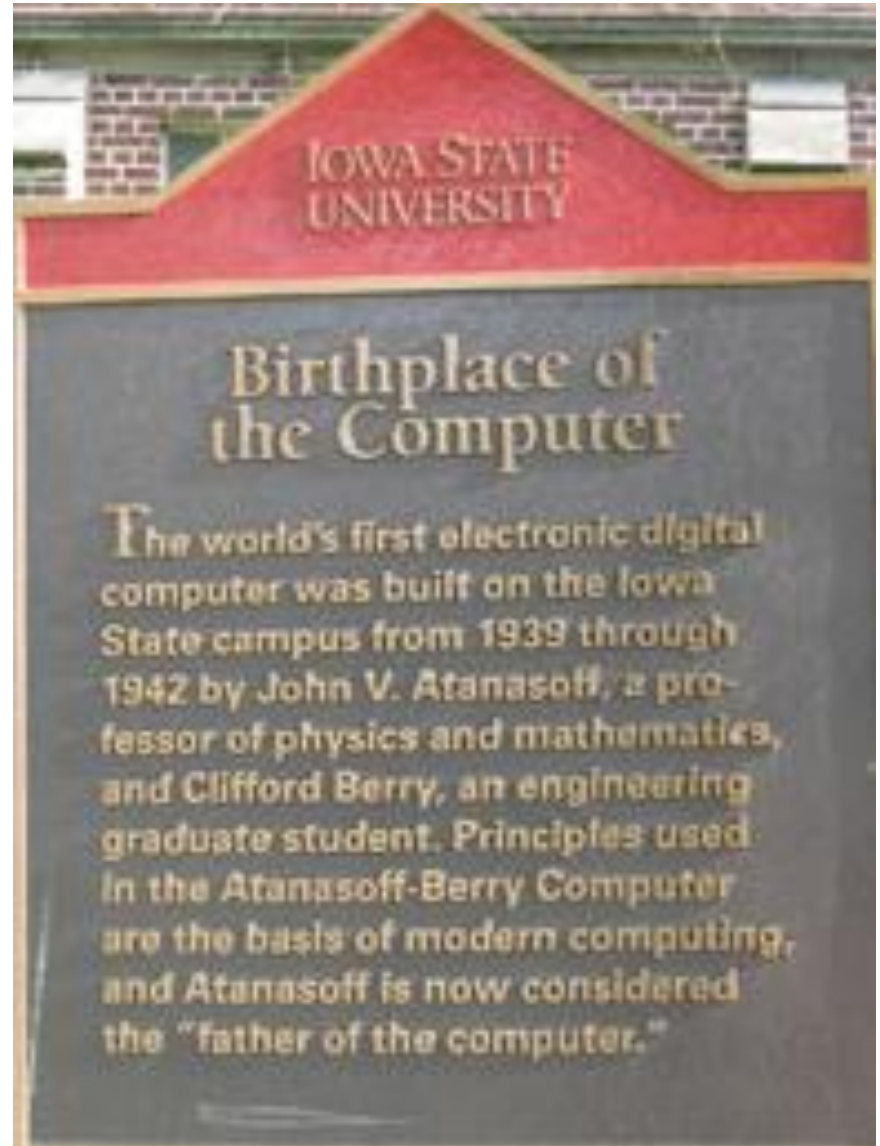
Z1- Computer (1938)

The First Freely Programmable Mechanical Computer invented by Konrad Zuse, 1910-1995 (Germany)

Prof. Atanasoff-Berry (graduate student) Electronic Computer (1939-1942)

CLIFFORD BERRY   JOHN V. ATANASOFF

The world's first electronic-digital computer at Iowa State University. The Computer State used a binary system of arithmetic, parallel processing, separation of memory and computing functions.


IOWA STATE UNIVERSITY

Birthplace of the Computer

The world's first electronic digital computer was built on the Iowa State campus from 1939 through 1942 by John V. Atanasoff, a professor of physics and mathematics, and Clifford Berry, an engineering graduate student. Principles used in the Atanasoff-Berry Computer are the basis of modern computing, and Atanasoff is now considered the "father of the computer."

The Harvard MARK-I Computer -
Howard Aiken and Grace Hopper (1944)

Grace Hopper   Howard Aiken

ENIAC (Electronic Numerical Integrator and Computer) 1944-46

- Developed by Army Ordinance to compute World War II ballistic firing tables.
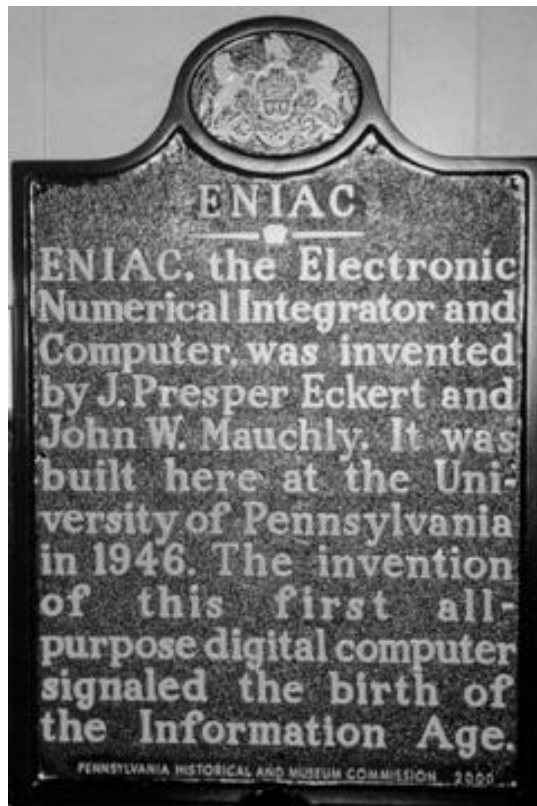
	ENIAC	Intel Core Duo chip
Debut	1946	2006
Performance	5,000 addition problems/sec	21.6 billion ops/sec
Power use	170,000 watts	31 watts max
Weight	28 tons	negligible
Size	80' w x 8' h	90.3 sq. mm.
What's inside	17,840 vacuum tubes	151.6 M transistors
Cost	$487,000	$637

