Introduction to Information and Communication Technologies (ICT)

(CSC – 107)

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Demystify Parameters

HP - Spectre x360 2-in-1 13.3" 4K Ultra HD Touch-Screen Laptop - Intel Core i7 - 16GB Memory - 512GB SSD + Optane - Poseidon Blue

Model: 13-AP0053DX **SKU:** 6339276

(277)

Compare Save

$1,162.99

Clearance

Save $387 Reg $1,549.99

Free item with purchase
A $29.99 value

Sold Out

HP - Spectre x360 2-in-1 15.6" 4K Ultra HD Touch-Screen Laptop - Intel Core i7 - 16GB Memory - 512GB SSD + 32GB Optane - Ash Silver

Model: 15-DF1033DX **SKU:** 6364582

(585)

Condition: Open-Box Fair

Store Pickup Only: Unavailable within 250 miles of Chelsea (23rd and 6th) Update Location ›

Compare Save

Open-Box
As low as
$1,122.99

Shop Open-Box

Buy New: Unavailable

Help

HP - Spectre x360 2-in-1 13.3" Laptop - Intel Core i7 - 8GB Memory - 512GB SSD + 32GB Optane - Natural Silver

(267)

Condition: Open-Box Fair

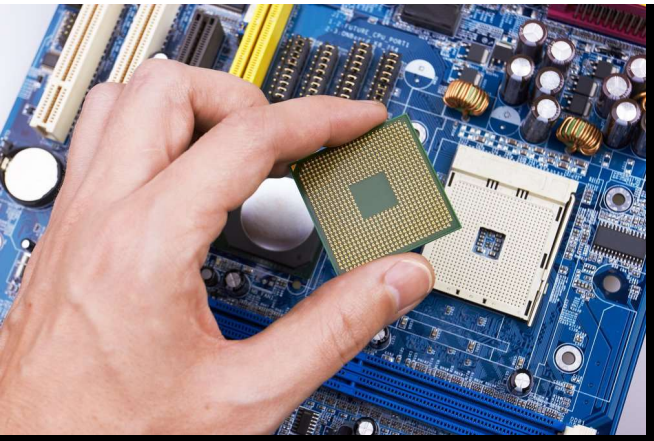
Store Pickup Only: Unavailable within 250 miles of Chelsea (23rd and 6th) Update Location ›

