Seneca College

Build PC from Scratch:

A detailed guide to build 3 PCs for 3 IT professions in a mid-sized company

Activity #1

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Course: HWD101

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Due date: 2/7/2020

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Introduction

The company that I am working in as a contractor needs a renewal in the computers due to the fact that our computer systems are about 3 years old. We are a mid-sized company that offers Software Services to the clients; The three main departments in the company are Administrators, Developers, and IT managers (IT support). Political matters led us not to be able to order pre-built computers; therefore, we have to build our PCs by ourselves based on the requirements that those sections above have.

Departments' responsibilities and requirements

In order to assemble a powerful and cost-effective PC, we need to be aware of the duties and obligations of the sections we are attempting to build computers for.

- Administrators

Administrators are crucial to effective and efficient day-to-day operations of our company. Those working in this position will usually be responsible for supporting our organisation in a variety of ways including bookkeeping, communications, scheduling, data entry, secretarial services and much more. Computer Administrators, to be specific, are responsible for the upkeep, configuration, and reliable operation of computer systems; especially multi-user computers, such as servers. Aside from identifying and fixing network issues, computer systems administrators must also make updates to all equipment and software so they're current. The role of administrator involves a great deal of multitasking; therefore, this fact gets clear that an administrator needs to operate several software and hardware during their work time. The thing is, much of the work involves oral and written communication, word processing and dealing with email and telephone enquiries; for example, computer system administrators ensure that the Internet connection in the office is working, and that the mail

server is running and processing emails that are sent and received by all staff within the company or organization. All these data given leads to this conclusion that the administrator's computer is going to be the simplest and the least powerful between the other sections, but still enough strong to cover all the needs. The solution could be a RAM with high capacity, a strong power supply, and a powerful CPU cooler, because our administrators are going to have system and network infrastructure which needs to run 24 hours a day, seven days a week.

- Developers

A developer is a programmer first and foremost but with larger scope of responsibility for other aspects of the project. Software developers are like professional chefs, as that programmers are like a reasonably confident cook. Not only can developers cook to a high standard, but they can take a more creative and conceptual approach to what they're making. This means finding out what their target market wants, creating a plan for how to make it, and coming up with a series of instructions that they can give to other cooks. A software developer's job starts by talking to users to analyze their needs. They use this information to create and test, software specifically in the context of solving their user's problems. To make it short, we are going to need a powerful CPU, and maybe even GPU, with strong RAM and a suitable power supply.

- IT Support (Manager)

An IT manager is someone who is responsible for the overall performance of a company's electronic networks and leads the IT department in fulfilling the organization's information systems requirements. The IT Support team maintains the computer networks of all types of

organisations, providing technical support and ensuring the whole company runs smoothly. IT Support monitors and maintains the company computer systems, installs and configures hardware and software, and solves technical problems. The IT support often recruits and trains system administrators, computer programmers, and database administrators. By consulting with upper-management, the IT manager can determine our organization's IT needs and can then lead our staff in a specific and strategic project. Even though most IT managers are able to execute the various jobs of the workers they supervise, they are more likely to be caught in a meeting room than a server room. Saying all these statements, in spite of the fact that IT managers should be aware of the knowledge the other departments have, they do not really need super powerful systems as I mentioned that they are mostly in meeting rooms. On the other hand, their job requires them to install and configure the company's computer hardware operating systems and applications, analyze logs in order to discover any underlying issues or trends, diagnose and solve hardware or software faults, perform electrical safety checks on the company's computer equipment, etc.; therefore, the computer needs to have all the superior specs of developers' and administrators' computers.

Recommendations

*All of my picks are gathered in pcpartpicker.com/ and I shared the link at the end of my recommendations.