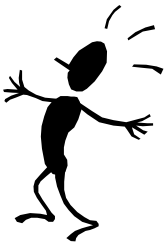- **(Moore School of Electrical Engineering, University of Pennsylvania)**

ENIAC: Electronic Computer
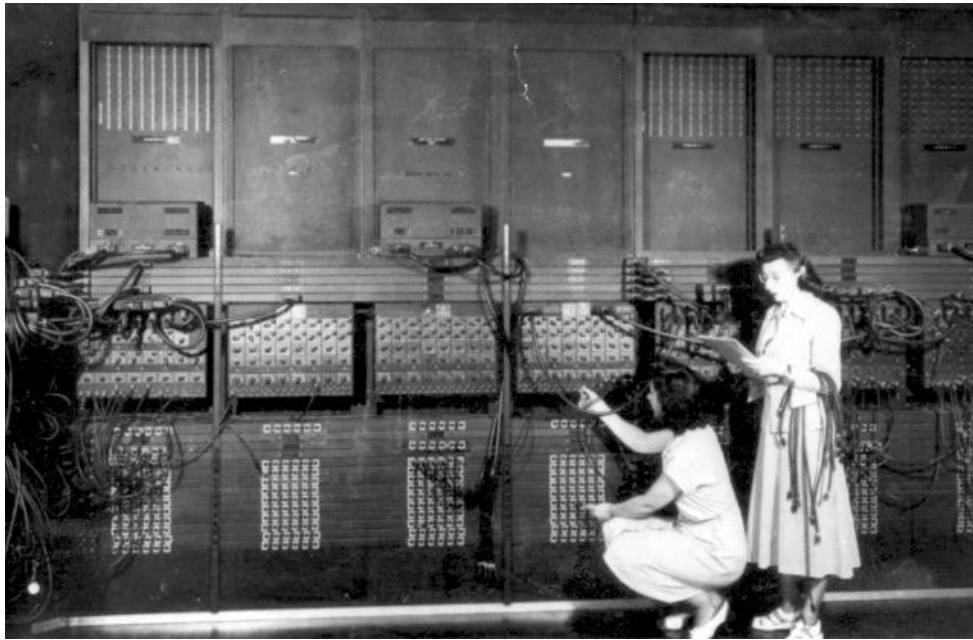
What can a computer do?

- Predict weather

- Run a factory

- Transportation and travel

- Money (Banks/ATM machines)

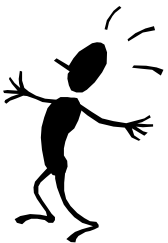- Communications (Mobile phone, email, …)

- Play games

- Robotics

- Medicine

Medicine … Robot (computer) surgery

What a computer can't do?

- Drink coffee

- Listen and solve your problems

- Design solutions to problems

Human computer

Input: *eye, nose, ear*

Process: brain

Output: *feet, voice*

Human made computer

Input: Keyboard, Bar code device, Monitor

↓

Process: CPU

↓

Output: Monitor, Printer
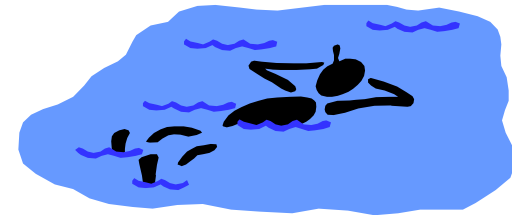
and

Instructions to run the system

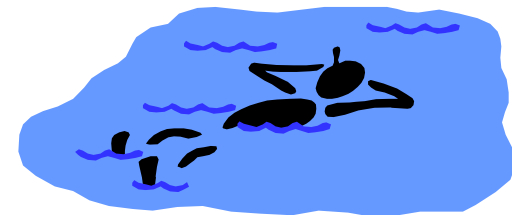# Human made "Computers" ...