Open-Box
As low as
$912.99

Shop Open-Box

Top

Buy Unavailable



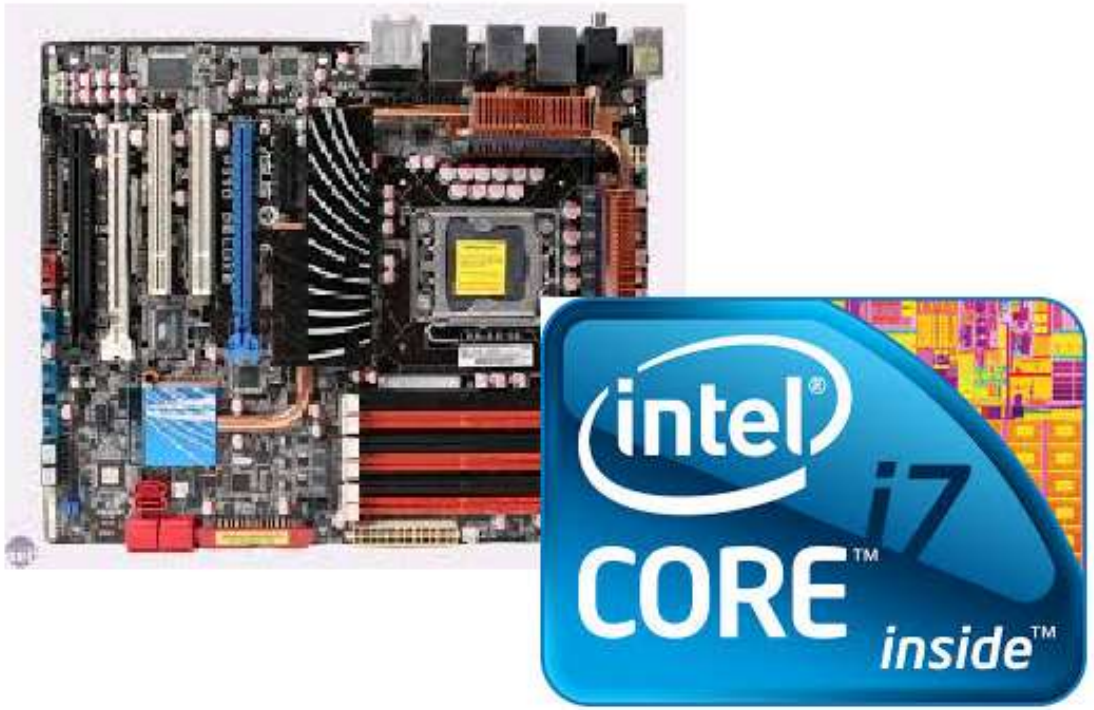
System organization

What's inside?

1. CPU

Central Processing Unit

- We know that the computer doesn't have a real brain inside.
- Yet, a computer acts in many ways as if it does have a real brain, because