The Case & Power Supply

The initial point to start building is to choose the right foundation and proper home for the components to fit in; the case is something that most of us underestimate its importance. There are 3 basic types of cases based on their sizes: the smallest one which is called shoe-

box, the mid-sized one is called desktop, and the last and biggest one is called tower. Based on the board size for the motherboard, cases are divided into three groups: ATX cases (the largest board size), microATX cases, and Mini-ITX (the smallest board size considered). Cases can be bought with a power supply in a package which have more reasonable prices but the quality may decrease a little bit. We are going to buy the case and the power supply separately because our departments and experts need a powerful power supply in order to provide sufficient energy for the computer to run 24 hours a day. For getting more efficiency and to have better cooling, we need to get a larger system unit; we should also consider the fact that bigger cases are heavier and more expensive.

For the **Administrator**, I'm choosing the Cougar MX330-G for the case and EVGA SuperNOVA G3 650W for the power supply. The case is an ATX mid-tower and is only $44 (there is no need for a bigger case because we do not use graphics card for the administrator's case); it has a full tempered glass side panel, a grilled front panel (to help with airflow), PSU shroud, magnetic dust filters, open interior, and looks great. The metal is thick and there are no sharp edges. For this budget price you're sacrificing some of the finer things (no rubber grommets, only one installed fan, no included RGB, etc.), but that's alright for an Administrator. The SuperNOVA 650 G3 achieves an excellent value score thanks to its good price and great performance in almost every discipline. The SuperNOVA 650 G3 features fully modular cabling, just like the generation before. However, it also incorporates a fluid dynamic bearing fan. It is a very strong power supply overall, regarding the fact the administrator needs to work 24 hours a day with the computer.

For the **IT support**, the case is going to be Aerocool Cylon. As it has lots of options and benefits compared to its price; we could order a better and more expensive case, but we need to invest on CPU and graphics card first. It's an excellent mid tower case with an acrylic side window, RGB lighting in the front panel, support for liquid cooling, and has a good selection

of I/O ports. It doesn't have USB-C, but there are plenty of USB-A ports and a headphone and mic jack for good measure. It has a segregated PSU mount for enhanced thermal control, supports all motherboard sizes up to ATX, and has space for some of the largest graphics cards in the world, despite its relatively compact size. For around $50, there are few cases that can match this one at this size. A real diamond in the rough. Our pick for power supply is Bitfenix Formula Gold BF450G. BitFenix's Formula Gold power supplies are aimed at builders without a lot of money to spend, but who still want high quality and efficient operation. Its max. DC output is 550W, which is high-level for an administrator. Other benefits to mention are its full power at 46°C, Quiet operation, Excellent build quality, Compact dimensions.

For the **Developer**, I choose NZXT H510 ATX Mid Tower Case. This case is incredibly simple and easy to build in; costs $60, looks like $600. With a USB 3.1 Gen2-compatible USB-C connector on the front panel, it's easier than ever to connect smartphones, high-speed external storage, or the latest peripherals to our PC. The clean, modern design, iconic cable management bar, and uninterrupted tempered-glass side panel showcase the stunning build. Two Aer F120mm fans are included for optimal internal airflow and the front panel and PSU intakes include removable filters. Includes a removable bracket designed for radiators up to 280mm simplifies the installation of either closed-loop or custom-loop water cooling. I will again prefer Bitfenix Formula Gold BF450G to be our computer's power supply due to its power and great price.

CPU (Processor)

Can computers think? Contrary to what many people used to feel in the earlier days, computers can 'think.' The Central Processing Unit (CPU) is where the 'thinking' happens. A

faster CPU enables you to crunch your Excel spreadsheets, play games, surf the web, and edit photos faster. At the same time, the faster the CPU, the smaller is the battery life.

