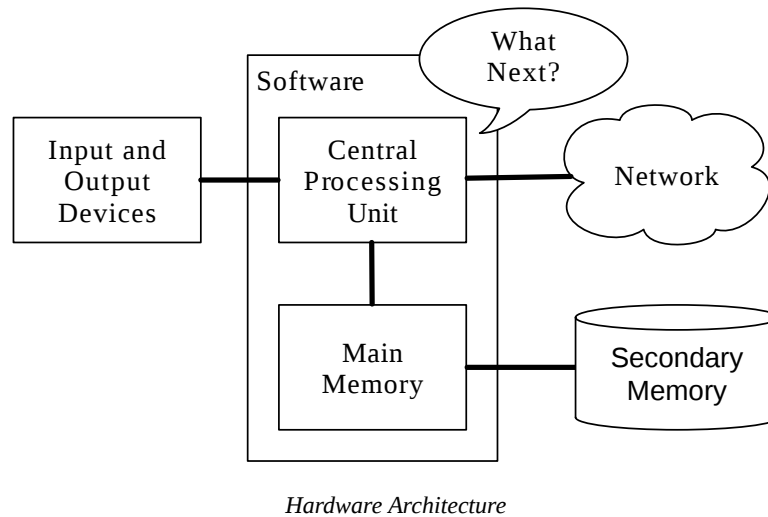


## 1.3: COMPUTER HARDWARE ARCHITECTURE



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Before we start learning the language we speak to give instructions to computers to develop software, we need to learn a small amount about how computers are built. If you were to take apart your computer or cell phone and look deep inside, you would find the following parts:

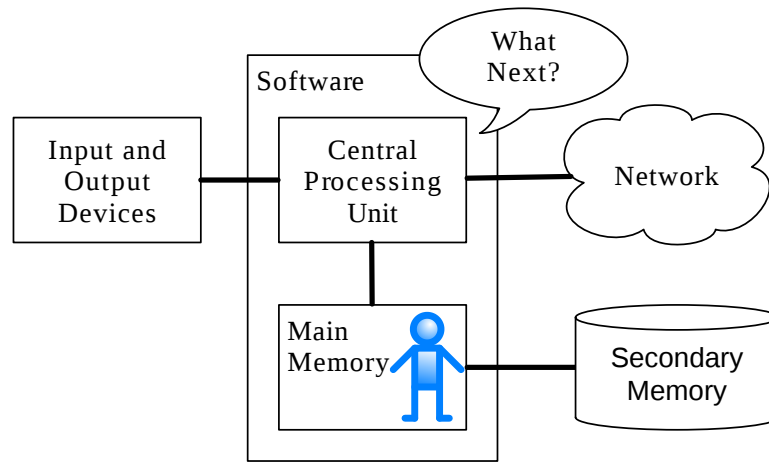


The high-level definitions of these parts are as follows:

- The *Central Processing Unit* (or CPU) is the part of the computer that is built to be obsessed with "what is next?" If your computer is rated at 3.0 Gigahertz, it means that the CPU will ask "What next?" three billion times per second. You are going to have to learn how to talk fast to keep up with the CPU.
- The *Main Memory* is used to store information that the CPU needs in a hurry. The main memory is nearly as fast as the CPU. But the information stored in the main memory vanishes when the computer is turned off.
- The *Secondary Memory* is also used to store information, but it is much slower than the main memory. The advantage of the secondary memory is that it can store information even when there is no power to the computer. Examples of secondary memory are disk drives or flash memory (typically found in USB sticks and portable music players).
- The *Input and Output Devices* are simply our screen, keyboard, mouse, microphone, speaker, touchpad, etc. They are all of the ways we interact with the computer.
- These days, most computers also have a *Network Connection* to retrieve information over a network. We can think of the network as a very slow place to store and retrieve data that might not always be "up". So in a sense, the network is a slower and at times unreliable form of *Secondary Memory*.

While most of the detail of how these components work is best left to computer builders, it helps to have some terminology so we can talk about these different parts as we write our programs.

As a programmer, your job is to use and orchestrate each of these resources to solve the problem that you need to solve and analyze the data you get from the solution. As a programmer you will mostly be "talking" to the CPU and telling it what to do next. Sometimes you will tell the CPU to use the main memory, secondary memory, network, or the input/output devices.



*Where Are You?*

You need to be the person who answers the CPU's "What next?" question. But it would be very uncomfortable to shrink you down to 5mm tall and insert you into the computer just so you could issue a command three billion times per second. So instead, you must write down your instructions in advance. We call these stored instructions a *program* and the act of writing these instructions down and getting the instructions to be correct *programming*.