Welcome to Section 3

Computer Hardware

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Types of Computers

- Personal Computers (PC)
  - In 1981, IBM introduced its first personal computer, termed as the IBM PC
  - It is mostly for personal or individual use
  - It is best for internet surfing, running small applications and playing games
  - You can run Windows, Linux or MAC as an OS.

- Desktop

- Laptops

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Types of Computers

- Workstation
  - A workstation is simply a desktop computer that has a more powerful processor, additional memory, high-end graphics adapters and enhanced capabilities for performing high end tasks
  - Typically, big companies buy these workstations for their employees.

- Notebook
  - They are pretty much same as laptop
  - Notebooks are generally manufactured to be sleeker, smaller computers with screen sizes of 15-inches or less. Typically weighing less than 5 lbs. and measuring less than 3 inches thick
  - Notebooks keep their supreme lightweight portability advantage over laptops.

Personal digital assistant

- Mobile, Handheld or PDA computers
  - A hand-held computer is a portable computer that is small enough to be held in one's hand
  - Examples of handheld computers are smart phones, tablets, ipads etc.
  - These computers are mostly used for very small applications.

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Types of Computers

- Server
  - In computer world there is a client and a server. Client sends a request whereas Server serves that request (e.g. webserver, database server etc.)
  - Servers usually have powerful processors, lots of memory and large hard drives
  - Typically, a server is racked horizontally on a computer shelf at a datacenter
  - Some of the big manufacturers of servers are HP, Dell, Cisco, IBM etc.

- Mainframe
  - In the early days of computing, mainframes were huge computers that could fill an entire room or even a whole floor
  - As the computing power increased in computers the mainframe became more like a server.

- Supercomputer
  - This type of computer usually costs hundreds of thousands or even millions of dollars. Although some supercomputers are single computer systems, most are composed of multiple high-performance computers working in parallel as a single system

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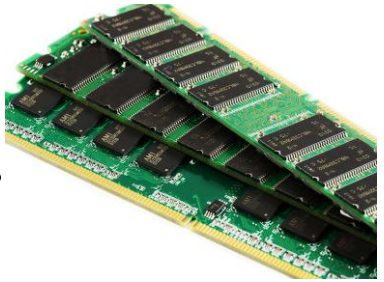
RAM (Memory)



- RAM stands for Radom Access Memory
- The data stored in RAM can be accessed almost instantly regardless of where in memory it is stored, therefore it is very fast. That is why it has the word random in it
- RAM allows your computer to perform many of its everyday tasks, such as loading applications, browsing the internet, editing a spreadsheet, or playing game. Memory also allows you to switch quickly among these tasks, remembering where you are in one task when you switch to another task. As a rule, the more memory you have, the better
- RAM gives applications a place to store and access data on a short-term basis, meaning when a computer shutdown, everything in RAM is flushed. Hard disk is a long-term memory
- If your system has too little RAM, it can be slow and sluggish
- RAM size comes in multiple of 2s (e.g. 2, 4, 8, 16, 32G and so on)

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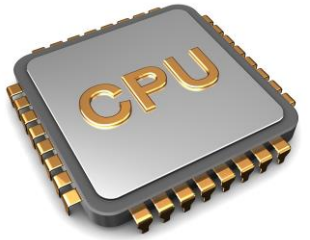
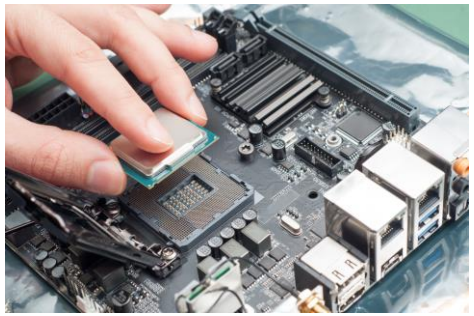
CPU



- CPU stands for Central Processing Unit
- It is a chip that sits on motherboard
- It is the brain of the computer which processes the instructions that come from programs, the operating system, or other components in your PC

