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What do I need to know before building a computer?

If you've ever opened up the side of a computer, then you may have been daunted to discover a rat's nest of components and cables. It might seem impossible then, that so many PC owners have put their machine together themselves. But, on the contrary, it's not only possible, but easy. In this, the first of two articles on the subject, we'll take a look at what goes into a PC, and how you might build one for yourself.

Why would you want to build your own computer?

It's worth first addressing why one might wish to build a computer from scratch rather than buying one ready-built – or even buying a games console instead. Let's consider some of the merits of the PC you build yourself.

Economy

In buying all of the components for your computer separately and putting them together yourself, you no longer need to pay for someone else to do it. The end result of this is that sometimes, it can work out far cheaper to build your computer yourself. Not only can you save money by eliminating labour costs, but you'll be able to select the cheapest components on the day that you purchase them, rather than having to rely on the pricing that the web-store is offering – pricing that was most likely determined weeks before, rather than at current costs. Since PC components are always changing in price, you'll be able to save that little bit more by selecting the cheapest possible component for your objective.

Customisation

If you're going to build your PC yourself, then you'll be able to select components according to your own personal needs. This might mean that you plump for two graphics cards rather than one, or that you decide to select a slightly larger heatsink for your CPU. By doing this, you'll be able to build a PC that's right for the types of games that you want to play on your PC.

Education

Naturally, if you have to put your computer together yourself, then you'll, by necessity, have to learn what each of its components does, and where they go. This knowledge will stand you in good stead later if you need to troubleshoot your PC.

Fun

It's often said that the most satisfying meals are the ones you cook for yourself. This is certainly true when it comes to PC gaming, as you'll be able to enjoy your gaming that much more, with the knowledge that you put the machine together yourself. Plus, the actual assembly of the PC can often turn out to be great fun in and of itself.

Plus, when your friends and co-workers are enthusing about the transistor-count of the latest NVidia GTX card, you'll have at least a vague inkling of what they're talking about. Now that we've established why we might want to build our own computer, we'll need to come up with a shopping list.

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What items do we need in order to build a computer?

CPU

Among the more important components in your computer is the central processing unit. It's in this chip that the computer performs all (or, almost all) of the calculations required for it to operate. Broadly speaking, the faster the CPU, the more quickly that the computer will be able to run.

Within the CPU is contained a number of distinct units, which work in concert to perform calculations. These include the arithmetic logic unit, which does all of the sums that the program can throw at it, along with a number of registers which store the incoming and outgoing data close at hand. These registers are a form of ultra-fast memory which help the CPU to smooth over all of those incredibly small waiting times, and prevent minor differences in speed between the CPU and the memory units from affecting the overall operation of the computer. In a sense, these units are like the oil that lubricates the inside of a car's engine, allowing it to run as smoothly as possible.

Modern CPUs have several cores, allowing them to simultaneously perform many calculations, which yields an overall improvement in performance. Typically, these cores are each equipped with a block of buffer memory, along with a larger, slightly slower block for the entire thing.

The benefits of multiple cores are, however, only felt if the software has been designed to exploit it. So, if you are playing a game which is optimised to make use of two cores, then you'll experience minimal improvement if you add another two.

When we're judging the power of a CPU, we might be tempted to look at the advertised clock speed, or frequency. While this figure has long been touted by manufacturers, it's rarely a reliable indicator of end performance. The proof of the CPU pudding comes in the real-world performance they produce, so be sure to consult [benchmarks](#) in order to see which chips lift the most weight in the games you'd like to play.

CPUs, in the main, are built by two different manufacturers: AMD and Intel, with the former normally following the lead of the latter. Intel release their chips in generations, with the internal circuitry shrinking with each alternate generation. The current generation, Skylake, uses the same 14nm process as its predecessor, Haswell.

It's important to note that CPUs come housed in specially-designed metal tiles, whose top is smooth and flat and whose bottom is covered with metal pins, which allow it to slot into the motherboard beneath (more on that later). The exact makeup of these pins will depend on the 'socket' designation. In Intel Chips, this might be '1151', '1150' or '2011-3', (so named after the number of pins at the bottom), while AMD chips use a slightly different architecture.