A computer system has two main parts

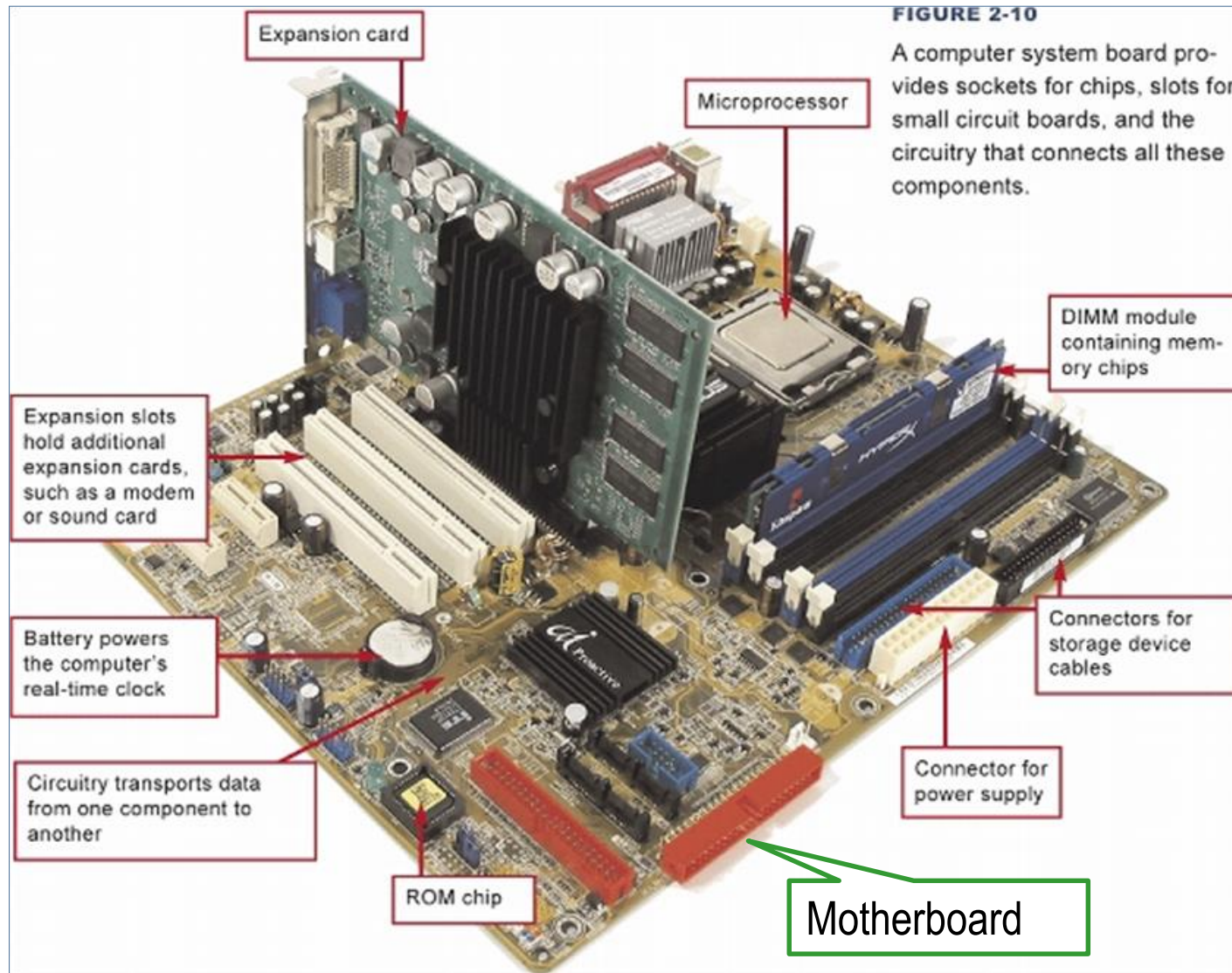- Hardware

- Software

A computer system has two main parts

- Hardware; Physical equipment

- Software; Instructions that run the hardware

Hardware

FIGURE 2-10

A computer system board provides sockets for chips, slots for small circuit boards, and the circuitry that connects all these components.