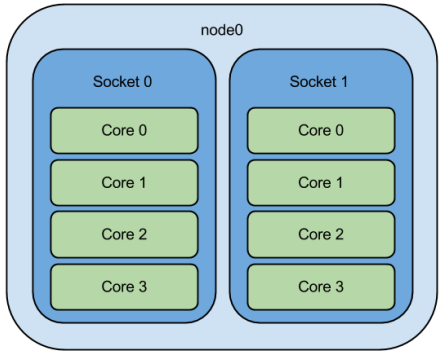


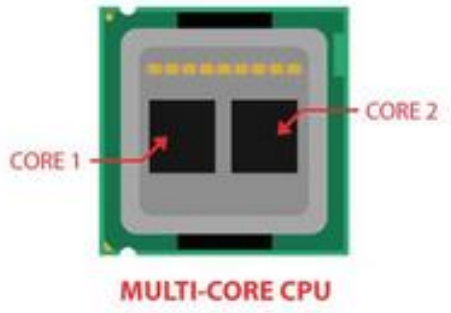
Socket:

- It is the actual socket on the motherboard where CPU resides

Core:

- A multiple CPU which sits on one single socket





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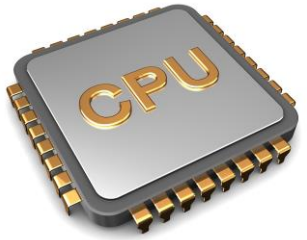
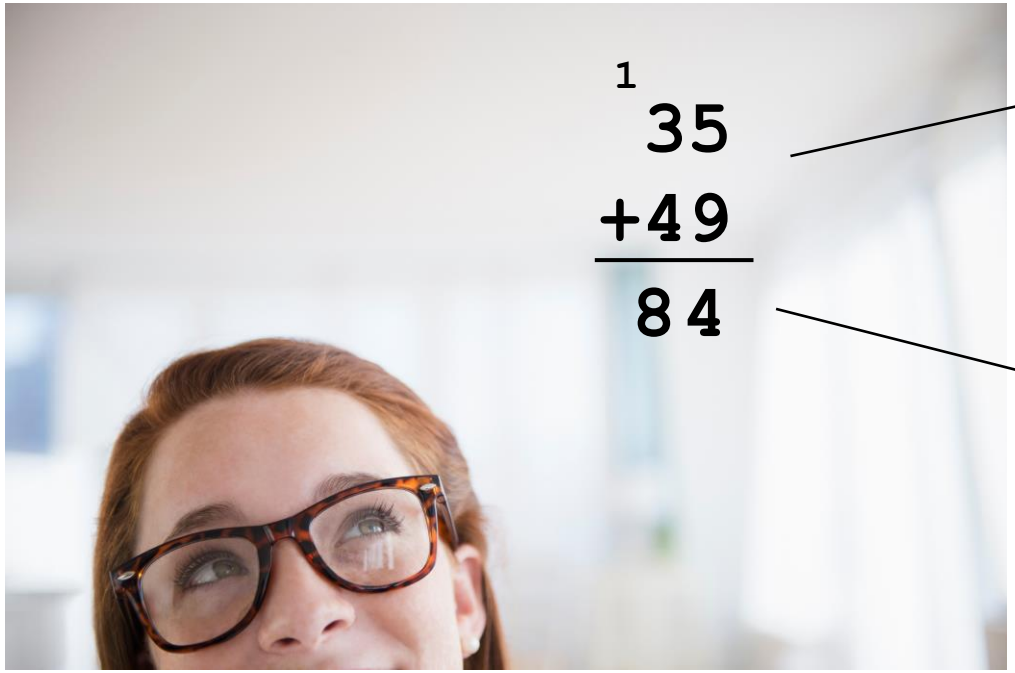
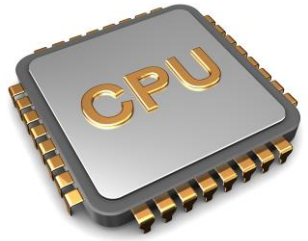
CPU