For the **Administrator**, who we do not want to specify a video card for their PC, we should pick a powerful CPU in order to handle everyday needs. My pick is AMD Ryzen 5 2600 3.4 GHz 6-Core Processor. It's an awesome processor that can tackle every issue we may occur during our job as an Administrator. Its 3.9 GHz boost clock speed can handle lots of software or a bunch of tabs opened on the net at the same time. We could go with AMD Ryzen 3 2200 as it is much cheaper and almost as powerful, but I considered the fact that we have to work with this processor only for 24 hours a day and there will be no GPU to help us. Its low price ($119 at NewEgg), excellent performance in gaming and applications, PCIe 4.0 support, bundled cooler, low power consumption, unlocked multiplier and backward compatility are the reasons for choosing this lovable processor. For the **Developer**, I'm going to pick AMD Ryzen 3 2200G 3.5 GHz Quad-Core Processor. This CPU is that good that experts say it's the miracle for cheap gaming PCs. Its core clock speed is 3.5 GHz which goes high to 4 GHz in Turbo Boost mode. It has a Radeon Vega 8 integrated graphics which helps the CPU to optimize performance. My pick for the **IT Support** is Intel Core i3-9100F 3.6 GHz Quad-Core Processor. Being a member of the wave of Coffee Lake Refresh (CFL-R) processors, the Intel Core i3-9100F is based on the Coffee Lake processor microarchitecture and built with Intel's third-generation 14nm++ manufacturing process. The Intel Core i3-9100 will use a quad-core configuration and it's expected to feature 6MB of L3 cache, 16 PCIe lanes, support up to 64GB of dual-channel DDR4-2400 memory modules and a 65W TDP (thermal design power). The allegedly have a 3.6GHz base clock that goes up to 4.2 GHz in Boost Mode. The Intel Core i3-9100F does not have integrated graphics which decreases the price tag to $80, which is perfect (the i3-9100 that has Intel UHD Graphics 630 costs $125).

CPU Cooler

The best CPU coolers keep PCs and its fantastic components safe. If we have a powerful CPU, GPU, and power supply, chances are the machine is going to run hot. Without a similarly impressive CPU cooler in place, the processor may burn itself out. (Or at least not perform as well as it could). There are two types of CPU coolers: An air cooler pairs a large metal heat sink with a massive fan to blow warm air away from the processor. The best CPU fans can keep a processor cooler without getting too loud, so we should check the noise volume as well. A liquid cooling system, often called an "all-in-one" or AIO liquid cooler, sends a cooling liquid in a loop from your processor to the fans to move the heat out of our case. Liquid coolers are generally quieter and more efficient, but they are also more expensive and can be tricky to install.

My pick for the **Administrator**, which needs a powerful CPU cooler in order to help the computer work all day, is Noctua NH-L9. Noctua is an Austrian manufacturer that does one thing, and one thing only: make the best CPU coolers and fans. What this means is that even though the Noctua NH-L9 is tiny, it is still more than capable of insane cooling with no compromises. This is a fantastic cooler for anyone with a smaller build, or even if we're using a ton of large components, and we're not comfortable with liquid cooling. For the **IT Support** and **Developer**, I pick Cooler Master MasterAir MA410P. The $34 price tag is unbelievable. The Cooler Master MasterAir MA410M is the best pick for an excellent performing mid-size air cooler, especially considering the aggressively designed exterior shell and the inclusion of addressable RGB lighting from within the cooling tower itself. This fan features continuous direct contact technology 2.0 by compressing heat pipes together increasing heat dissipation over previous versions. The Air Balance RGB Fan ensures quiet operation, but fun color variations to play with. The Stacked Fin array ensures the least amount of air resistance and the intuitive fan bracket design makes upgrading a breeze. With

16.7 million colors to play with and a performance to praise, cooling has never been the same. I could not order the same MasterAir CPU cooler for the IT support due to incompatibility with the case, so I had to choose another version which is close to the one picked above. Cooler Master MasterAir G100M RGB 22.63 CFM CPU Cooler is the answer to our problems; It's almost the same price and it has somehow all of the features that MasterAir has. We could order EVGA CLC 240 CFM Liquid CPU Cooler if we wanted to have a liquid CPU cooler, but the thing is that the company is a bit short of budget, so...