Expansion card

Microprocessor

DIMM module containing memory chips

Expansion slots hold additional expansion cards, such as a modem or sound card

Battery powers the computer's real-time clock

Connectors for storage device cables

Circuitry transports data from one component to another

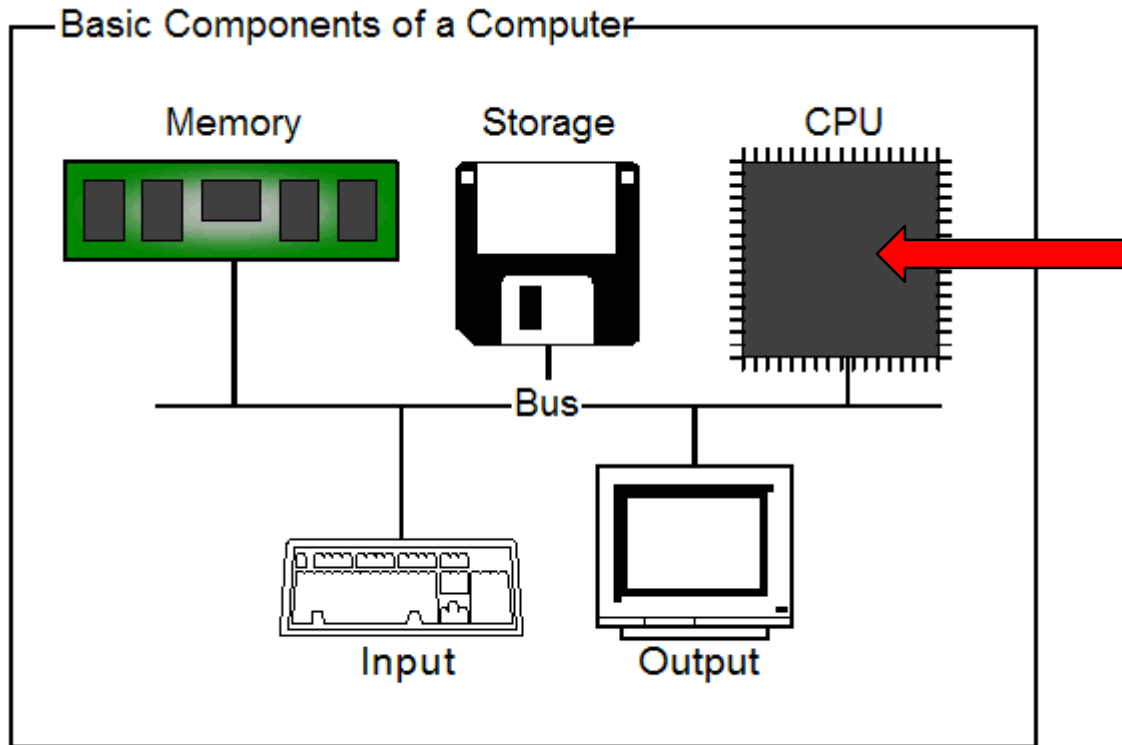Connector for power supply

ROM chip

Motherboard

Software

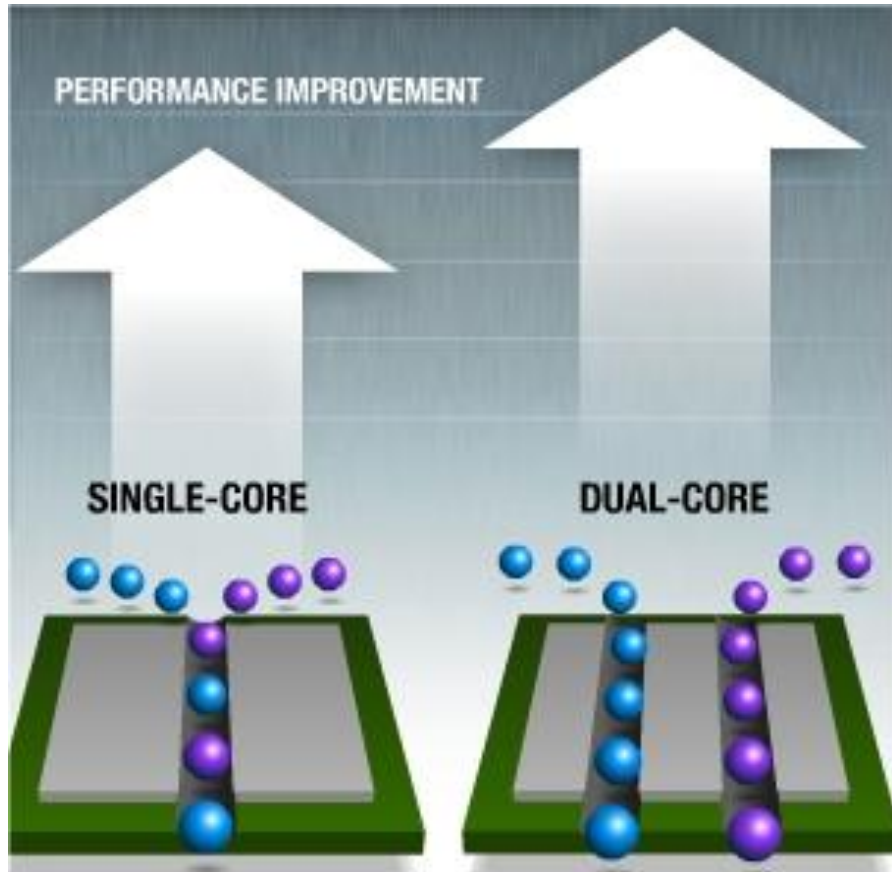- Software = Instructions that run the hardware (programs @ applications)

Such as…

- Operating System (Win7, OSX, Unix, Android etc)

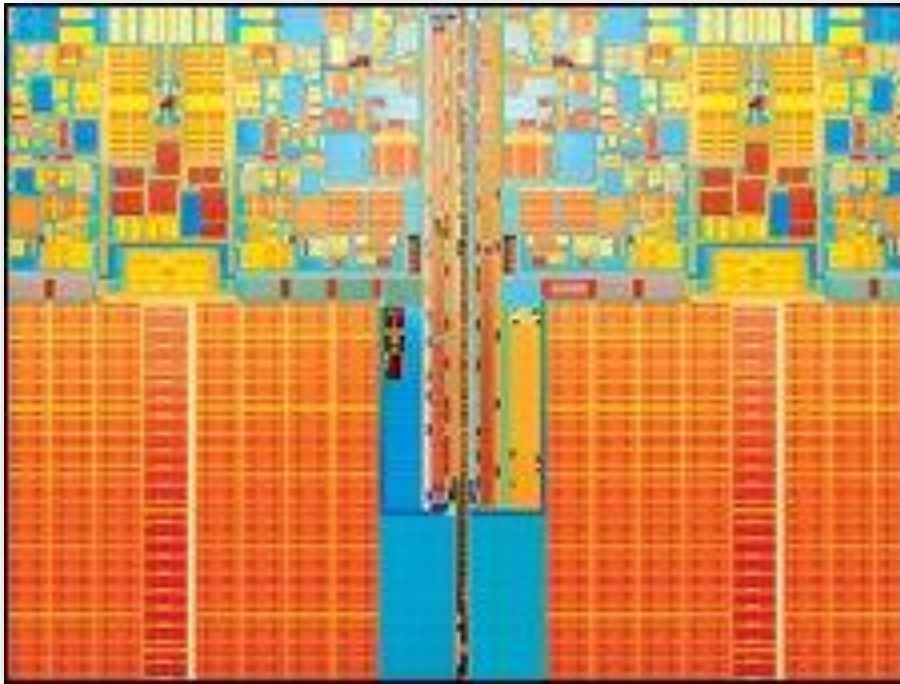- Microsoft Office

- Web browsers

- iTunes

- Games

- etc…

Computer hardware …basic componets
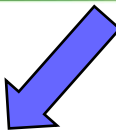
CPU's … single and Multicore

MultiCore CPU

Intel …. evolution

Name	**Date**		**MHz**

- **8086**   **1978**   **5-10**
    - First 16-bit Intel processor. Basis for IBM PC & DOS

- **386**   **1985**   **16-33**
    - First 32 bit Intel processor

- **Pentium 4**   **2004**   **2800-3800**
    - First 64-bit Intel processor, referred to as x86-64

- **Core 2**   **2006**   **1060-3500**
    - First multi-core Intel processor

- **Core i7**   **2016**   **1700-3900**
    - 2- 8 cores

Speed of CPU's … Hertz (*Hz*)

- Hertz (*Hz*) is a measure of the frequency (cycles per second)

- Today … typical CPU values 2-4 G*Hz*
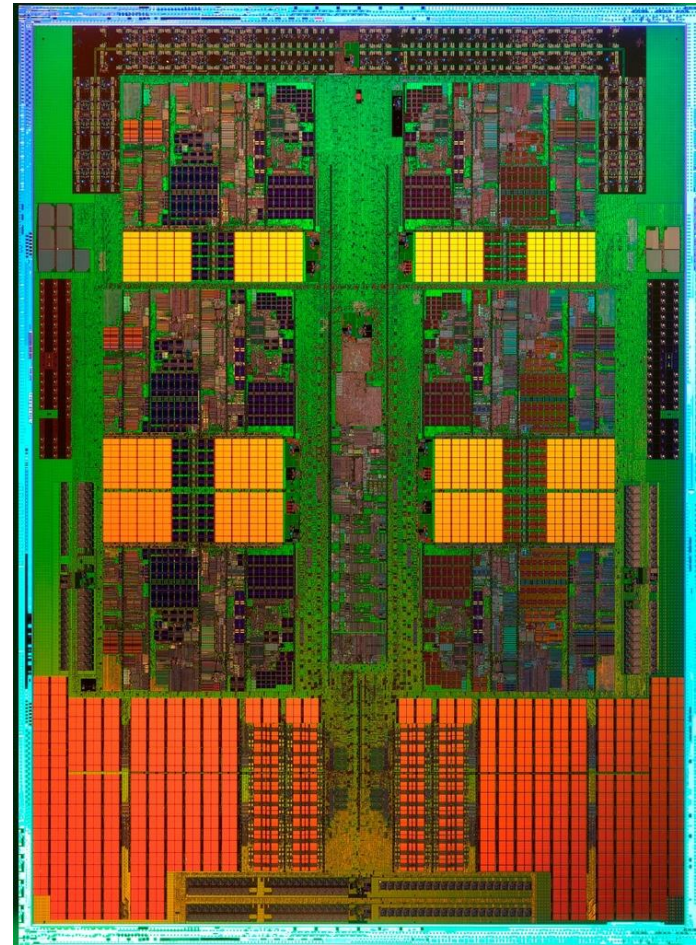
Note:

1 GHz = 1,000,000,000 Hz

1 MHz = 1,000,000 Hz

1 KHz = 1,000 Hz

… from "AMD" … Opteron (12 cores)

ARM CPU for mobile devices ….