- 2+2 = 4
- 35+49 = 84





$$\begin{array}{r} {\scriptstyle 1} \\ 35 \\ +49 \\ \hline 84 \end{array}$$



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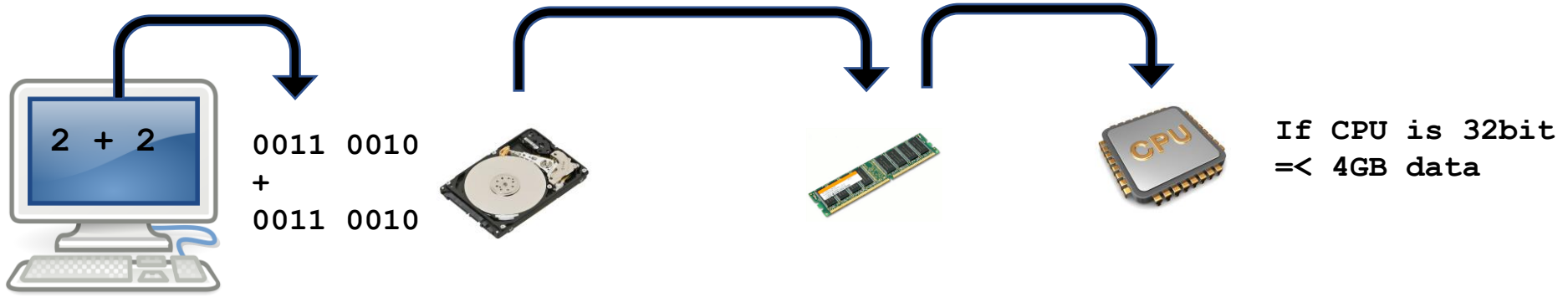
32 vs 64bit Processor

- Processor is same as CPU which processes the instructions that come from programs, the operating system, or other components in your PC
- CPU gets the unit of data from RAM to process it. If your computer is 32bit processor then it can only process 2 power of 32 (2^{32})memory addresses (i.e 4G of RAM)
- In computers there is only binary: 0 and 1. Each one is considered a "bit." That means for 1-bit computing, you get two possible values; 2-bit means four values; then at 3 bits you double that to eight

8 bits = 1 byte

1024 bytes = 1 KB
1024 KB = 1 MB
1024 MB = 1 GB
1024 GB = 1 TB



If CPU is 32bit =< 4GB data

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32 vs 64bit Processor

Power of 2 Expo-nent	Binary Bit Weight in Decimal
2^0	1
2^1	2
2^2	4
2^3	8
2^4	16
2^5	32
2^6	64
2^7	128

History:

- The Intel 8080 chip in the 1970s supported 8-bit computing
- In 1992, Windows 3.1 was the first 16-bit desktop version of Windows.
- AMD shipped the first 64-bit desktop chip in 2003.
- Apple made Mac OS X Snow Leopard entirely 64-bit in 2009
- The first smartphone with a 64-bit chip was the iPhone 5s in 2014

- Keep going exponentially and you eventually get 32-bit (2 to the 32nd power) worth 4,294,967,296 (4.3 billion)
- 64-bit (2 to the 64th power) is worth 18,446,744,073,709,551,616 (18.4 quintillion and change)

