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| **COMP.5201 Information Technology Operations** | **Semester 2, 2017** |

**Portfolio 1**

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| **Week 01** | **Session 1 - Monday (2 hr)** | **Date - 10/07/2017** |
| **Task & Activity**  The first half of today was spent on going over the course outline, this portfolio assignment, and the regulations relating to the course. We went over the learning outcomes of the course  In the second half we were introduced to several resources useful for self-study relating computer hardware.  onion diagram | | |
| **Reflections** | | |
| **Problems & Difficulties** | | |
| **Trouble shooting** | | |

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| **Week 01** | **Session 2 - Thursday (1 hr)** | **Date – 13/07/2017** |
| **Task & Activity**  Discussed portfolio assignment  Reviewed previous class  Bits, bytes and ascii  Difference between char and int types  IP adresses  measurement PC  Kibibyte etc  Next slide show  Components  System unit  Motherboard - ram slot, cpu slot, adapter card slots  Buses  Look at different sizes of case - slim, tower, server rack mounted (2 psu)  For ATX, case must be ATX, mobo must…, PSU must be…  Arithmetic, Logical operatons (AND, OR, NOT)  LGA1366 - 1366 refers to number of contacts  Land Grid Array - pins in socket  Heatsink and Fans  Thermal paste  Liquid cooling | | |
| **Reflections** | | |
| **Problems & Difficulties** | | |
| **Trouble shooting** | | |