it can store (memorize) data and derive new information (operations) from the input data.

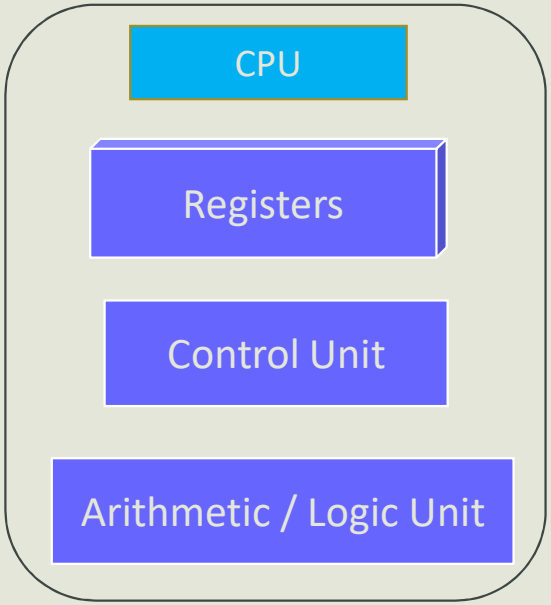


Central Processing Unit

The CPU is a silicon chip that contains millions of tiny electrical components.

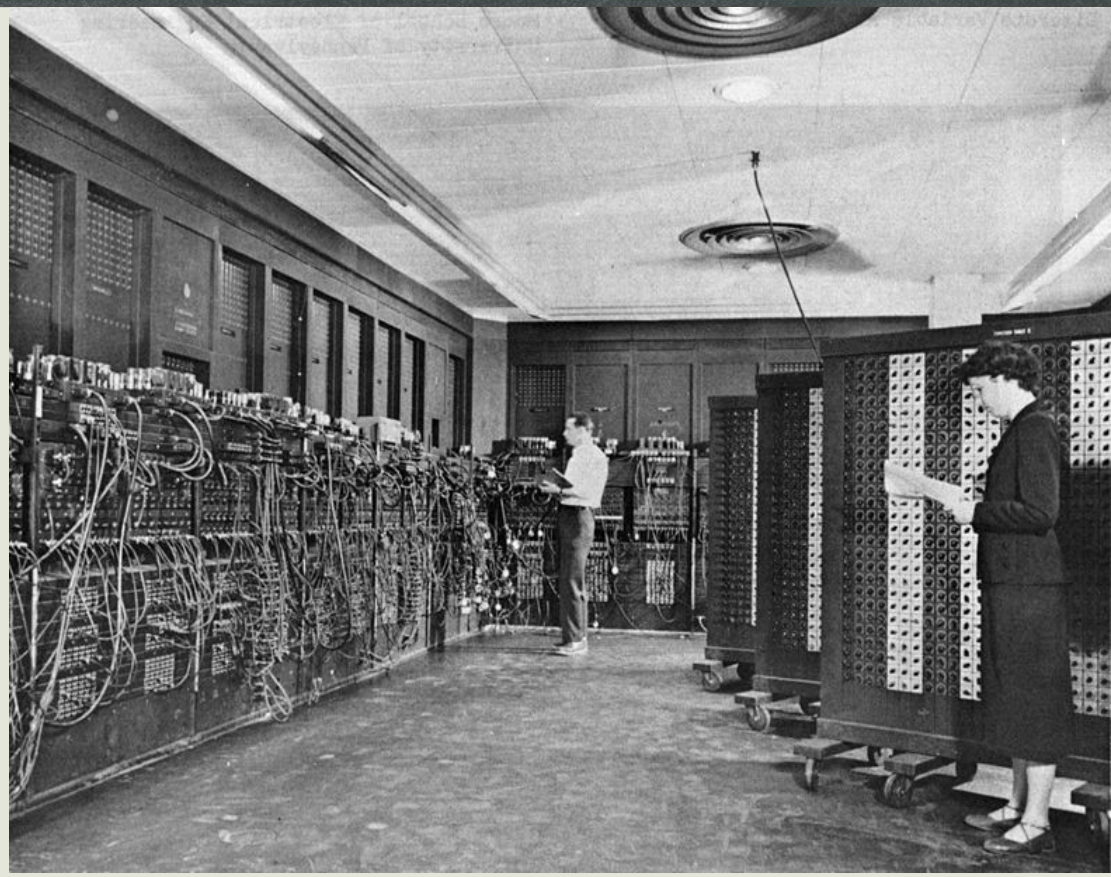
The CPU's three main parts are:

- Registers
- Control Unit
- Arithmetic Logic Unit (ALU)



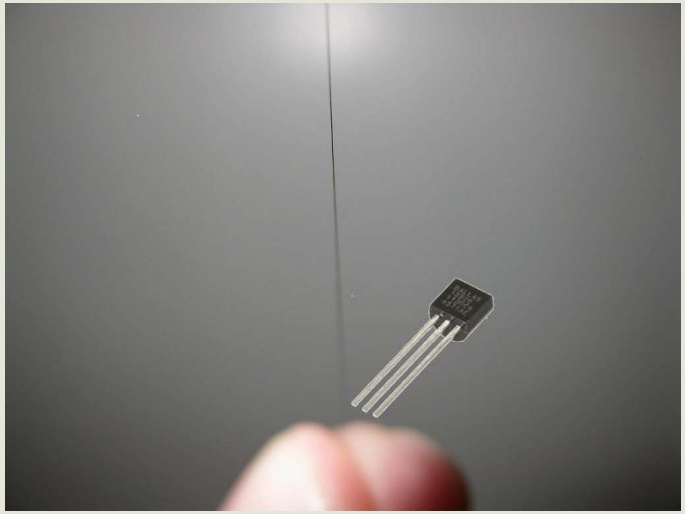
Before transistors …
ENIAC : 1946

- 1943 : Army initiated a research project with J. Presper Eckert and John Mauchly of the University of Pennsylvania to build a completely electronic computing device. The machine, dubbed the ENIAC (*Electronic Numerical Integrator and Calculator*.
- **First fully electronic general-purpose programmable computer**
- It contained over 18,000 **vacuum tubes**, weighed 30 tones and drew 150 kW of power to operate.



Transistors : latest

- Smallest transistor = 4 atoms wide.



1500 transistors can fit on single strand of hair.