ARM (Cortex-9)…next generation devices

Mobile Handsets
Connected Mobile Computers

Networking / Home Gateways
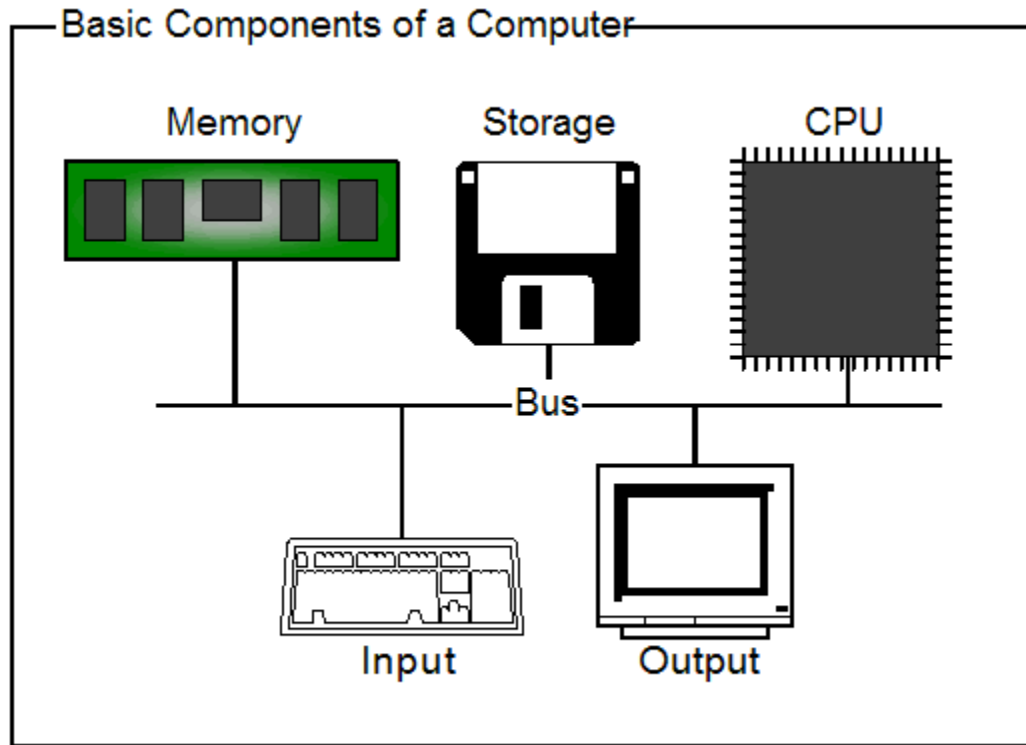
Consumer and Auto-infotainment