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| **Week 01** | **Session 3 - Friday (2 hr)** | **Date – 14/07/2017** |
| **Task & Activity**  At the start of this class, we went briefly over this portfolio assessment, emphasis being placed on putting sufficient detail into it. Stefan showed us his version which reminds him what we covered and encouraged us to expand fully upon that. After that, we were reminded of what we covered in the previous class. For details on what was covered, you can see the previous entry above.  **Central Processing Units**  We started the lesson looking at CPUs, first of all at the cores of the CPU.  Most computers nowadays have multicore processors, each core is essentially its own CPU (but on the same chip) functioning in unison with all the others which lets each core execute separate instructions at the same time as each other, which means that programs that can take advantage of the multiple cores can run significantly faster. The number of cores is usually stated with a prefix e.g. dual-core, quad-core and so on up to deca-core and beyond.  Next we covered the different kinds of CPUs made by Intel, the largest producer of CPUs. Different kinds of computers need different kinds of CPUs. Intel Core is the most well known, often found in desktop computers but also in servers and mobile computers (like phones or tablets). Mobile devices also commonly have an Atom processor, which is based on a different architecture called ARM (more about this below). There are various kinds of Intel CPUs specifically for servers, the Xeon, Xeon Phi and Itanium to name a few. The other type of computers that Intel design processors for are embedded systems, these are computers with a specific function found inside of a larger device. Examples of this usage are the computer in your car, in traffic lights, calculators and even microwaves. Intel’s line of processors for emedded systems is called Quark.  Within each line of CPUs, Intel divides them into generations, based on when they came out. The second generation of Core CPUs was first released in the fourth quarter of 2011, the seventh generation in the first quarter of 2017. With each new generation comes new technology, a notable example being the size of the transistors, also called the lithography. The second generation of Core i7 CPUs had transistors of 32 nanometres, the fourth generation 22nm, and the seventh a tiny 14nm. You can tell what generation of Core series CPU you have by looking at the first number after the i5, i7 etc. So a Core i5-6700 is sixth generation, i7-2960 is second generation.  Moore’s Law comes from Gordon Moore, co-founder of Intel, and says that the number of transistors in an integrated circuit like a CPU doubles roughly every two years. He first said this in 1965 and his observation has remained true to this day. See this illustration:    **Data Buses**  Next we learned about buses, which carry information in the form of bits as electrical signals between the processor and other components of the computer. Buses take the form of copper tracks on the motherboard. Each track carries one bit of data at a time but buses can be made up of multiple tracks, often with mutiple layers going down into the motherboard, called parallel buses. The size of a bus is known as the width and the bus width decides how much data can be transferred at any one time, a 32 bit bus can transfer 32 bits (or 4 bytes).  There are two types of buses, internal and external. Internal buses connect the internal components like the RAM, the CPU and motherboard. External (or expansion) buses connect external devices like USB or expansion cards like a graphics card to the computer.  The graphic below is a generic diagram of a bus that shows the three components of the system bus that connects the CPU, RAM and input/output:    The data bus is for the bits that make up the data that needs to be transferred. Those bits could be part of, for example: a program, the operating system, a file (a picture, song etc).  The address bus contains the address for where in memory the data in the bus needs to be read from or written to.  The control bus transmits control signals that tell the system what is actually happening to the data. The most common control signals are read and write but there are others.  Chipset  Northbridge - closest to CPU, sometimes now inside CPU  Closer to the CPU is faster on Northbridge  More complicated with 2 or more CPUs but we will stick to one CPU socket  CPU cache memory - different levels - Stefan drew diagram. Back side Bus communicates between them and cores  Inte put northbridge functinaity inside CPU on core i series - few differences  Inside CPU  Look up how works  Floating point numbers often dealt with with FPU or dedicated maths co-processor  32bit vs 64 bit  Machine cycle  data (eg. report.doc) and program (MSWord etc.) loaded from HDD to RAM then to Operating System control before machine cycle  CPU Architecture  80/20 rule -- 20% used 80% of time, 80% 20% of time  RISC uses this conept to have fewer and simpler instructions but complex instructions can take longer  ARM uses RISC (mobile devices)  Intel uses CISC (but sometimes both)  Slide 36  **Workshop Safety**  After the slides, we talked about workshop safety for our practical exercises. We won’t be working in a typical workshop but it should be treated like one. This means no food or drink except for sipper bottles of water to avoid damaging anything.  The most important point is to take care in whatever we’re doing. Think about and pay attention to what you’re doing before you do it and don’t be in a rush to do things.  Always wear appropriate footwear ie covered shoes in case of falling objects. Stefan told us an anecdote of dropping soap on his foot and not worrying too much about it, then doing yardwork with the foot exposed and getting an infection. Even small things can end up hurting a lot.  **Fire Safety**  We covered what to do in the event of a fire, the major points being:   * Do not run in the event of a fire, you could trip over and be caught in the fire. * Do not use elevators, use the stairs * If you are the first to notice the fire, pull the fire alarm located on the stairs * Head down the stairs to the ground level, out the front door and to the left, assembly point is outside the Toyota dealership * Do not try and take all your stuff with you, stuff can be replaced, life cannot * There is a carbonic fire extinguisher in the room, ideal for electrical fires   **Electrical Safety**  Next we covered electrical safety:   * If somebody is getting shocked, there is a red button by the door that cuts all electricity * The residual current device (RCD) should prevent us getting shocked, if there is a a mismatch in the current coming out of the powerpoint and going back in, such as if a human became part of the circuit and electricity flowed through them into the ground, the powerpoint should shut off. We shouldn’t take this for granted though and be careful around electricity * Powerpoints in New Zealand put out 240 volts of alternating current (AC) electricity, PSUs put out +/-12V, +-5V, and 3.3V of direct current (DC). The PSU has to change the electricity from the powerpoint into the above voltages of DC and the components inside it can get up 1000-2000V. We will never have to take the cover off a power supply in this course and never should.   **Electrostatic Discharge Protection**  We then learned about electrostatic discharge protection. Static electricity can be up to a few thousand volts, 30V can be enough to damage components inside a computer. Components like the CPU and RAM can be easily damaged and wrecked by static electricty and we have to be very careful.  In a normal workshop you have electrostatic mats on the desk and floor to dissipate static, or failing that a mat on the floor with a wristband and an alligator clip to put on the case to put you and the components at the same voltage since it is the difference in voltage that causes damage (picture birds on a powerline). We do not have these things and instead will be using anti-static straps that slip onto our wrists and attach to the case without the mat. We need to make sure the clip is attached to an unpainted part of the case or scratch the paint off of where we want to clip it.  Something else that can help is to plug the computer into a powerpoint that is turned off so in the case of static discharge, the current has somewhere to go. We will not be doing that in this course.  In a snap, without an anti-static strap, you can simply touch the PSU or the case to equalise the voltage.  **Tools**  For the practical exercises, we will be using:   * Screwdrivers, mostly phillips head size 2. There are extra long ones available so we can avoid angling the screwdriver to reach screws, reducing the risk of crossthreading the screws. * Anti-static strap, as explained in the electrostatic discharge protection section above * Anti-static bags to put components in or on to stop them getting static discharge off the table * Small containers to keep track of screws   We will be working on the Dell Optiplex 745s marked A for task A and the 755s for task B. For task A the computers do not need to boot after, for task B they do. The documentation for the computers is found in the I drive on the class computers. | | |
| **Reflections**  I learned a lot in this class I didn’t previously know. A lot of the CPU stuff was familiar but I did not know much about buses and chipsets beforehand. I did a bit of reading on Wikipedia to better understand the components, but I feel I’ll need to do a little more reading to fully understand how it fits together. I do not mind though as the way computers are put together is fascinating.  I’m particularly interested in the CPU architecture and how we get from transistors to something that essentially thinks. Stefan said there used to be a class on computer architecture offered here but now it is only offered in Rotorua. I have previously done a bit of research on it in my own time but I will do more to better understand it when I am not so busy with coursework.  The safety stuff was pretty standard but before I didn’t know where the fire alarm was or where the assembly point was. I also didn’t know the function of the big red button by the door. So I’m glad we went over that stuff. | | |
| **Problems & Difficulties**  There wasn’t much difficulty. The only thing is the amount of information we covered in the class, I’ll need to go over the material a few more times to make sure it gets into my long term memory but that’s to be expected. | | |
| **Trouble shooting**  No practical component so no troubleshooting. | | |

