Build Your PC

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1 Requirements

1.1 Programming

The final build should be able to excecute build tasks at a decent speed so processor, memory and SSD choices should take this into account.

1.2 Quiet

The PC should be as quiet as possible. As such, parts that require massive amounts of cooling are out of the question. This will also affect fan choice.

1.3 Open Source Drivers

Since the computer will be running GNU/Linux, it will be preferable if most of the parts have drivers which are open-source. This means no Nvidia.
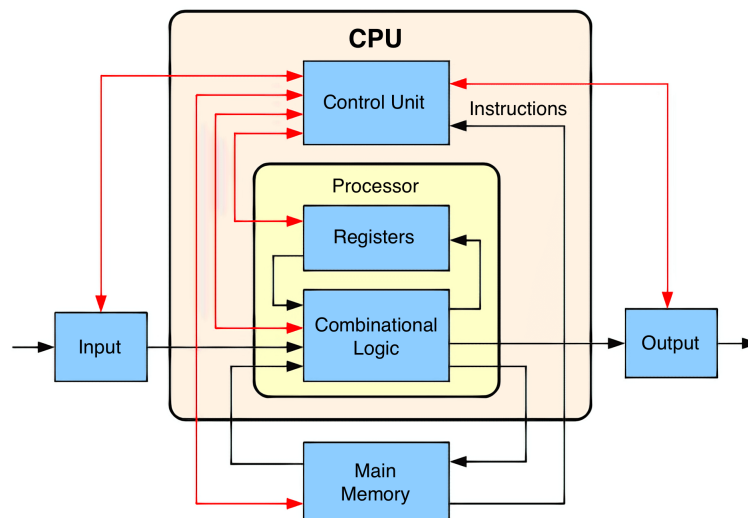
1.4 Budget

Ideally, the parts should offer a decent performance whilst being relatively affordable.

2 Parts Investigation

This section shall cover different parts considered and will focus on the following aspects:

- Cost

- Availability

- Performance

2.1 Processor

The above is an image showing the basic internals of a CPU. A CPU can be considered to be the primary component of a computer. It is often referred to as the "brain" of the computer since it is responsible for arithmetic, logic, control and input/output operations specified by instructions in the computer's program.

The two main competitors in this space are AMD and Intel. Over the years, both have whipped out decent budget alternatives. This section will look at what both sides can offer with respect to the aforementioned requirements.

2.2 Motherboard
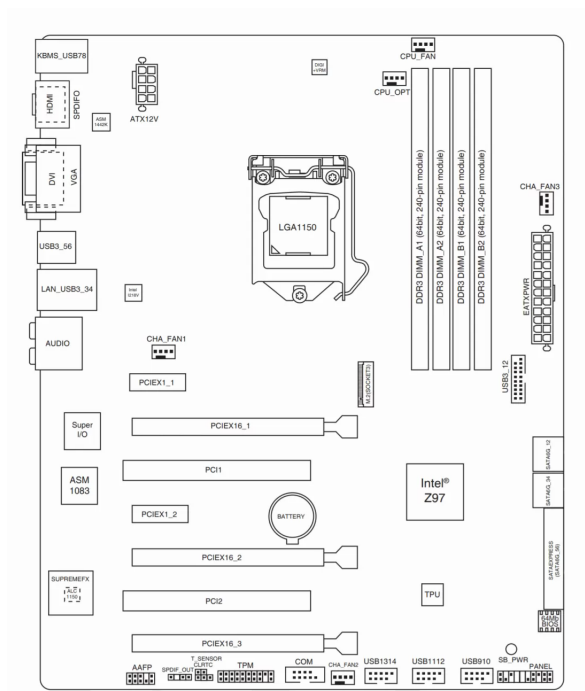
A motherboard is the main printed circuit board (PCB) in a computer. It serves as the foundation upon which other parts are built upon. It connects all the parts of the machine together. It consist of many parts as shown on the diagram above.