Embedded

CPU's

CPU's are also called MicroProcessors

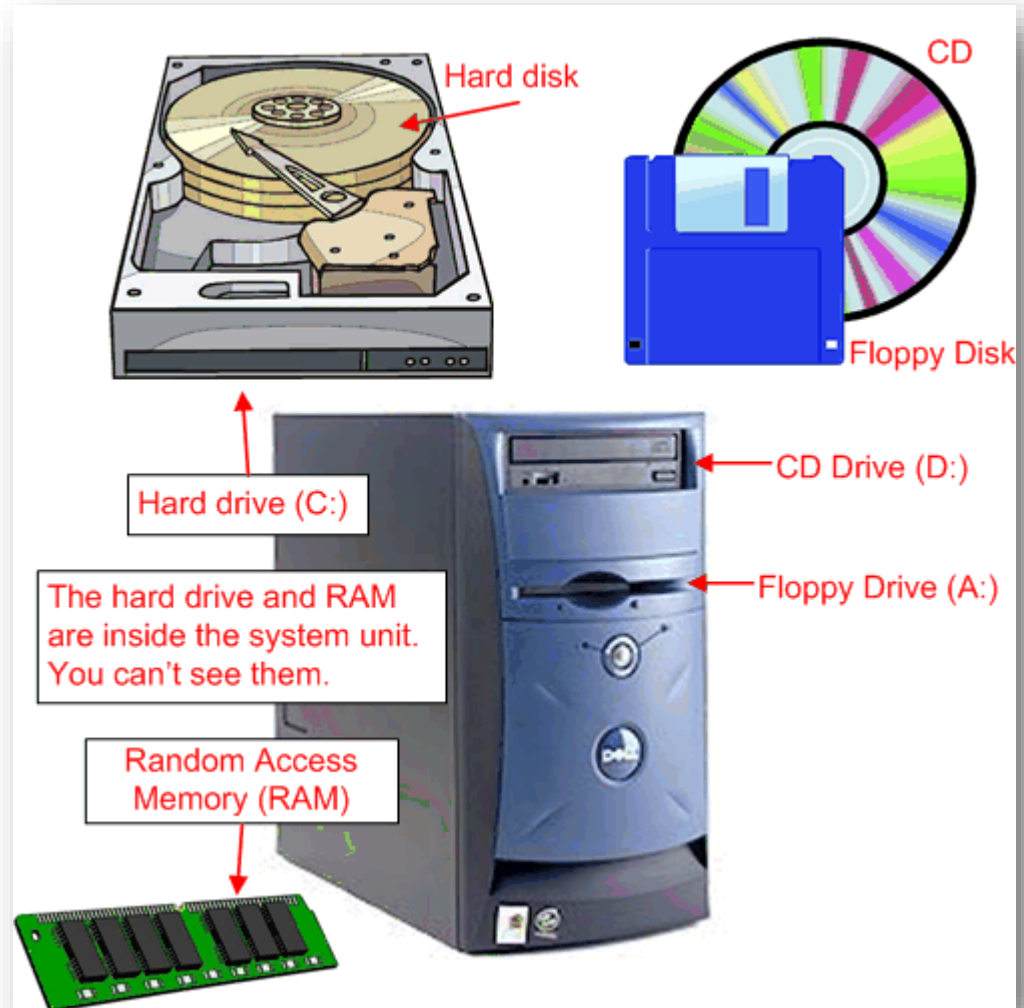# Next … Computer memory

Computer Memory

Computer Memory

- ➢ Primary
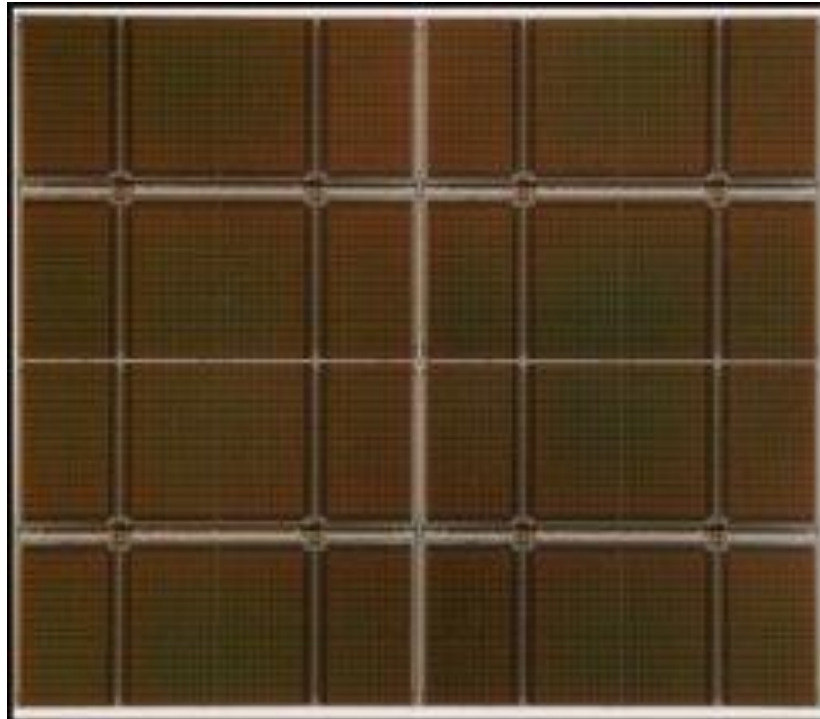
- ➢ Secondary

Computer Memory

❖ **Primary**

- RAM

❖ **Secondary**

- Hard Disk

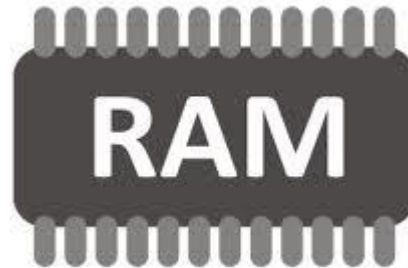- Diskettes, CD, DVD, Tapes, Flash, …

RAM

Rows and columns with 0's and 1's

RAM or System Memory

- ## RAM (Random Access Memory)
  - ➢ Fast
  - ➢ Volatile (not permanent)
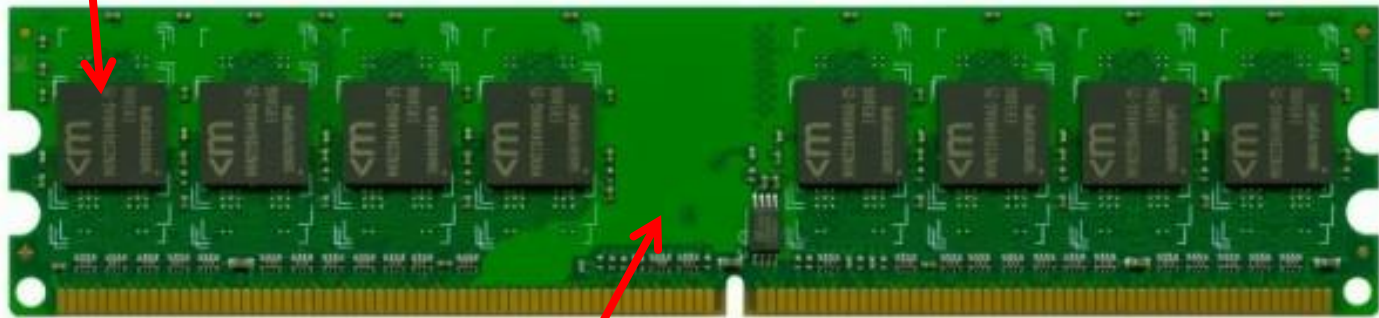 - ➢ Limited
  - ➢ Relatively expensive

RAM

- Random Access Memory (Read And Write Memory)

- When the power goes off, any information stored in the RAM is erased.