Video Card

I'm not going to pick any video card for the **Administrator** due to the fact that it both doesn't need to do as much work as the other departments and it has a powerful CPU on its own. For the **IT Support**, Asus GeForce GT 1030 2 GB Phoenix Fan OC is the video card I picked. Yes, it has 2 GB memory but this card can still handle everything you can throw at it and with way less power draw. It gives us plenty of room as it is much smaller compared to others. GT 1030 2GB with Core i3-9100F 3.6GHz make a great team to handle any need an IT manager would have. For the **Developer**, I picked MSI GeForce GTX 1660 6 GB VENTUS XS OC. GTX 1660 is the sweet spot of video cards as it gives all you need to have as a developer or even gamer with the lowest price possible; I just envy the case we are building for the developers' department. If we want to cut the prices we can go with XFX Radeon RX 580 8 GB GTS XXX ED, too.

Memory

I'm going to pick the iconic Corsair Vengeance LPX 16 GB (2 x 8 GB) DDR4-3000 Memory for the **Administrator**. We need to have a RAM with high capacity in order to take care of all the software and tabs we open. 3000 MHz RAM and Corsair, what's not to love especially for the price. For the **Developer**, as we need more RAM on this one too, I picked G.Skill Ripjaws V Series 16 GB (2 x 8 GB) DDR4-3200 Memory. Speeds in the line range from

2133MHz up to 3200MHz. To make it short, Speed and quality for cheap. Last but not least, I picked Kingston HyperX Fury RGB 8 GB (1 x 8 GB) DDR4-3200 Memory for the **IT Support.** 8 GB of RAM is enough for the tasks an IT Manager is going to deal with. Being DDR4 and having a speed range up to 3200 MHz, we should not underestimate this beauty at all.

Motherboard

I'm going to go straight to the picks. I chose ASRock B450M PRO4 Micro ATX AM4 Motherboard for the **Administrator**. The memory type is DDR4 and it has 4 RAM slots so it can cover our 2×8GB corsair RAM and it has more space if we at some time want to add some more. Simply saying, it does everything very well, has lots of fan headers and has amazing VRM cooling for great OC's. I picked MSI B450 TOMAHAWK ATX AM4 Motherboard for the **Developer**. It also has 4 RAM slots so there will be no worry in this case; it can support up to 64 GB RAM. I picked ASRock H310M-HDV Micro ATX LGA1151 Motherboard for the IT Support. It has 2 slots for RAM and it's enough for us because we only have on RAM card. It gives us 32 GB maximum RAM and is totally suitable for us as we are not going to need more RAM as an IT Manager; one other thing

Storage

I'm going to specify Seagate Barracuda Compute 2 TB 3.5" 7200RPM Internal Hard Drive for every department as it's the best and cheapest HDD you can find. The speed is 7200rpm so that there will be no complaint. We also need SSD for every section and they will be from Samsung and Adata. Samsung has proven itself to the market as the fastest hard drive brand, and Adata is a very well-known brand that has been pretty good these years. For the **Administrator**, I pick Samsung 970 Evo 500 GB M.2-2280 NVME Solid State Drive and Samsung 860 Evo 250 GB 2.5" Solid State Drive for the **Developer**. We need something powerful, speedy, and large in size for the Administrators; We, for Developers, do not need

that capacity but we need the speed to utilize the process of coding, running and debugging, etc. These SSDs have somehow the same technology; however, 970 Evo is much faster with 3,400MB/s Seq. Read speed. They both have the latest V-NAND technology, Phoenix controller, and algorithms which I will not get into it in detail; To sum it up, These Samsung's SSDs are worth the price, which is not high compared to other brands. For the **IT Support**, I pick <u>ADATA SU635 480 GB 2.5" Solid State Drive</u>. The Adata SU635 uses the latest 3d QLC technology and dynamic SLC Caching and because of that we can see the read speed reach up to 520 MB/s. The affordable price tag that this SSD has makes this option so interesting. Our IT Support department needs a SSD with high capacity but does not need the speed as Developers.

