**Tech Corner: A Quick Resource for PC Building**

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In the last issue, I gave you an overview of why I think PC building can be a worthwhile adventure—how it gives you an appreciation for the technology running inside that metal box next to your desk, and how it can potentially help you save money by knowing which parts are important, and which parts aren’t.

In my personal PC-building adventures, I have done a lot of research and learned a lot of rules of thumb—sage wisdom passed down from veteran 24-year-olds to novice 21-year-olds. I’d like to outline a great deal of these, with the important caveat that I am not an expert, and I can’t guarantee the reliability of my advice. But, you know, it’s worked for me so far: I’ve *almost* broken a CPU by installing its fan incorrectly, *almost* broken my motherboard by screwing it directly to the case (that’s a big no-no), I *did* break my graphics card, though in that case it was because I spilt water on it. ...I’m pretty sure even babies know water and electricity don’t mix.

**Building Your Own PC: Buying Rules of Thumb**

When buying components, it is good to have a rough idea of what will be worth spending more on. In general, you’re going to want to be looking at the sites I outlined in the October 2016 issue (available at [http://themetropolitan.metrostate.edu/issue/2016/10/002](http://themetropolitan.metrostate.edu/issue/2016/10/002/)), using Google to get a feel for things. Alas, it is easy to be overwhelmed at first, so I’d like to offer a few good rules that will generally apply:

**You probably want to get Windows 10 Home, but Metro State students can get full-fledged Server 2012 R2 for free.**

When I built my most recent computer, I was able to cheap out by obtaining Server 2012 R2 for free from DreamSpark (https://www.dreamspark.com), an educational resource offered by Microsoft to students of registered universities. At the time, it was through Normandale, but recently Metro State has also become part of DreamSpark. Windows Server is, of-course, not *exactly* the same thing as regular Windows, but it comes shockingly close: Server 2012 R2 will run nearly all of the same programs and drivers as Windows 8.1, comes with the normal Windows desktop, and has most of the same Windows programs. In my experience, it differs only in two respects: the added server manager program, which can be used to turn your computer into a full-fledged server (but can also be completely ignored), and the strange removal of the Bluetooth stack. Unfortunately, you will not be able to use Bluetooth devices with a Server 2012 R2 installation. Still: by using the slightly different operating system in your build, you may be able to save $100.

* **Know your brand.** In general, different brands tend to have better quality and customer support. Corsair, EVGA, MSI, and Gigabyte all have good build quality and acceptable customer support, though EVGA’s customer support is known to be the best. (ASUS is also generally good, but has horrible customer service.)
* **Don’t skimp too much on the motherboard or case.** I would recommend most builders spend at least $50 each on the motherboard and the case, while heavy users and gamers should be looking at ones costing $100. More expensive motherboards support more hard disks, more memory, faster components, better sound, and overclocking. More expensive cases have better airflow and are easier to work with, and will generally come with a decent number of system fans. Put simply, a good case may be with you for a decade, and a good motherboard should be with you for at least five years (depending on when CPUs change their format, as newer, faster CPUs will eventually not be compatible with your old motherboard).
* **When choosing a power supply unit (PSU), you generally want something that’s reliable.** A cheap PSU could break every component in your computer if it surges, but a reliable PSU almost never will. You probably won’t need many watts, however; non-gamers will be fine with 400W, NVIDIA gamers will generally be fine with 500W, and AMD gamers will generally be fine with 600W. (At about $50, the Corsair CX line is generally a good balance of reliability and cost, but there’s nothing wrong with going for a $100 PSU with a 10 year warranty from EVGA, Corsair, or SeaSonic.)
* **Non-gamers don’t need to worry about GPUs**. A modern, high-end CPU contains a weak, but sufficient on-board GPU. Gamers, however, will generally want to look at AMD’s R7 370, R9 380, or RX 480, if they have a budget under $1000, or NVIDIA’s 1060 or 1070, if they have a budget over a $1000. No matter what, if you’re looking to game on a PC, you’ll want to be spending at least $600 in most cases; you can certainly add the expensive graphics card later, as long as you have at least a 500W PSU, however.
* **Memory is cheap.** If you want to save a little money, get a last-generation DDR3 CPU and 16GB of DDR3 memory to match. However, a more future-proof build should use DDR4 memory and a modern DDR4 CPU to match. You can generally still scoot by with 8GB of memory, but you’d be surprised how much an extra 8GB helps, especially with RAM-hungry web browsers.
* **Choose a CPU to fit your needs and budget:**
  + **Get an AMD CPU on the low-end, or an Intel CPU on the high-end.** AMD is generally cheaper at the low-end because of its cheap multithreading; the FX-8300 would be my go-to for builds under $500. The comparable i3-6100 from Intel has fewer cores, but its faster core speed may be preferable, depending on your needs. On the upper-end, Intel always wins out; the i5-6500 is the best current generation chip, while people with dedicated GPUs *could* consider Intel’s similarly priced low-end Xeon chips, as these offer better performance without the on-board GPU.
  + **Intel i7s often aren’t worth the additional cost.** The i7’s “hyperthreading” means it can do two things on one CPU core but, as you can imagine, this doesn’t mean a doubling of performance—there’s still only one CPU core doing all the work. Instead, this allows programs to more optimally share resources, which can be worth the money for video editors and people who virtualize other operating systems, but is rarely beneficial for gamers and casual computer users. (At least for gamers with a budget under about $1200, the extra money for an i7 should be spent on a better GPU instead.)
  + **Don’t be afraid to get a previous-generation chip** if you can find one for cheap; as I’ve said, the new ones aren’t much faster.
  + **Ignore the GHz speed.** While it is a useful number for comparing very similar CPUs, it is almost useless at comparing between i3s and i5s, or between AMDs and Intels. (There’s a very technical reason for this that I’ll briefly mention: GHz is roughly how many times the CPU is able to execute a command per second. The thing is, CPUs can “overlap” multiple commands, support complicated commands that do many things all at once, and have multiple “cores” to do things simultaneously. These factors simply aren’t accounted for in the GHz speed.)
* **Finally, if you haven’t used a solid-state drive (SSD)**, you’d be amazed at how much faster they are. People with lots of data should get a small SSD (~128GB for non-gamers, ~256GB for gamers) and a large mechanical hard drive (~1TB), and put their operating system and common programs on the SSD. People who don’t have a lot of data should get a bigger SSD (~512GB) and put everything on it. Still, large HDDs are dirt cheap these days: 3TB HDDs can generally be found for under a $100. There’s nothing wrong with starting with an SDD and then adding an HDD later if you need the extra space.
* **For first time builders, overclocking should come later.** If you want to overclock, you should add about 100W to your PSU and make sure your motherboard is compatible and your CPU is overclockable (many aren't). It may be worthwhile to install a third-party CPU cooler right away (one will be essential for overclocking later), but all Intel CPUs come with a decent stock cooler if you don’t plan on overclocking.
* **First time gaming builders really shouldn’t worry about SLI or CrossFire.** If you eventually want to use these technologies, make sure you get a compatible motherboard, and add an appropriate number of watts to your PSU -- generally at least 200W. In general, though, the technologies really aren’t worth using unless you have money to burn.