$$4{,}294{,}967{,}296 \,/\, 1024 = 4{,}194{,}304 \text{ KB}$$

$$4{,}194{,}304 \,/\, 1024 = 4096 \text{ MB}$$

$$4096 \,/\, 1024 = 4 \text{ GB}$$

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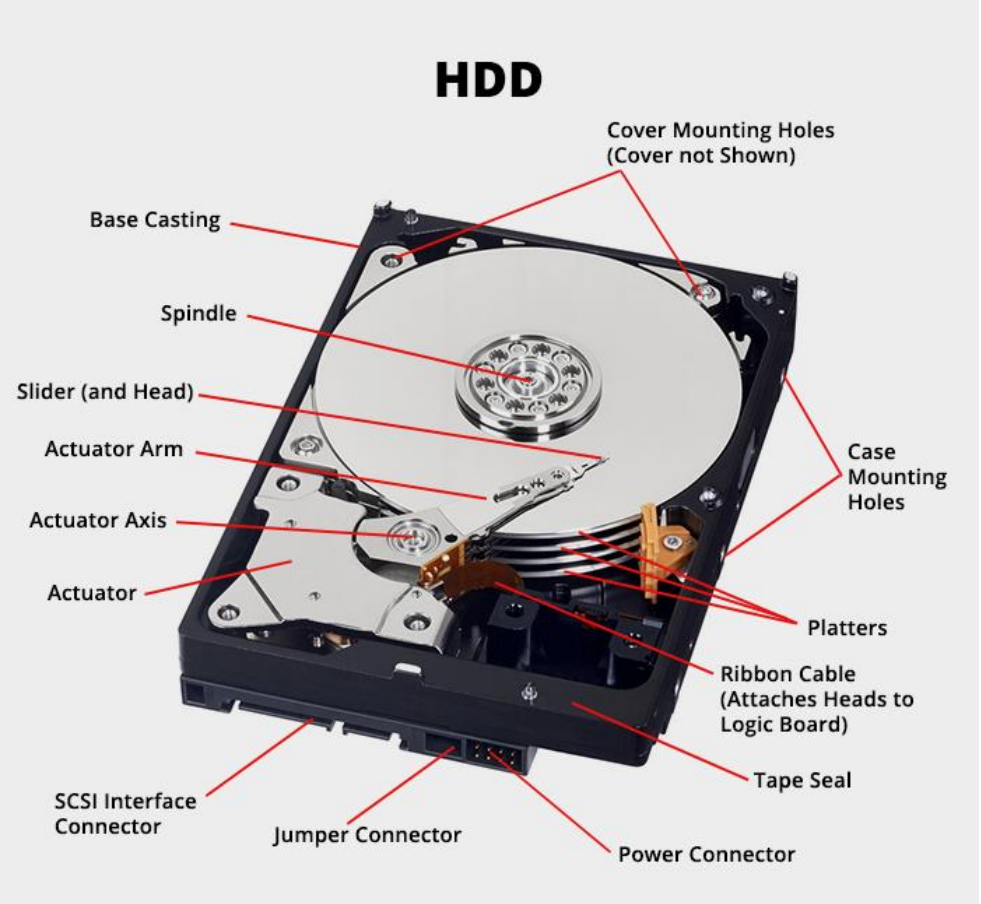
Hard Disk Drive

- A hard disk drive (HDD) is an electromechanical data storage device that uses magnetic storage to store and retrieve digital information using one or more rigid rapidly rotating disks (platters) coated with magnetic material. *(Wikipedia)*

- A hard drive is the hardware component that stores all your digital content, such as documents, pictures, music, videos, programs, applications and operating system

- Hard drives can be external or internal

- It is a long-term memory as opposed to RAM.