Full list of specs chosen:

Administrator: https://pcpartpicker.com/user/Arsenicolos/saved/kKK3ZL

Developer: https://pcpartpicker.com/user/Arsenicolos/saved/Q4Ygt6

IT Support: https://pcpartpicker.com/user/Arsenicolos/saved/fRwz7P

Considerations

Case & Power Supply: Firstly, we should think about that how can we make the computer quieter; it can be done by choosing a case that has Quiet PC technology. The Power Supply can help us in controlling noise level, too. Added to these, Power supply should be high-qualified, with DC output of 450W to 550W. high energy efficiency is another key factor because we don't want our PCs to make noises or get hot as time passes.

Processor: We should know the fact not all the current models of the Intel or AMD's processors are the best and cost-effective ones; in some cases, even the older version (i3 compared to i5) or older generations (7th generation compared to 8th) are better in performance. The last thing to consider while buying a processor is to prefer retail-boxed model to OEM model. They cost a bit more, but instead, they give us more options like longer warranty or a bundles CPU cooler.

Motherboard: The first thing to consider for buying a motherboard is that whether it works perfectly or not. it should do the job for us; to accomplish this request, we can look into motherboard's construction quality. We should also consider the form factor that a motherboard is built in, whether we need an ATX, mini-ATX, or micro-ATX board. Last but not least, something we normally forget to think is I/O ports, such as the number of USB ports or the type of Ethernet port.

Memory: a regulation that we can obey to buy the right memory is to specify 1 GB of memory per core for multicore processors. The other factor is to match the memory cards to the memory slots in the motherboard so that we would have empty slots to fill in the future. We should also be warned that just buying the fastest memory may be not that cost-effective and beneficial.

Hard Drive: The three important factors to consider when buying a hard drive are Power (speed, noise level, temperature), Capacity, and Price. You usually cannot gather three of them in a single hard drive; we may need to buy a HDD for storing information and data, and use a SSD for the tasks that need faster processing.

References

Building a PC for dummies, by Mark L. Chambers: Part 2

Building the perfect PC, by Robert Bruce Thompson and Barbara Fritchman
Thompson: Part 2 and 4

https://www.pcgamer.com/

https://www.newegg.ca/

https://pcpartpicker.com/

https://www.quora.com/

https://devskiller.com/programmer-vs-developer/

https://blog.stafflink.ca/recruiting-tips/whats-the-difference-between-adeveloper-and-a-programmer

https://www.irishjobs.ie/careeradvice/administrator-job-description/

https://www.careerexplorer.com/careers/it-manager/

https://www.theverge.com/2018/9/13/17828092/gaming-pc-build-custom-how-to-asus-intel-geforce-cost

https://www.careerexplorer.com/careers/computer-systems-administrator/

https://www.roberthalf.com.au/our-services/it-technology/help-desk-jobs

https://www.hanselman.com/blog/BuildingTheUltimateDeveloperPC30ThePartsListForMyNewComputerIronHeart.aspx

https://www.bls.gov/ooh/computer-and-information-technology/mobile/network-and-computer-systems-administrators.htm

https://vsbytes.com/cpu-buying-guide/

https://www.indeed.com/career-advice/careers/what-does-an-office-administrator-do

https://techguided.com/best-budget-pc-cases-under-50/

https://www.digitaltrends.com/computing/best-mid-tower-pc-cases/

https://www.digitaltrends.com/computing/best-cpu-coolers-for-desktops/

https://improb.com/

https://www.jobs.ie/job-talk/job-description-technical-support/

https://www.anandtech.com/show/9799/best-ssds

https://www.techradar.com/news/best-pc-power-supply

https://www.tomshardware.com/reviews/best-psus,4229.html

https://www.tomshardware.com/topics/pc-builds