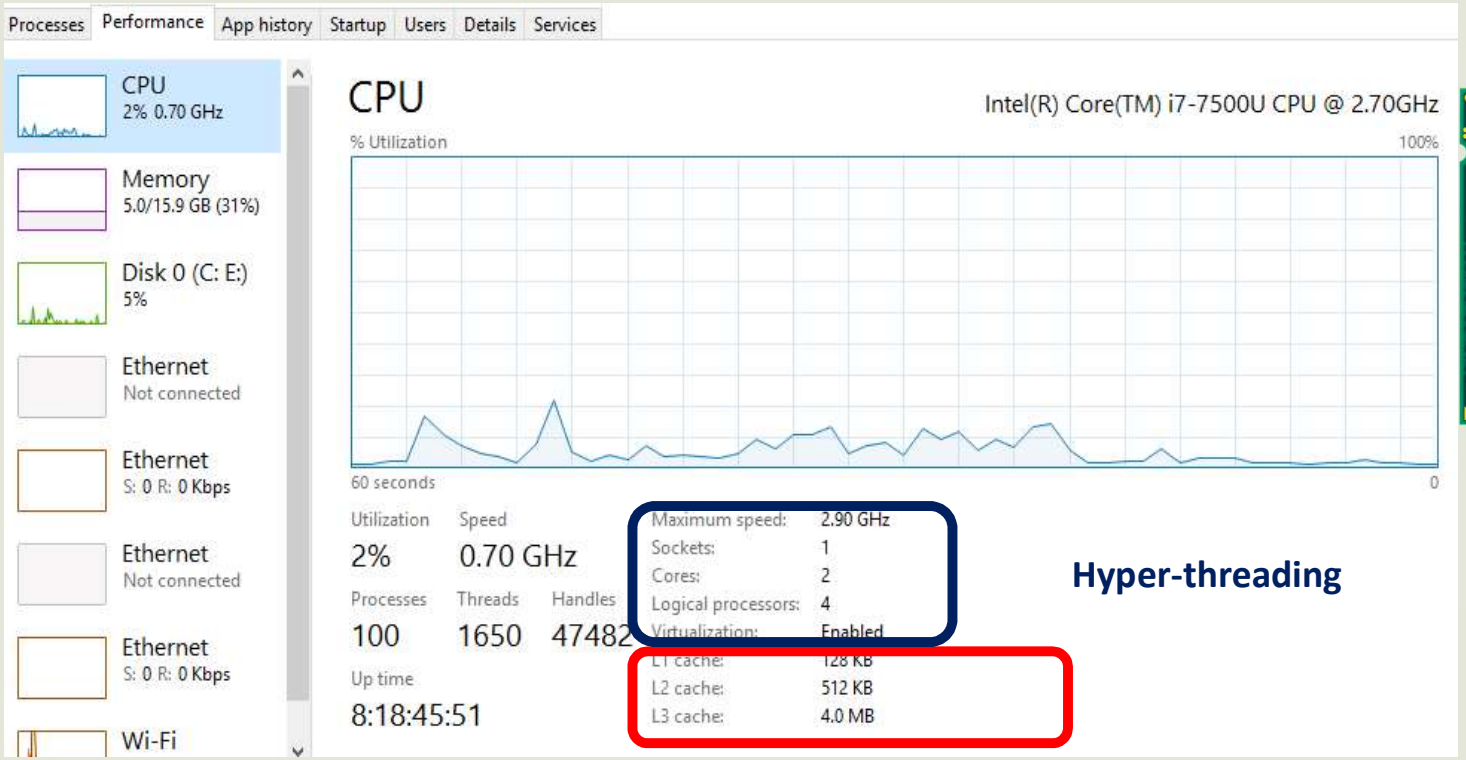
- 18 Billion transistors
- Area: 398 mm^2

Measuring speed

Factor of 1000

- Frequency
  - 1 Hertz = 1 cycle per second
  - 1 KHz = 1000 cycles / second
  - 1 MHz = 1,000,000 cycles per sec (1 Million or 10^6)
  - 1 GHz = 10^9 Cycles / second (1 billion)

Central Processing Unit



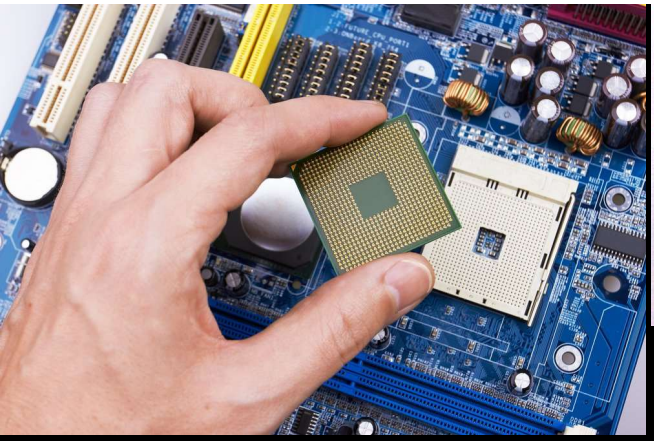
Hyper-threading

Ctrl + Shift + Esc (Windows 10)