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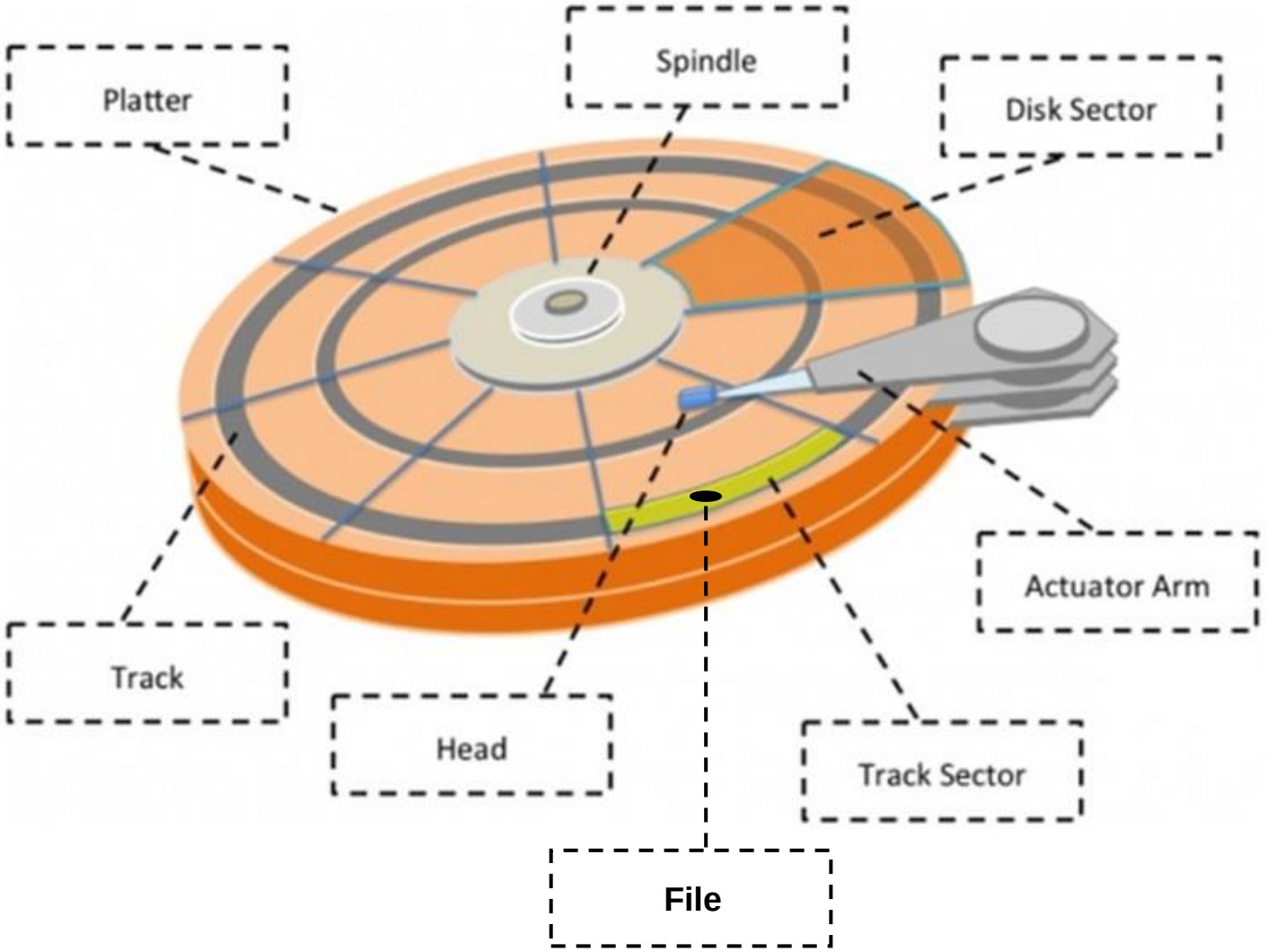
Hard Disk Drive



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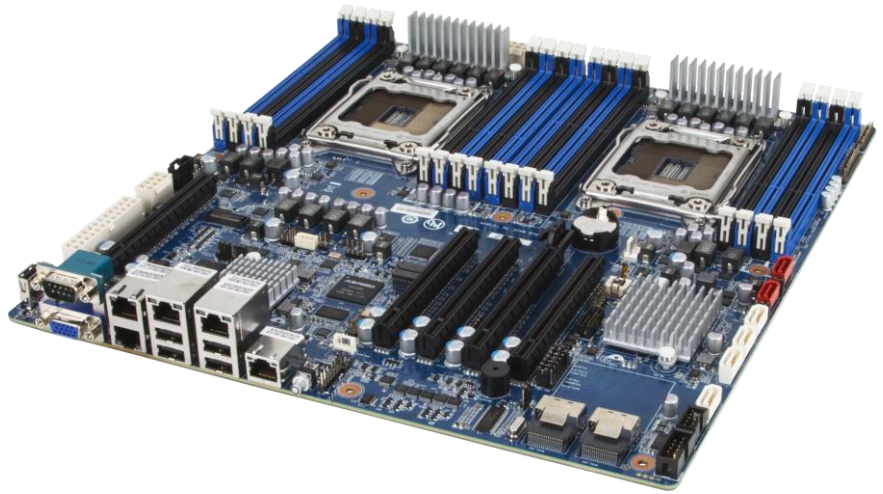
Motherboard

- The motherboard is the backbone that ties the computer's components together at one spot and allows them to talk to each other. It is the main circuit board inside a computer
- It connects the CPU, RAM, HDD, optical drive, video card, sound card and many other internal components
- The motherboard is also responsible to distribute power to the various components of the computer
- It is also referred as main board, system board, logic board etc.



Popular Manufacturers

Following are the popular manufacturers of the motherboard.

