Computer Hardware & Software Lesson Part 1

Hello everyone, [Arrash Jaffarzadeh](#) here. Today we're going to take a look at some computer hardware and how a computer system works. It's important for us to have a basic understanding of the inner workings of this tool that we use so much in our day-to-day lives. The inside of this computer system might not be as scary as you might think. One fun way I like to look at a computer system is to compare it to something that we use every morning: like a toaster. It might not look like they have any similarity at first glance, but in fact they do. Usually the way we use a toaster is, we'll take a piece of bread, put it inside the toaster, press the button, wait a certain amount of time. The toaster will do something to it, and out pops a fresh piece of toast. Computers not that dissimilar: you give the computer some input, it does something to it, and returns a modified product. So, for example if I give the computer 2+2 it returns 4 to me, just like I give the toaster bread, and it returns toast to me.

Let's take a look at some specifics. Your computer system is divided up into input and output devices. Input devices are things that send information into your computer, and output devices are things where information is coming out from your computer . So, for example a keyboard sends input into the computer: therefore it's an input device. I'll type my keys, and it sends the signal inside the computer, giving it some directions.

A mouse is also another example of an input device. We're sending information into the computer system. A monitor is an example of an output device. This is because the computer system is sending information out to the monitor for us to see. A webcam would be an example of an input device. It takes pictures of us and sends it into the computer. Speakers are examples of output devices: the reason is because the signal is coming out, creating sounds from the computer.

We have a few other ones down here, like this microphone. The microphone would be an input device: we're sending information into the computer. This tiny little printer would be an example of an output device: that's because of computer sending information out to it, so that we can create some cool prints. The last one I'll talk about is this thing: this is a scanner and we usually can put a document in here, have it scan it as an image into our computer system. This would be an input device because it sends the image information into the computer.

So now that we know what's going on, on the outside, let's take a look at what's going on, on the inside. This is actually a computer tower that I have been building with my students, here at the school. It's not too difficult to put together a computer, it's actually a pretty fun project, and it's within all of your capabilities. If you're ever interested in doing that, let me know. But you're actually going to learn the basics right now.

Let's take a look inside. You'll see a lot of things going on, on the inside, this outer shell is known as the case. Its primary function is to keep the insides nice and safe from things that are on the outside. And it also helps keep the system cool. Usually it has vents on the front and back. And in the case of this cover, you'll notice that it has vents on the side as well.

The next thing we'll talk about is something called the power supply. Now the power supply in this system is right down here, it's this black box. I have another example I can show you. Here's another power supply. And basically, what the power supply's function is, to take power from the electrical outlet and spread it out all over your computer system, giving power to all individual parts. Power supplies come in wattages, and that's dependent on how much hardware you have inside your system: how much power do you need? You'll see that there's cables coming out from it. These are what you connect to the different parts on the inside of your computer system to give it power.

This example is a modular power supply, or at least partially modular, and it allows me to connect specifically what I want. I don't want to have million cables running all over the place. So, if I can pick and choose how many I want to plug in, it just makes the inside of your system more organized.

The next thing we'll talk about is the system board, or the motherboard. The motherboard can be found in the very back, and you can see everything is kind of connected on top of it. I have another example for you to see here. This one's a little old, so some of the slots and things like that are outdated, but you can get the general information from it. As I mentioned, it has some slots on it. These slots are expansion slots. It allows me to connect peripherals, video cards, things like that   we're going to cover in a minute. There's some long slots here, there's a big rectangular slot here, we're going to get into all that in a little bit. But the one I want you to take a look at while we're on the topic, is this little chip right over here this chip is called BIOS. Essentially when your computer turns on, it needs to have some information about what's connected to it: what time it is, just things that get it off the ground, get it started. Well, all that information is stored on this little chip called the BIOS.

Now if we take our motherboard and turn it on its side, you'll notice that there are a whole bunch of ports along the side. This is actually what you see on the back of your computer system. It's connected to your motherboard and you can see ports, like an area where you can plug in your speaker's, your USB ports are right here, for your USB devices. This is where you can plug in your Ethernet cable for your internet. This one has an integrated video card, which we're going to talk about that goes right here. Well, everything connects to that motherboard, and the motherboard is allowing things to communicate with each other. That's why the surface looked like a city.

