# Introduction to Computer Systems

The word *hardware* is used for _____ _____such as _____, DVD players and _____. The word _____ is used for the information used with such devices: _____, music, _____, web pages, computer _____, and _____.

Components of a Computer System

For typical desktop computers, the _____, _____, _____, power supply, and _____ are housed in a _____. Many of the components are connected to the main circuit board of the computer, called the _____. The *power supply* _____. Various _____ devices (such as the keyboard) and _____ devices (such as the monitor) are attached through connectors at the rear of the case.

Hardware Components
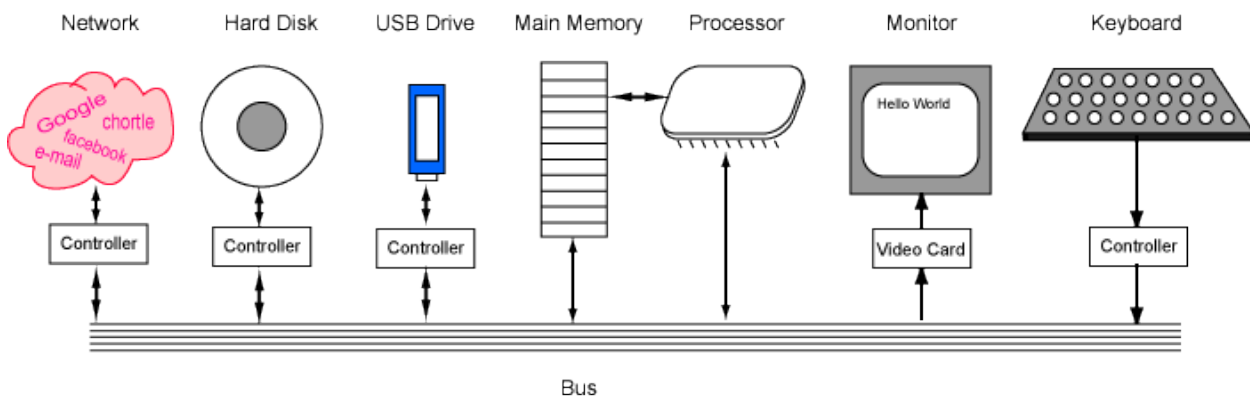
Main Components of a Computer System

The terms *input* and *output* say if data flows into or out of the computer. The picture shows the major hardware components of a computer system. The arrows show the direction of data flow.

A _____ is a group of _____ on the main _____ of the computer. It is a _____ for data flowing between components. Most devices are connected to the bus through a _____ which coordinates the activities of the device with the bus.

The _____ is an electronic device about a one inch square, covered in plastic. Inside the square is an even smaller square of silicon containing _____ of tiny _____ parts. A processor may contain 100 million _____. It does the fundamental computing within the system, and directly or indirectly controls all the other components. The processor is sometimes called the _____ or **CPU**. A particular computer will have a particular type of processor, such as a _____ chip or a _____ chip.

Memory

The processor performs all the fundamental _____ of the computer system. Other components contribute to the computation by doing such things as _____ data or _____ data into and out of the processor. But the processor is where the fundamental action takes place.

A processor chip has relatively little _____. It has only enough memory to hold a few instructions of a program and the data they process. Complete programs and data sets are held in memory _____ to the processor. This memory is of two fundamental types: _____, and _____ memory.

Main memory is sometimes called _____ because it _____ its information when _____ is removed. Secondary memory is usually _____because it retains its information when _____ is removed. (However, it needs power when information is stored into memory or retrieved from it.)

- **Main memory:**
  - closely connected to the _____.
  - stored data are quickly and easily changed.
  - holds the _____ and data that the processor is actively working with.
  - interacts with the processor _____ of times per _____.
  - needs _____electric power to keep its information.

- **Secondary memory:**
  - connected to main memory through the _____ and a _____.
  - stored data are easily changed, but changes are _____ compared to main memory.
  - used for _____ storage of programs and data.
  - before data and programs can be used, they must be _____ from secondary memory into main memory.
  - does _____ need electric power to keep its information.

Main Memory

Main memory is where programs and data are kept when the processor is actively using them. When programs and data become _____, they are copied from secondary memory into main memory where the processor can interact with them. A copy remains in _____ memory.

Main memory is intimately connected to the processor, so moving instructions and data into and out of the processor is _____ _____. Main memory is sometimes called **RAM.** RAM stands for _____ _____ _____. "Random" means that the _____ cells can be _____ in any _____.

When people say that a computer has "512 megabytes of RAM" they are talking about how _____ its main memory is. One _____ of memory is enough to hold approximately _____ (10—) characters of a word processing document. Nothing _____ is kept in main memory. Sometimes data are placed in main memory for just a few seconds, only as long as they are needed.

Secondary Memory

Secondary memory is where programs and data are kept on a _____ basis. Common secondary storage devices are the _____ disk and _____ disks.

- The hard disk has _____ storage capacity compared to main memory.
- The hard disk is usually contained _____ the case of a computer.
- The hard disk is used for long-term storage of programs and data.
- Data and programs on the hard disk are _____ into files.
- A _____ is a section of the disk that has a name.

A hard disk might have a storage capacity of 500 _____ (room for about 500 x 10— characters). This is about 100 times the capacity of main memory. A hard disk is _____ compared to main memory. If the disk were the only type of memory the computer system would slow down to a crawl. The reason for having two types of storage is this difference in _____ and capacity_____.

Large blocks of data are copied from disk into main memory. The operation is slow, but lots of data is copied. Then the processor can quickly read and write small sections of that data in main memory. When it is done, a large block of data is written to disk.

Often, while the processor is computing with one block of data in main memory, the next block of data from disk is read into another section of main memory and made ready for the processor. One of the jobs of an _____ system is to manage main storage and disks this way.

Primary memory	Secondary memory
_____ _____ Low capacity Works directly with the processor	_____ Cheap _____ _____ connected directly to the processor

Input and Output Devices

Input and output devices allow the computer system to _____ with the outside world by _____ data _____ and _____ *of* the system. An _____ *device* is used to bring data into the system.

Some input devices are:

- _____
- _____
- _____
- Bar code reader
- _____ tablet

An *output device* is used to send data out of the system. Some output devices are:

- _____
- Printer
- _____

A network interface acts as both input and output. Data flows from the network into the computer, and out of the computer into the network.

I/O

Input/output devices are usually called I/O devices. They are directly _____ to an electronic module attached to the motherboard called a **device** _____. For example, the speakers of a multimedia computer system are directly connected to a device called an audio _____, which in turn is plugged into a bus on the motherboard.

Embedded Systems

A computer system that is part of a larger machine and which controls how that machine operates is an **embedded system**. Usually the processor constantly runs a single control program which is permanently kept in ROM (_____).

The overwhelming majority of processor chips are used in embedded systems. Only _____% of processor chips are used in the familiar _____ computer!

A typical embedded system is a _____. This is obvious, but there are many less obvious embedded systems. Your _____ contains dozens of processors, and even more in the _____ system. For instance, each _____ is controlled by its own computer chip.

Software

Computer software consists of both *programs* and *data*. Programs consist of _____ for the processor. Data can be any _____ that a program needs: character data, _____ data, image data, _____ data, and countless other types.