- Intel
- ASUS
- Aopen
- ABIT
- Biostar
- Gigabyte
- MSI

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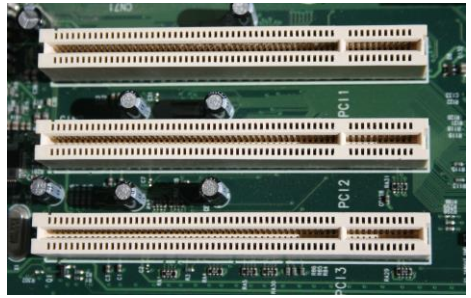
Other Internal Parts of a Computer

- Fans

- Video cards

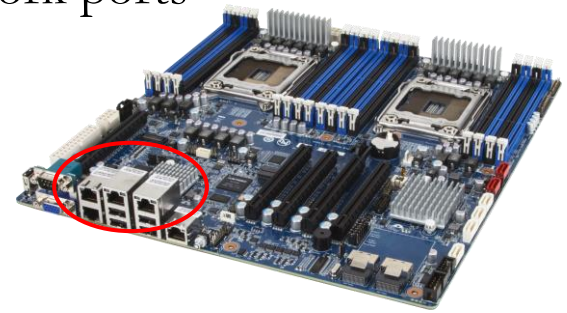
- Power Supply

- PCI expansion slots



- CDROM drive

- Network cards or built-in network ports



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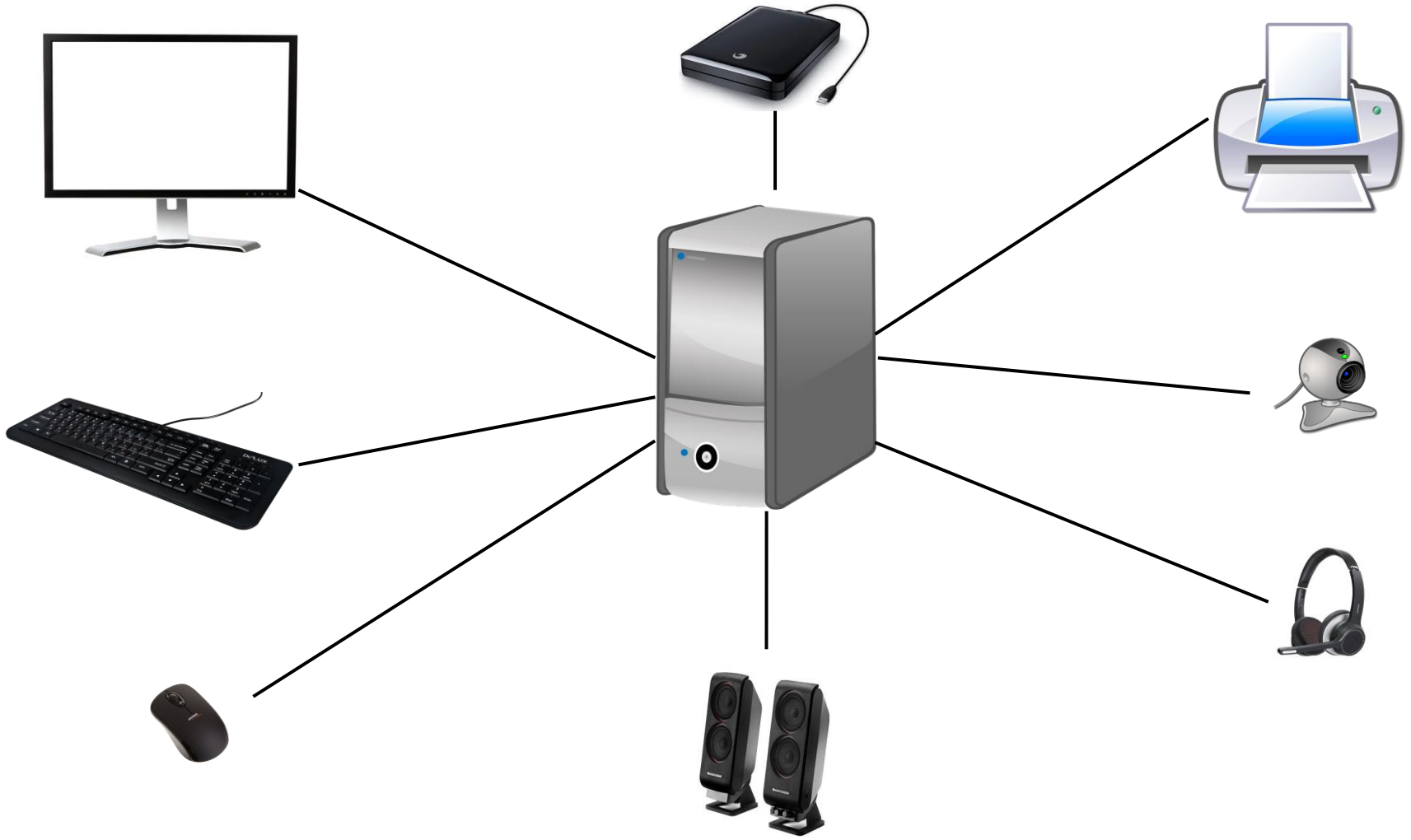
External Components of a Computer