Memory Hierarchy: Cache

- Cache memory is high speed semiconductor memory which can speed up CPU.
- It acts as a buffer between the CPU and main memory.
- It is used to hold those parts of data and program which are most frequently used by CPU.
- The parts of data and programs, are transferred from disk to cache memory by operating system, from where CPU can access them.
- It stores the program that can be executed within a short period of time.

Maximum speed:	2.90 GHz
Sockets:	1
Cores:	2
Logical processors:	4
Virtualization:	Enabled
L1 cache:	128 KB
L2 cache:	512 KB
L3 cache:	4.0 MB



System organization

What's inside?

1. CPU
2. Memory Hierarchy (volatile memory)

Memory Hierarchy

There are two basic types of computer memory

- Primary memory / Volatile memory
- Secondary memory / non-volatile memory

Random Access Memory (RAM) is volatile memory.

Memory Hierarchy: RAM

- It is also called as *read write memory* or the *main memory* or the *primary memory*.
- The programs and data that the CPU requires during execution of a program are stored in this memory.
- It is a volatile memory as the data loses when the power is turned off.
- RAM is further classified into two types- *SRAM (Static Random Access Memory)* and *DRAM (Dynamic Random Access Memory)*. ***(Read about them)***

Memory Units

- **Bit** is the smallest unit of memory!
- 8 bits = **1** Byte

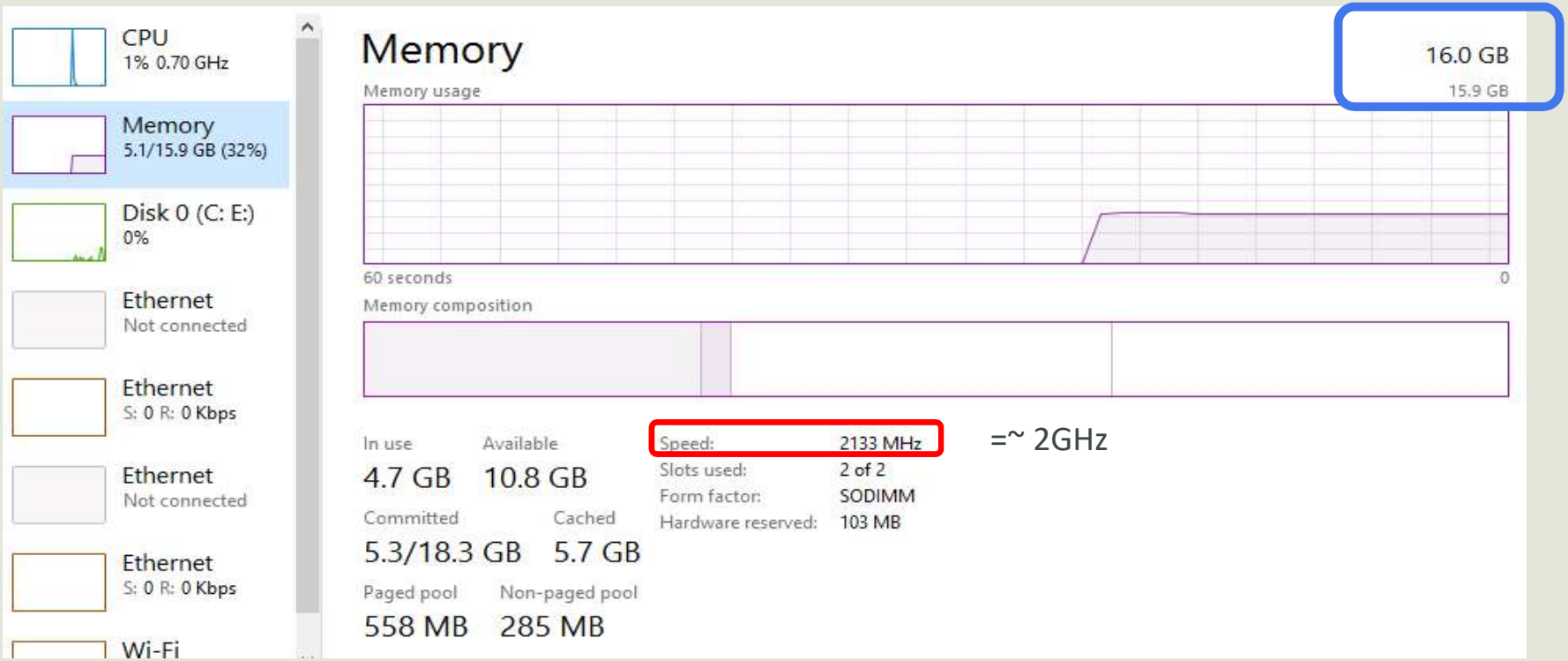
Factor of 1000 or 2^{10}

Unit	*Exact Number of bytes*	*Approximation*
kilobyte	2^{10} Bytes (1024)	10^{3} Bytes (1000)
megabyte	2^{20} Bytes (104,8576)	10^{6} Bytes (100,0000)
gigabyte	2^{30} Bytes	10^{9} Bytes
terabyte	2^{40} Bytes	10^{12} Bytes
petabyte	2^{50} Bytes	10^{15} Bytes
exabyte	2^{60} Bytes	10^{18} Bytes

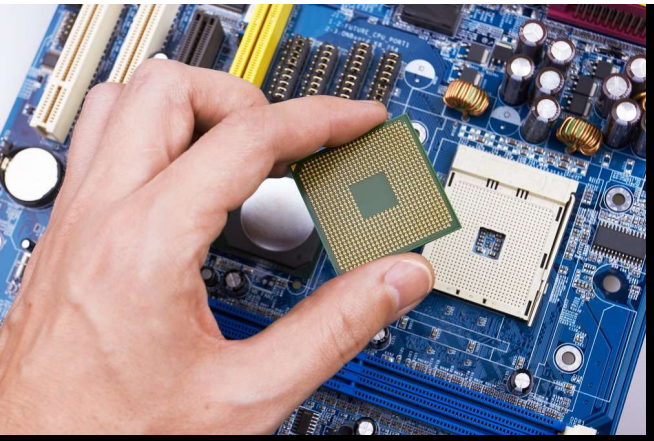
Memory Units

- Bit
- Byte
  - Each character is a Byte. A file of 10 characters would be ___ bits.
  - *Verify using text file!*
- Kilobyte (1000 ..1024)
  - Typical example : word document
- Megabyte (1 Million)
  - Typical example : Music files .. 1 minute / MB , Pictures , Graphics ..
- Gigabyte (1 Billion bytes or 8 Billion bits)
  - Typical example : ??
  - Movies .. 1GB, 2 GB .. onwards
- Terabyte (1 trillion bytes)

Memory Hierarchy



=~ 2GHz



System organization

What's inside?

1. CPU
2. Memory Hierarchy (volatile memory)
3. Memory Hierarchy (non-volatile memory)

Hard disk drive

Hard disk drive

- Rotating Magnetic Media – On a disk called a platter
- Platter rotates several hundred times a second
  - 5400, 7200, 10000, 15000 rpm –
- Platter contains magnetic domains on which data is written

Marketing tactics (playing with units)

Is 2^10 = 10 ^3 ??

