

There are 10 decisions to make before you build your next PC

Takeaway: While building a custom system lets you tailor the components to meet your needs and hold down costs, you'll need to make some decisions first.

Building PCs is a hobby that many tech enthusiasts enjoy. Even if building PCs is not your hobby, it is sometimes the only way to get a machine that exactly meets your needs, or meets them at a reasonable price. Here are 10 things to think about when building your next PC, some of the choices you may have, and what to keep in mind when making these choices.

1: SSD vs. platters

At this point in time, I think the drive selections have more to do with performance than the CPU choice does. Modern CPUs have more than enough power for typical loads, but as the applications we use get bigger, and the data they handle gets larger (video games, multimedia editing, giant-size Outlook PSTs, etc.), the drives can become the bottleneck.

Solid state drives (SSDs) are lightning quick, especially for accessing lots of small files at a time (like when the system boots). The price to pay is in the cost-per-gigabyte: They are many times more expensive on a per-GB basis than traditional drives. While there is debate about whether traditional drives are as fast reading long, sequential files, or if the read/write limits on SSDs make them less reliable than the mechanical failures of traditional drives, the performance on typical usage is not a question.

One possibility, especially with an OS like Windows 7 or Linux that make it easy to separate data from applications, is to use an SSD for the main OS and application space and put user data on a traditional drive. That way, you can get both speed and disk size at a reasonable price.

2: Video card

People often tend to buy either too much video card or too little. Unless you are playing video games, the on-board video card should be sufficient — so long as it has enough of the right kinds of ports and can meet your resolution needs. You should not need to devote too much system memory to it, either.

If you *are* playing video games, keep in mind that games are now putting the lion's share of the hard work onto the video card. There is a definite price curve on the video cards. You can often get last year's top-end models for a good price, and they will handle all but the most modern and intense games at reasonable settings (often the highest settings). If you are doing a lot of multimedia, numerical analysis, and other computationally intense tasks, check to see whether your applications can leverage the video card and if so, what cards it is compatible with.

3: x86 or x64?

When installing the OS, there is no reason to *not* use the x64 version at this point, unless you have an extremely outdated application that refuses to run on it. And you should almost always install the x64 version of applications. That said, there are *some* things where you need to make a choice. Internet Explorer, for example. While it installs both versions, always use the x86 one — the one labeled “Internet Explorer” instead of “Internet Explorer (64-bit)” — because the modernized JavaScript engine in IE 9 is available only in the x86 version. Many IE users I’ve met have been baffled by the lack of speed in IE 9, and that was the reason.

Also, be *very* wary about installing Microsoft Office’s x64 versions. Many, if not most plugins still do not run under x64 Office, and it looks like they probably never will. The only reason to go for x64 Office is if you routinely work with monstrously huge files that the x86 version can’t handle.

4: RAM density

Let’s say your motherboard holds up to four DIMMs, each one with a maximum size of 8 GB, and supports Dual Channel RAM, and your goal is to have 8 GB of RAM. If you buy one 8 GB DIMM, you are leaving lots of room open to eventually fill the machine to 32 GB, but you are giving up the speed advantages of Dual Channel. If you buy two 4 GB DIMMs, you get the speed of Dual Channel. But if you want to get the full 32 GB in the future, you’ll have to replace the two 4 GB DIMMs with an 8 GB DIMM. Personally, I like to buy the smaller DIMMs and get the Dual (or Triple) Channel advantage, worrying about the extra costs down the road if I ever need an upgrade. You may prefer to leave as much space for future expansion as you can.

5: RAID

A RAID (redundant array of inexpensive disks) allows you to combine various physical disks into one volume. The main RAID levels to think about on a desktop are:

- RAID 0: Allows multiple disks to be combined into one large disk; a single drive failure takes down the whole RAID and often loses data. The volume size is the total of the size of all of the disks.
- RAID 1: Mirrors a pair of disks into one volume; if one disk fails there is no data loss, and the drive can be replaced (and the data automatically copied to the replacement), usually with no downtime. The volume size is the size of the smaller of the two disks.
- RAID 5: This is more complex. It takes three drives and combines them in a way that they all provide some redundancy for the others, with an optional fourth drive as a “hot spare” to be immediately incorporated into the RAID if the drive fails (highly recommended). A little bit of drive space is lost due to the way the redundancy is performed.

Each of these RAID types can bring some speed benefits. Due to the high level of drive failures I experience, the value of my data to me, and the cost of downtime, I choose RAID 1 for all of my personal PCs and have done so for quite a few years now. It has saved my neck many times!

6: Case

Even if you are not the sort to care what your computer looks like (other than a nondescript beige, gray, or black box), the case selection is still important. Cases with better airflow reduce internal temperatures, which in turn reduces failure rates and allows temperature-controlled fans to spin slower (which makes the machine quieter). Larger fans turn more slowly to move the same amount of air, which also reduces the noise. Some cases even have air filters to keep the dust levels low. In addition, better cases make it easier (and less painful, if they have smoothed edges on the metal) to replace components. Look for removable motherboard trays and drive cages to make maintenance easy. The pricier aluminum cases weigh a lot less, which is important if you plan to move your PC often.

7: Power supply

People tend to overestimate how big a power supply unit (PSU) they need. You're better off having a smaller PSU with higher efficiency than a larger PSU with lower efficiency. Not only will it deliver the same power to your components, but it will save on your electric bill and produce less heat. (Again, heat reduces reliability and makes the fans work harder which increases noise.) Unless you have a super-powerful video card or a *lot* of hard drives, it is hard to argue for more than 350 - 450 watts of PSU capacity.

8: CPU choice

I am not going to get into the Intel vs. AMD debate. Just compare capabilities and price and get the cheapest CPUs that meet your needs. Here are some questions to ask yourself when picking a CPU:

- Does it support virtualization and do I need that support? As a developer and author who occasionally needs to run VMs for testing, the answer is “yes” for me.
- Does it support HyperThreading (HT)? HT allows one CPU core to act as two, and while it does not always improve performance, it can often increase it.
- How many cores do I need? Remember, many applications still are not written to leverage multicore architecture, but the OS will. And more cores means a better experience on the whole if you like to do many things at once or play games.
- What speed do I need? Few things will actually max out a modern CPU long term. I would rather have four cores at 2.0 GHz than two cores at 4.0 GHz, all else being equal.

9: Backups

Thinking about backups should start when you are putting your PC together. If you are using online backups, you don't need any additional hardware. But for onsite backup, now is the time for it. Some people like external drives for backups because they are easily switched, moved to other places, etc., but they are a bit more expensive.

I've got a large internal disk (much larger than the data I will ever store on the machine) that I perform a nightly backup to, and I backstop that with the Carbonite online backup service. Between this and my RAID 1, if I ever permanently lose data, it means that I have bigger things to worry about than my data! If you use an external drive, eSATA is much faster than the ubiquitous USB 2.0. In terms of software, there are lots of great choices out there. While the built-in Windows Backup is adequate for most home user needs, it does have its gaps and you will want to consider a third-party application.

10: Malware protection

Now that your fresh, pristine system is up and running, it's time to protect it from viruses, spyware, and other nasty applications. We all know that education is the best defense. But even so, the malware has a habit of finding its way in sometimes. There are plenty of good anti-malware choices out there, ranging from "free" to "expensive," with plenty in the middle, too. Whatever you choose, make sure that it is one of the first things you put on there.