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Hardware Vendors

- **Dell/EMC**
  - Dell is an American multinational computer technology company that develops, sells, repairs, and supports computers and related products and services
  - Founded by Michael Dell in 1984.
- **HP**
  - An American multinational information technology company headquartered in Palo Alto, California, that developed and provided a wide variety of hardware components
  - It merged with Compaq in 2002
  - Founded by David Packard, Bill Hewlett in 1939.
- **IBM**
  - International Business Machines Corporation is an American multinational technology company headquartered in Armonk, New York, with operations in over 170 countries
  - Founded by Charles Ranlett Flint in 1911.
- **Cisco**
  - Cisco Systems, Inc. is an American multinational technology company headquartered in San Jose, California, in the center of Silicon Valley. Cisco develops, manufactures and sells networking and compute hardware, software, telecommunications equipment and other high-technology services and products
  - Founded by Sandy Lerner and Leonard Bosack in 1984.

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Hardware Vendors

- **Oracle**
  - Oracle Corporation is an American multinational computer technology corporation headquartered in Austin, Texas
  - Oracle acquired Sun microsystems in 2009
  - Founded by Larry Ellison, Bob Miner and Ed Oates in 1977.
- **Lenovo**
  - Lenovo Group Limited, often shortened to Lenovo, is a Chinese multinational technology company. Incorporated in Hong Kong
  - Founded by Liu Chuanzhi in 1984.
- **Hitachi**
  - Hitachi, Ltd. is a Japanese multinational company headquartered in Chiyoda, Tokyo, Japan
  - Founded by Namihei Odaira in 1910.
- **Intel**
  - Intel Corporation is an American multinational corporation and technology company headquartered in Santa Clara, California
  - Founded by Gordon Moore and Robert Noyce in 1968
  - Not only they hold the biggest share in CPU market, but they have started manufacturing high-end servers.

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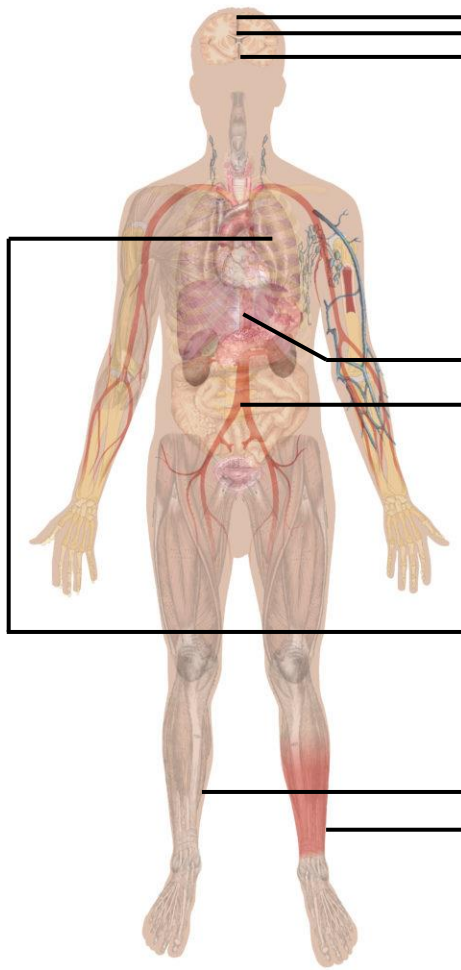
Computer Comparison with Human Body



