



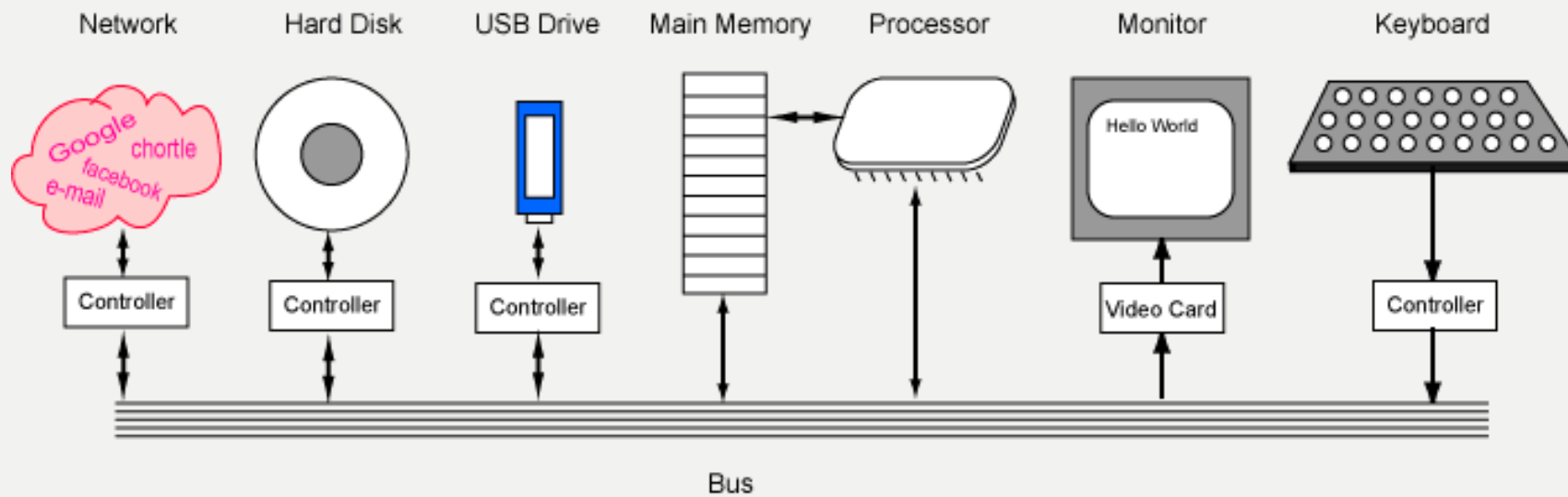
Hardware & Software



Hardware components

- Processor
- Main memory
- Secondary memory
- Input devices
- Output devices

Hardware components



Main Components of a Computer System

Memory

- The processor performs all the fundamental computation of the computer system. Other components contribute to the computation by doing such things as **storing data or moving data into and out** of the processor.
- A processor chip has **relatively little memory**. 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 external to the processor. This memory is of two fundamental types: main memory, and secondary memory.
- Main memory is sometimes called **volatile** because it loses its information when power is removed.
- Secondary memory is usually **non-volatile** because it retains its information when power is removed.

Memory

- **Main memory:**
 - closely connected to the processor.
 - stored data are quickly and easily changed.
 - holds the programs and data that the processor is actively working with.
 - interacts with the processor millions of times per second.
 - needs constant electric power to keep its information.
- **Secondary memory:**
 - connected to main memory through the bus and a controller.
 - stored data are easily changed, but changes are slow compared to main memory.
 - used for long-term storage of programs and data.
 - before data and programs can be used, they must be copied from secondary memory into main memory.
 - does not 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 active, they are copied from secondary memory into main memory where the processor can interact with them. A copy remains in secondary memory.
- Main memory is intimately connected to the processor, so moving instructions and data into and out of the processor is very fast.
- Main memory is sometimes called **RAM**. RAM stands for **Random Access Memory**. "Random" means that the memory cells can be accessed in any order. However, properly speaking, "RAM" means the type of silicon chip used to implement main memory.
- Nothing permanent is kept in main memory. Sometimes data are placed in main memory for just a few seconds, only as long as they are needed by the processor

Secondary Memory

- Secondary memory is where programs and data are kept on a long-term basis.
 - The hard disk has enormous storage capacity compared to main memory.
 - The hard disk is used for long-term storage of programs and data.
 - Data and programs on the hard disk are organized into files.
 - A **file** is a collection of data on the disk that has a name.
- Large blocks of data are copied from disk into main memory. This operation is slow, but lots of data is copied. Then, while a program is running, 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 back 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 operating system is to manage main storage and disks this way.