RAM
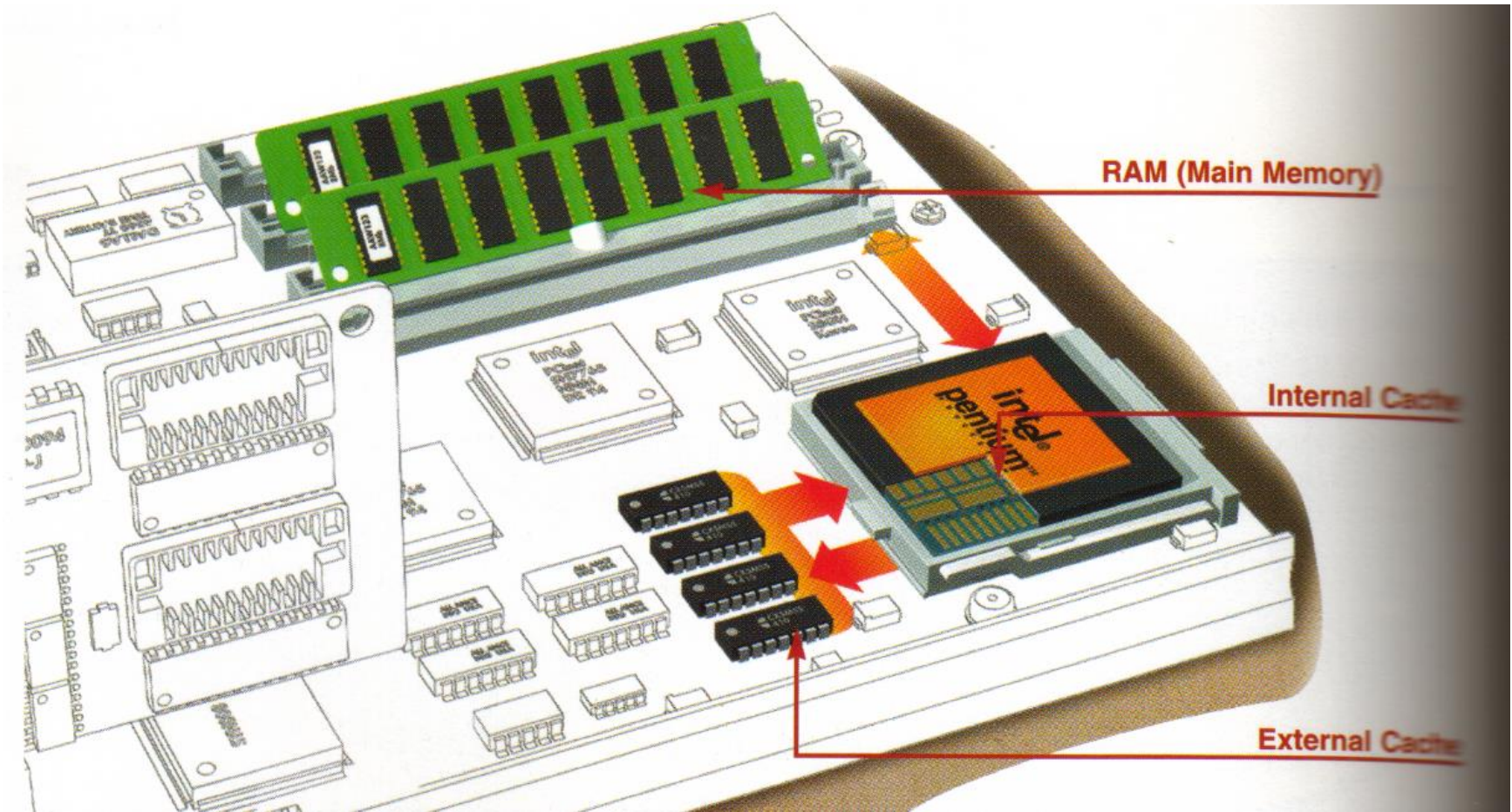
Memory chips
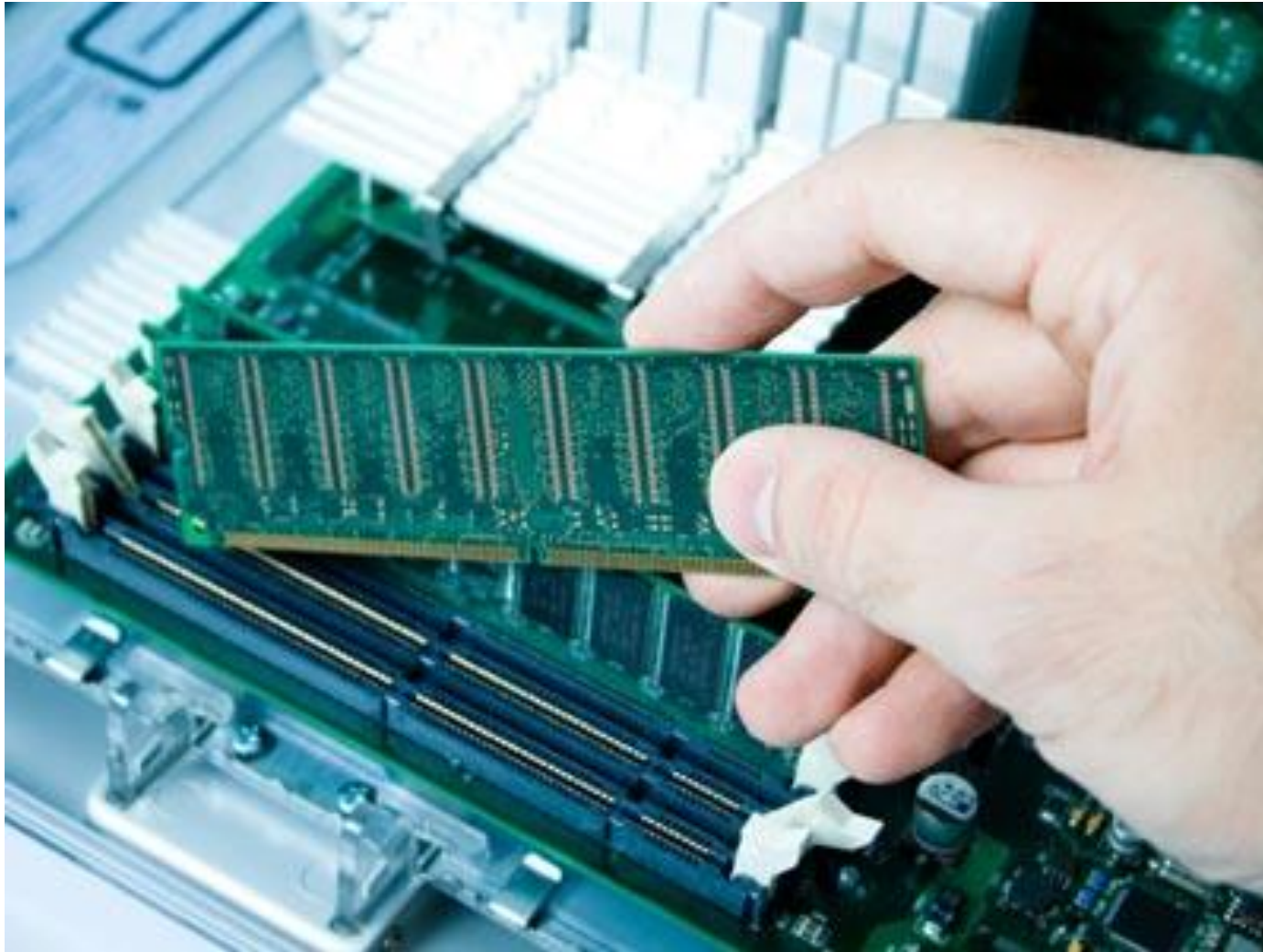
Memory module