**Building Your Own PC: Assembling Rules of Thumb**

While buying the parts may be quite overwhelming at first, once you actually have them, the assembly is really quite straightforward. Some tips:

* **Follow along with somebody else!** NewEgg has a pretty good video at <https://www.youtube.com/watch?v=VIF43-0mDk4>
* **Take it slowly.** There really is no rush in the assembly. In general, your first build could take up to three hours, so set some time aside. If you want to take a break, just make sure no kids or pets can access the machine.
* **Static is a concern, but generally a minor one.** Make sure to keep yourself grounded (the NewEgg video shows how), but if you’re building in a humid environment, you’re unlikely to have many issues. Stay off carpet (linoleum and wood floors are best), keep discharging yourself on the case or PSU, and you’ll be fine.
* **It is easy to mistakenly install the motherboard with screws instead of “standoffs,”** which keep the motherboard from touching the case (which causes electrical damage). In a moment of stupidity, I actually built my current computer without standoffs, but was lucky in that my chosen case has semi-integrated standoffs.
* **Back in the 90s, it was pretty easy to plug the wrong cord into the wrong slot, but this is pretty hard to do today, thankfully.** The only thing to be sure of is that you don’t confuse the 4+4 PSU power cord with the 6+2 PSU power cord (or so I’ve been told).
* **Don’t worry about cable management… too much.** Especially at first, you won’t have a sense of how to keep cables from being a mess, but thankfully it doesn’t really matter too much. However, do make sure you are aware of your case’s cable management features. For instance, you’ll often sleeve your hard drive cables through the opposite side of the case, but if you don’t fully examine your case first, you might not be aware of this and have a lot of troubling installing hard drives. (...I’m speaking from experience.)
* **Things generally shouldn’t move.** Make sure components aren’t wobbly inside your case. If your motherboard is wobbly, it’s missing screws. If your PSU is wobbly, it’s missing screws. The one exception is graphics cards, which will move around a little bit in their slot, but you should still make sure there’s at least one screw keeping the graphics card in place.
* **Double check everything.** Finally, before powering on your assembled computer, double check that every cord is connected and going to the right place, that there are no screws lying around, and that all fans are plugged in (especially the CPU fan).

Hopefully, you will have been successful. If something isn’t working, Google is always a great resource, and flowcharts like <http://fixingmycomputer.com/flowcharts/boot-up-flowchart.html> can be a good start. The /r/buildapc community is generally quite friendly if you’re unable to figure things out; just be detailed and post plenty of pictures when you ask for help. If nothing else, you could take your PC in to Micro Center in St. Louis Park. They can most likely diagnose the issue, though at a cost.