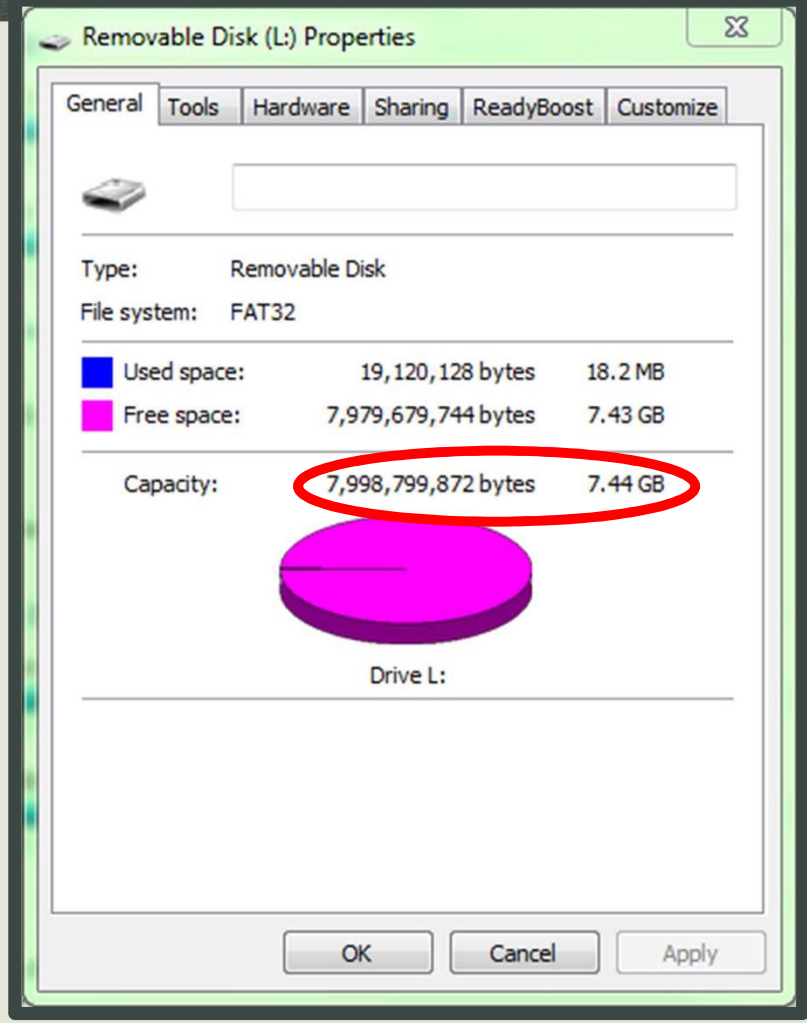
8 GB (Gigabyte)