2.3 RAM

Random Access Memory is a form of volatile memory in a computer system responsible for the temporary storage of data and instructions currently being executed.

2.4 Storage

These include storage devices that are not directly accessible by the CPU. They are non-volatile devices which allow data to be stored for as long as the user needs. In terms of capacity, they are much larger than main memory but access times are slower. Applications, the operating system, device drivers and general files are stored in secondary storage. This system will consider the following 2 types of secondary storage:

- Hard Disk Drives: Makes use of magnetic storage technology with moving parts. HDDs have slower access and data transfer speeds. They are also less durable and make more noise since they have moving parts but are generally more affordable.

- Solid State Drives: Uses flash technology and stores data in non-volatile memory chips (usually NAND). They do not make use of moving parts and are hence quieter, smaller and more durable. However they tend to be more expensive.

2.5 Power Supply Unit

As its name suggests, a Power Supply Unit (PSU) provides power to the system. In more precise terms, it converts electrical power from an outlet to the appropriate direct current voltages required by the computer parts. Some of its key responsibilities are: voltage regulations, provision of connectors, modularity and safety features.

2.6 Case

A case provides an enclosure where other parts of the computer live in. They come in different shapes and sizes to accommodate for different configurations a user a opt for when building a PC. Cases serve the following purposes, amongst others:

- Protection: protects the internal components from dust, moisture and other factors that could damage the internals.

- Cooling: many cases are designed with airflow and cooling in mind. With strategically placed vents and cable management systems, some cases allow for optimal airflow leading to optimal performance of hardware and prevention of thermal throttling.

2.7 Fans

3 Parts Selection

Sitting around $125, the ryzen 5 5600G offers 6 cores, clocked at 3.5 GHz base, and 12 threads, this processor offers a great balance between price and performance. It is also widely available on Amazon and Ebay. Furthermore, it comes with pre-applied thermal paste and a cooler. Finally, the integrated graphics module will be more than enough for desktop use and will save on noise which a dedicated GPU would have produced.

To complement our processor, the Corsair Vengeance LPX DDR4 will fit our needs for $45. It consists of 2 sticks of 8GB, clocked at 3200 MHz with XMP available.
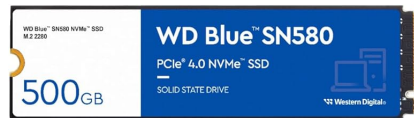
The Western Digital NVMe SSD offers Gen 4 PCIe speeds at $57.

The Gigabyte B550M DS3H AC will be able to house the aforementioned parts comfortably. It has built-in Wifi and supports dual-channel memory. At $ 99, this will be a bargain.

4   Operating System

Linux. No debate. MacOS is only supported on devices Apple sells; legally anyways. And windows is a nightmare on its own. The sheer amount of resources it takes while idle is mind boggling. Windows also dominates in the market share for viruses with over 83% of all viruses in 2020 designed for it. Furthermore, windows is an operating system that just gets in the way. Need to find a package or library? Spend an ungodly amount of time scouring websites to find it and hope it does not contain any malware. Moreover, in terms of personal configurations, it's like scraping the bottom of the barrel. Hence, Linux, more precisely Arch shall be my OS of choice for this PC. Here are a couple more advantages:

- Pacman: It is the package manager for Arch Linux. Any package can be installed with 'sudo pacman -S <package name>'. It also supports parallel downloading. In addition, Pacman has many frontends such as Yay which can easily download and install packages which are not in the main repositories.

- Customisability: Linux is extremely modular by nature. Almost anything from the desktop environment to the kernel itself can be modified to fit the user's need. With Linux, the computer changes itself to accommodate the user, not the other way around.

- Privacy: Being open-source means that Linux is very transparent by nature. As such, no hidden data collection or spyware running in the background.

- Programming environment: with support for many languages available by default and others just a command away, Linux is considered by some to be the ideal coding environment. Furthermore, any libraries or dependencies are simpler to deal with on Posix systems as most of them are available via the package managers.