RAM (main memory)

How to add RAM memory

Two types … RAM

➢ DRAM (Dynamic RAM); Main memory

➢ SRAM (Static RAM); Faster and more expensive than DRAM
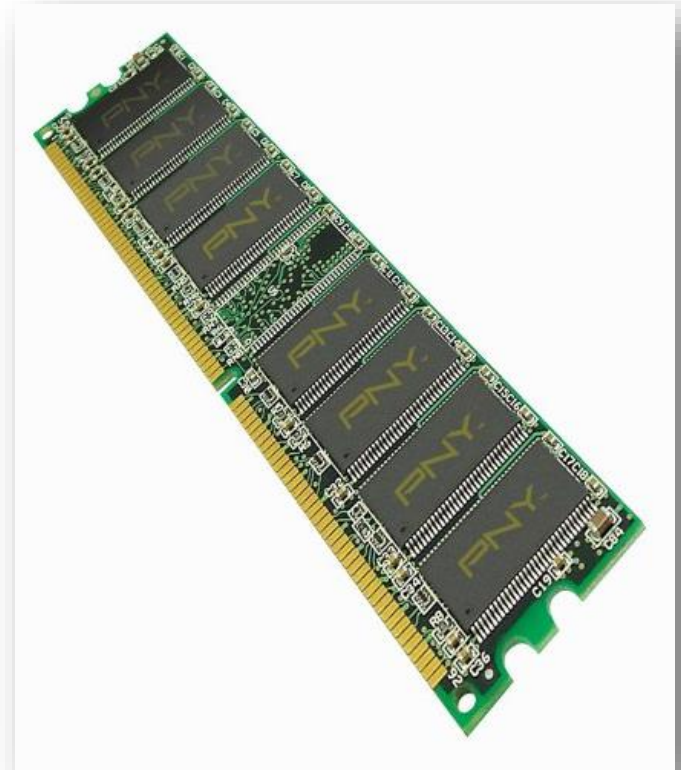
➢ SRAM = Cache memory

DRAM & SRAM chips

DRAM

SRAM

RAM modules (types)

- The memory chips are packaged in memory modules that plug into expansion slots on the main system board (motherboard).

✓ SIMMs

   ✓ Single Inline Memory Module (32-bits)

✓ DIMMs

   ✓ Dual Inline Memory Module (64-bits)

Actual DIMM's

RAM capacities

- System memory (DRAM)

  <div style="background:blue;color:white">4-128 GB</div>

- Cache memory (SRAM)

  <div style="background:green;color:white">2-64 MB</div>

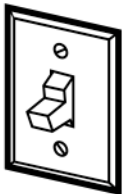What is **MB** (**M**ega**B**yte), **GB** (**G**iga**B**yte) … ?
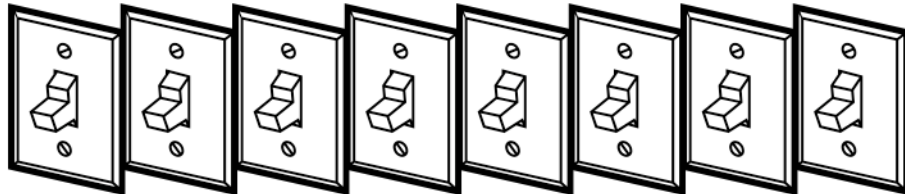
What is Byte?

Byte - Bit

1 Byte = 8 Bits

1 Bit   =   0 - 1

bit

byte

Example…

File.txt

```
0123456789
 0123456789
```

- The file is 10 Bytes

- Each Byte is 8-Bits (ASCII)

- Therefore Total Bits: 10 X 8 = 80 Bits

- 1 character in our keyboard = 1 Byte

Units used for computer storage

Kilo, Mega, Giga, Tera [SI units]

➢ 1 K (Kilo)   = 1,000

➢ 1 M (Mega) = 1,000,000

➢ 1 G (Giga)   = 1,000,000,000

➢ 1 T (Tera)   = 1,000,000,000,000

• SI = International System of Units

[KB, MB, GB, TB] … in computer science

- ➢ 1 Kibi (Kilobinary)   = 2^10   = 1,024   Bytes
- ➢ 1 Mebi (Megabinary)   = 2^20   = 1,048,576 Bytes
- ➢ 1 Gibi (Gigabinary)   = 2^30 Bytes
- ➢ 1 Tebi (Terabinary)   = 2^40 Bytes

- bi = binary

For u to know …

1 KB = 1 000 Bytes

1 MB = 1 000 000 Bytes

1 GB = 1 000 000 000 Bytes

Size << Songs- Video

Size	Song Capacity	Video content
1 GB	250	
2 GB	500	4-7 hours
8 GB	2,000	30 hours
30 GB	7, 000	100 hours

- What is the memory size … 1 song ?

1 song ... about 4 MBytes

Size	Song Capacity	Video content
1 GB	250	
2 GB	500	4-7 hours
8 GB	2,000	30 hours
30 GB	7, 000	100 hours

- 1,000,000,000/250 = 4,000,000 Bytes

- = 4 MBytes