8 x 1000 x 1000 x 1000 = 8,000,000,000 Bytes

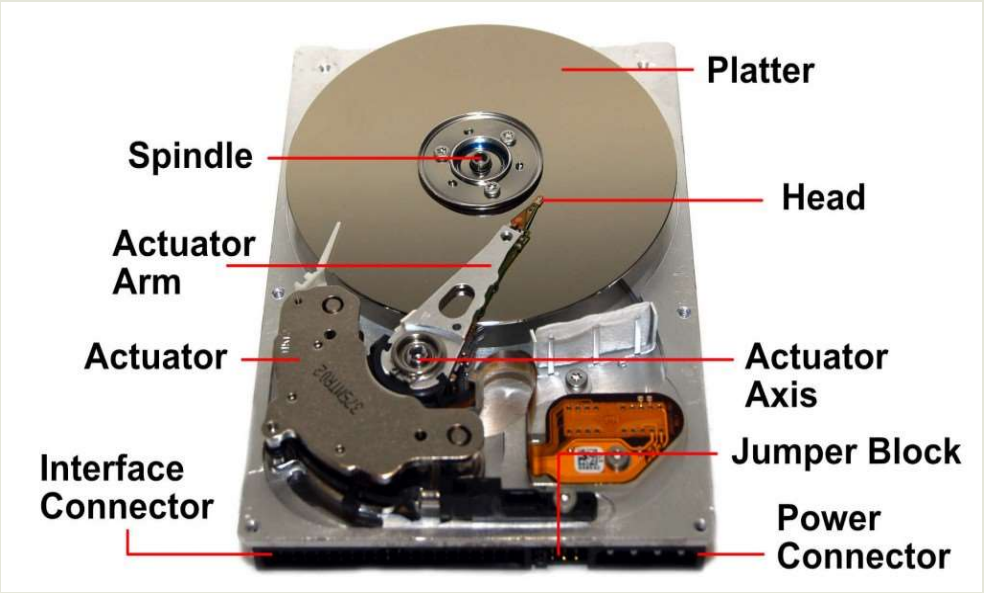
Kilo Mega Giga

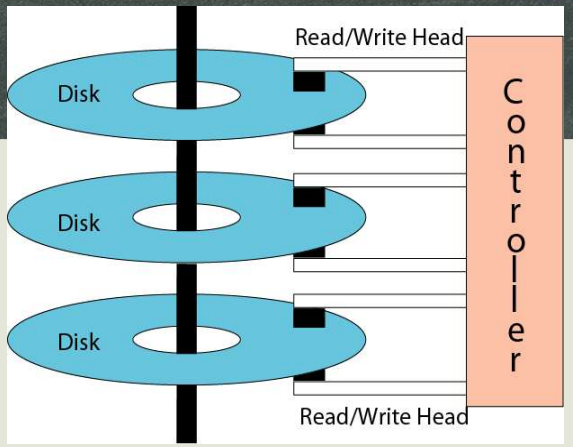
8000000000 ÷ 1024 ÷ 1024 ÷ 1024 =

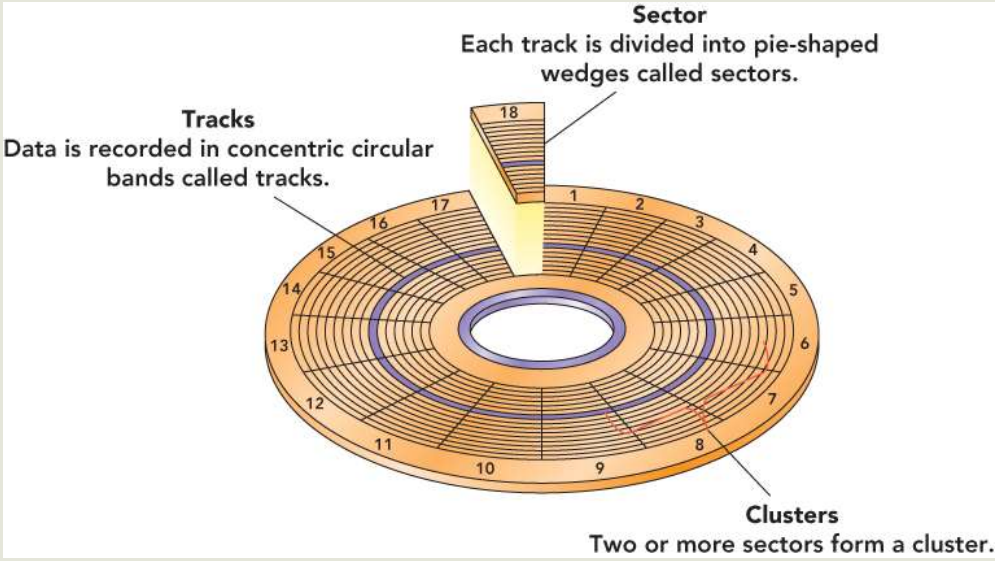
7.450580596923828125



Physical layout of a magnetic disk







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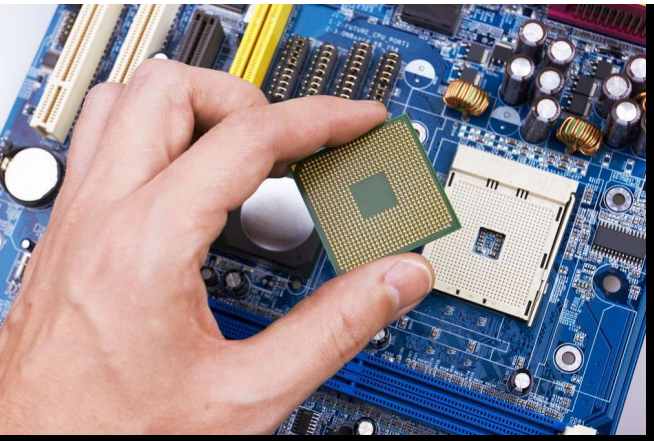

System organization

What's inside?

1. CPU
2. Memory Hierarchy (volatile memory)
3. Memory Hierarchy (non-volatile memory) / SSD

Solid State Disk - SSD