Graphics card

Of all the components in your computer, the graphics card is the one whose impact on gaming performance is the greatest. A mediocre graphics card in an otherwise powerful PC can be far outstripped by a powerful graphics card in an otherwise mediocre PC.

Of course, the extent to which this is so will depend on the game you're playing. In games with lots of flashy particle effects, heavily detailed textures and post-processing, then the strength of your

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graphics card will matter enormously. If your game is a turn-based one, which tends more toward handling a lot of databases, and simulating AI decisions, then CPU will matter more.

In recent years, the trend has certainly been for much of the heavy lifting to be performed by the GPU. For this reason, many gamers are able to get by with an old CPU, and keep up with the pace of current games by occasionally swapping the graphics card out for a newer model.

Graphics cards are produced by two different manufacturers: there are NVidia cards, and there are AMD ones. When comparing the performance of these cards, we should consider that the former company tend to be quicker in releasing driver updates for their cards. This is important, as these updates can often yield substantial performance boosts for newer games.

If you'd like, you can increase your horsepower by inserting two or more graphics cards into the same computer, and linking them together. In the case of Nvidia cards, this technology is called SLI, or Serial Link Interface. For AMD, it's called Crossfire. Functionally, the two are effectively identical. If you're considering a multi-GPU rig, you should be aware that it might not always function as intended, and that it might take the manufacturer time after a game's release to get things working properly – and even then, the performance doesn't always 'scale' upwards to quite the degree you might like. Graphical artefacts, like the infamous 'flicker' are liable to rear their ugly heads, particularly in the early stages, and so if you'd prefer a simpler life, a single card is often advisable.

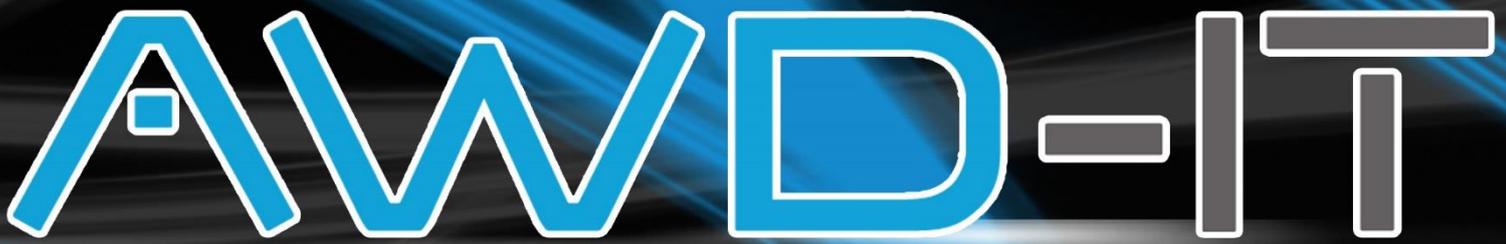
RAM

While your computer is 'working' on a given program, various data from that program's will be loaded into Random Access Memory. This RAM comes in the form of eight or more chips, which are in turn installed into long sticks which can be slotted into the motherboard.

When considering the available RAM options, you'll need to account for both the speed of the ram, and the amount of memory it can provide for your computer. If you're going to be playing games, you'll need enough space that the game's contents can be loaded into RAM, along with the processing requirements of your operating system and any other minor processes which might be running. If your game should require more memory than your computer can provide, then it will need to create temporary 'virtual memory' on a local storage drive. This will be many times slower than the physical memory, and so the result of this will be a nosedive in performance.

There are many different sorts of RAM, including dual, triple, or quad channel sticks, which are designed to work in pairs, trios, or quartets respectively. Successive memory technologies will come in slightly different shaped sticks, in order to prevent them from being mistakenly inserted into the wrong sort of motherboard.

A bare minimum of 16GB of RAM should be considered for modern gaming purposes. If you're looking to make an upgrade further down the line, then you might buy a pair of 8GB sticks, and then add another pair in order to provide your computer with 32GB of memory.



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