Long-term memory/HDD

Short-term memory/RAM

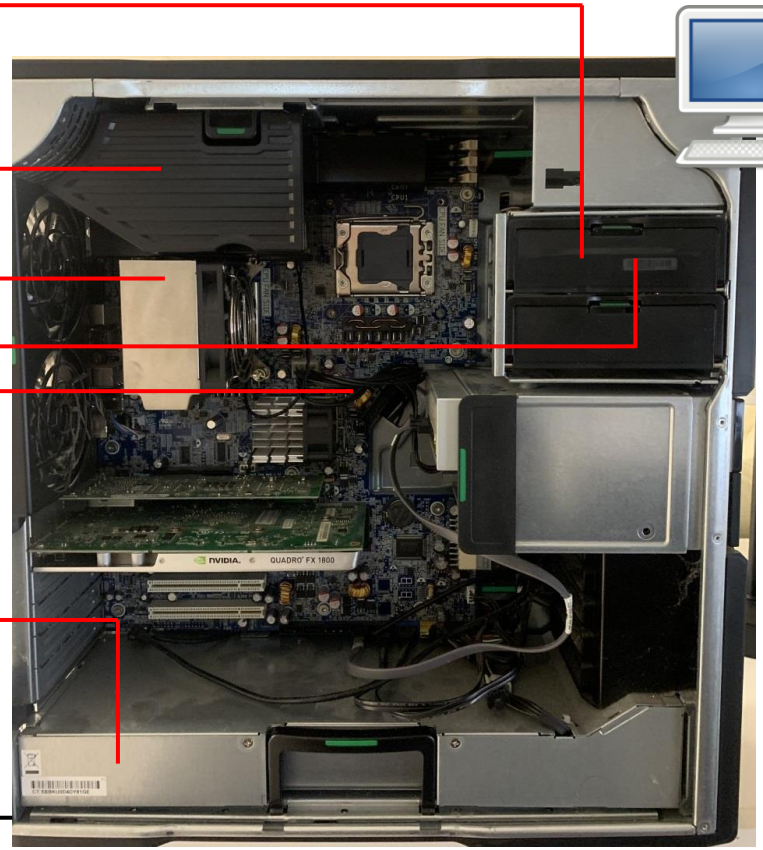
Brain/CPU

Soul/Operating System

Backbone/motherboard

Heart/Power

Body/Chassis



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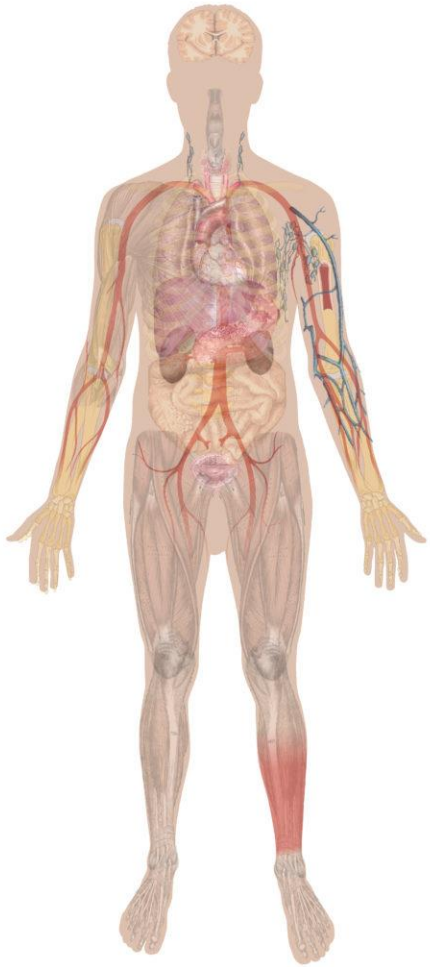

5 Senses

- Sight = eyes
- Sound = ears
- Touch = Body
- Smell = nose
- Taste = tongue

- Artificial intelligence
- Virtual reality

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