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| **Week 02** | **Session 1 - Monday (2 hr)** | **Date - DD/MM/YYYY** |
| **Task & Activity**  First thing today, Stefan instructed us to install adobe acrobat reader for viewing the PDF manuals of the Optiplex 755 and 745. The internal links on the documentation now function correctly.  Next, we took a brief look at the manual for the 755, briefly going over the information it contains before taking a quick look at the table of how to interpret the diagnostic LEDs. The lights flash in different patterns to let the user/technician know what problems the computer is having.  The rest of the lesson was a practical exercise, where we disassembled then reassembled the Optiplex 745s.  First we watched Stefan disassemble one, and then we did it ourselves. While Stefan showed us, he pointed out several components that I wouldn’t have recognised myself, like the CMOS chip and the PCIe ports. The steps for both were the same so I will go over them once:  The tools used were:   * Anti-static Bracelet, to be clipped onto the case * Long phillips head screwdriver with magnetic tip (this helps to avoid angling the screwdriver and possibly bending the components or cross-threading the screws) * A container to hold screws * Two anti-static bags to put components on after taking them out   The steps we took disassembling were:   1. Pull the latch on top of the case back to remove the side cover, then place the side cover out of the way where there is no risk of falling 2. Lay the computer on the side that still has a cover 3. Put on the anti-static bracelet and clip it to a non-painted metal part of the case 4. Remove the cables from the motherboad, including:  * A cable between the speaker and the motherboard * A cable between the heat sink and the motherboard * A series of cables in a “ribbon” connecting the motherboard to the lights, power button and usb ports on the front of the case. Stefan showed us a motherboard that didn’t have the ribbon so all the cables were separate. It seemed much more tedious to plug in. * Several cables connecting the power supply to the motherboard  1. Unscrew the four black screws on the rear of the case holding the power supply unit (PSU) to the case and then lifted a lever below the PSU and slid the PSU out 2. Unscrewed the screws holding the heat sink down, then leant the heatsink over to remove it from the bracket it sits on. 3. Unscrewed the bracket the heat sink sits on and removed it 4. Unscrewed the screws that hold the motherboard down, then removed the motherboard by sliding it forward so the ports that stick out the rear of the case were free then lifting it by the edges and placing it on an anti-static bag 5. Removed the RAM by pushing back the clips that hold it in place and lifting it out and placing it on a separate anti-static bag 6. Removed the CPU, this is down by pushing down a lever and sliding it out and then leaning it to the opposite side. Then lifting of the CPU cover and carefully lifting the CPU out and placing it on an anti-static bag   The steps taken reassembling were much the same but in reverse so there’s no point in reiterating them, the differences were:   * Had to be careful with lining up the screw holes, especially with the heat sink and bracket * Had to be careful to get components in the right way. The plugs for cables mostly have extrusions used to get them out that make it easier. Also, the RAM and CPU have notches that can be used to line them up. * Normally we would put thermal paste in between the CPU and the heat sink but we didn’t bother with that today because the computers we are working on do not need to function. | | |
| **Reflections**  This was my first time disassembling and assembling a computer by myself. I built my own desktop computer at home but had a more knowledgeable friend help me with the actual assembly. I was surprised how easy it was, especially with Stefan’s instructions. Upon opening the case, most things were self-explanatory but there’s a few things that would have taken some fiddling without instruction, such as removing the heat sink properly and the lever on the PSU.  There were a few components inside the computer that I had seen before but would not have identified myself, these being the north and south bridges, the CMOS chip and the PCIe ports. I’m sure there are other components I could stand to learn more about to and I plan to read through the Optiplex manuals to brush up on these. Even if it is not needed for the course, I’m fascinated in the actual functioning of computers and how we get from silicon to a something that thinks. | | |
| **Problems & Difficulties**  I found the exercise fairly easy and did not have much issue. I did run into two minor things that slowed me down:   * It took me a second to locate the lever for the PSU and a bit of jiggling to get the PSU out but I realised the PSU is pretty sturdy and I didn’t need to worry about breaking it * When taking the motherboard out, it got stuck on some cable, especially the ribbon cable that connects to the front of the case. This only took a second to fix. | | |
| **Trouble shooting**  The problems I ran into were quite simple and only took a little common sense to solve. I was quickly able to identify the problems and fix them without external help and without really thinking about it. I expect this to change in future exercises | | |

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| **Week XX** | **Session 2 - Thursday (1 hr)** | **Date - DD/MM/YYYY** |
| **Task & Activity** | | |
| **Reflections** | | |
| **Problems & Difficulties** | | |
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| **Week XX** | **Session 3 - Friday (2 hr)** | **Date - DD/MM/YYYY** |
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