There's a section on there that's rectangular. And it's on this motherboard as well, but it's being covered by this big round thing, which we're going to get to in a second. Behind this round thing, there is a small chip that looks similar to this. This is a CPU. The CPU is like a big brain: all it does all day long is think, think, think. CPU stands for central processing unit. So it's processing information. You give this guy 2 plus 2 and it spits out 4. The CPUs usually come in Hertz, so you'll see, you know 2.5 gigahertz, things like that. There's two main companies that make CPUs: AMD and Intel.

The CPU gets quite hot, and it needs a special way to stay cool. That's where this comes in. This is known as a heat sink. And basically what it does is it helps keep the chip underneath nice and cool. It has a high surface area, so that it can assist in keeping this small device nice and cool.

Now the thing about the CPU is that it has no memory. It's very smart: it can process information very quickly, but it can't remember anything. That's where your storage devices come into

play. Your computer usually comes with something called a hard drive. A hard drive looks something like this. Now this is an older hard drive, and it has some moving parts on it. This type of hard drive is called a static drive. And if we look on the inside, we can see that there is a platter which spins around, there is an arm with a head on the top, and later on we're going to talk about how this stores information. But for now, we know that all of your computers software, Windows or Mac, the Mac operating system, Microsoft Word, your games, everything that you have for your computer system is in here. And this is your computer's long-term storage. There are other types of hard drives as well, and they're becoming more and more common. This is a hard disk drive, but there's also something known as a solid-state drive. a solid state drive, like the name suggests, has no moving parts. The advantage of thate is that it's much faster, and you won't have to have something moving to go pick up the information for you.

Now in addition to your computer's long term memory, like the hard drive, your computer also needs some short-term memory. That's where RAM comes into play. RAM stands for random access memory. We can see it in the example here. It's these two long blue chips right next to the heat sink. We can take a closer look at them right here. These are really old examples of RAM, but the concept still remains the same. Let's take a closer look at how this works. Let's talk a little bit about the relationship between your computer's hard drive and the RAM. We're here at the school's library. To help us figure that out, imagine the bookshelves as a symbolic representation of your computer's hard drive. And imagine this desk as the representation of your computer's RAM. At any time, I can grab a book from the bookshelf. Let's take a look at the Very Hungry Caterpillar. I can put it on my desk and read from the book. While I'm using the book, it's going to be on my desk. And when I'm done with it, I can go ahead and put it away.

The bigger my desk is, the more things I can do at one time. So I can have my book here. I can maybe open up a second book to compare things. I can have a notebook on my desk, so I can take notes while I'm working. I can have some folders here with some other information. So the more space I have, the more I can do at one time. The smaller my desk is, the less I can do at one time. Well your RAM works in a very similar way: the more storage capacity your RAM has, the more things you can do at one time, or multitask. So that means you can have your windows available for you, and your Microsoft Office available for you, and maybe play a game in the background, whatever. But you can have a lot of things happening at one time without your computer slowing down.

Let's get back to our lesson in the class. Well, now that we have some of the basics down, let's talk about the monitor. The computer has to have a way to show us the information on our computer screen. For that you need a video card. The video card is right here. I have an old example of one here, that you can take a closer look at. This video card basically has an output here where it can send the signal out to your monitor. There are different connections that we'll cover later on. Sometimes you can also find integrated video cards. What that means is, the video card is actually part of the motherboard, and it's included. I don't have an example here, but you also have other cards: like the sound card. The sound card is responsible for all the sounds you hear on your speakers. Usually, the microphone would connect to that. Generally, your motherboard will have the sound card, again integrated on it.

Another type of card that you'll find is a network card. The network card allows us to connect your computer to the web. Again, that is usually included with the motherboard as well, but some motherboards require you to have your own network card.

The last thing we'll talk about is the drive right up here. This is a CD/ DVD / Blu-Ray drive. And on the inside, it looks like this: like this rectangular piece of equipment. And it's designed to play your optical discs.

Now one thing you might be wondering is if I'm using a laptop, how the world do they fit all these things inside that smaller device? Well, the truth is, a laptop has all the same stuff. The only thing is that a laptop is more compact. So your hard drive is smaller. The pieces are fit together more tightly and more efficiently. So that's the only difference, but the inside of your laptop has the same stuff.

Now your optical discs, your hard drive, all those things require something called software and that's the next part of our lesson.