Alienware Area 51 R4 2018

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1. Motherboard

Motherboard or Printed Circuit Board (PCB) is the element of the PC that combines all the hardware to work together (Fisher, 2019) . It always has a CPU socket (for the different generations & companies producing CPUs there usually are different sockets), also RAM slots are mandatory, slots to power the motherboards itself, the CPU and all other components . There also are SATA ports to connect the storage to computer. There are 2 types of PCI slots – PCI-E (Express) and PCI. PCI-E slots are usually used for graphic cards, because they can process more bandwidth in a shorter amount of time (Fisher, 2019). On the PCI slots the user can attach after-market LAN cards, sound cards, etc. There is also the M.2 PCIe slot which serves as a smaller PCI-E. It can be used to attach SSDs there (Fisher, 2019). On the motherboard are positioned all the pins that are used to connect the front end of the PC case. For example the Power button, Reset button and all these functions like Hard-Drive LED, Power on LED etc. Usually, whenever people build PCs for the first time they have the most issues with connecting these pins the right way, because there are not much instructions and the workspace is very tight and small (Since the PCB is already in the case, screwed). There are many more ports on the motherboard such as USB ports, fan for the CPU cooler, fans for the case and every different motherboard model has different features (Fisher, 2019).

In this exact build the motherboard has these features (CNET, n.d.):

- Intel 2066 Socket
- X299 express chipset
- 8xDDR4 DIMM sockets for RAM (max capacity – 128 GB), when using a 6 core or above CPU
- 4xDDR4 DIMM sockets for RAM (max capacity – 64 GB), when using a 4 core or above CPU
- Dual or 4 channel memory architecture respectively
- Ram speed support – between 2133 MHz and 4400 MHz
- 5x PCI-E 3.0 slots
- 2x M.2 Connectors
- Intel Optane ready (this is special kind of memory that Intel developed that makes your HDD faster)
- 2x USB 3.1 Gen 2 ports
- 10x USB 3.1 Gen 1 ports
- 4x USB 2.0 Gen 1.1 ports
- ATX Form Factor

2. CPU

The CPU is the brain of the computer. Every system that does some kind of calculations has a CPU. Modern CPUs are extremely powerful compared to older ones. This is because the way they are built is constantly evolving. Nowadays most of the processors are built with the 7nm technology since they can pack more power and more semi-conductors into the same chip size (UserBenchmark, n.d.). While working processors heat up to 100 degrees Celsius (if reached, it usually shuts down the pc for safety reasons). Processor's computing power is measured in Hz or usually GHz (to use smaller numbers in indicating its speed). CPUs always have cores. Modern processors usually have 4 or more "physical" cores, the thing is, that cores help the processors do things simultaneously

(UserBenchmark, n.d.). Why is that ? Because pc's do everything in order, so if pcs have multiple tasks then it is going to throttle and here is where the different cores come in handy. They usually decrease the speed of the processor by a certain amount, but let it operate on a few things at once (Intel, n.d.). CPUs have cache memory which serves as a mediator between CPU's logical sector and RAM. The bigger the cache memory the better.

The specs of the CPU featured in this build (CNET, n.d.):

- CPU model: Intel Core i7 7800X – 64 bit, 7th generation "Skylake" processor, LGA INTEL 2066
- Technology used (Lithography): 14nm
- Physical Cores: 6
- Base Frequency: 3.5 GHz
- Max Turbo Frequency: 4 GHz (This is activated once the processor needs more processing power but doesn't stay on all the time to save power & not to produce too much heat)
- Cache memory capacity: 8.25 MB
- TDP (Thermal Design Power): 140 Watts
- Max supported memory capacity: 128 GB
- Memory type supported: DDR4 2400 MHz up to 4000 MHz – Quad-Channel memory

3. CPU Cooler

The CPU cooler is a very important part of every PC. Its function is to cool down the processor of the PC so it continues its work properly (PC Magazine, n.d.). Usually, the bigger the cooler the better, however the cooler should be compatible with the type of processor. There are AIO (All-In-One) CPU coolers, that use air to cool the heatsink. There are the water CPU coolers, which use the heat charge & discharge properties of the water to cool the PC faster and more efficient (PC Magazine, n.d.). It works by making a closed circuit with tubing, a pump, radiator (where the water discharges the heat it has absorbed) and a water block (this is attached on top of the processor instead of a heatsink to absorb the high temperature) (PC Magazine, n.d.). This kind of cooling is customizable, and you can do whatever you want to with it. For the Alienware area 51, CPU cooler is said to be a liquid cooling circuit integrated into the case itself.

4. GPU

The GPU, also known as Graphic Processing Unit, is the piece of hardware that usually renders the image on the monitor (PC Magazine, n.d.). It is similar in build to the CPU but differs in one specific thing – it mostly executes parallel processes unlike the CPU which executes consequential processes (PC Magazine, n.d.). The GPU can do many processes at once, unlike the CPU which does everything

one after another. The power supply needs to be sufficient for the graphics card of your choice. Since CPUs and other component usually don't need too much power, the user needs to be aware about the wattage rating of your power supply and whether or not it has the capacity to take the TDP of the graphics unit.. Since it's not a mandatory part for the PC to work, not every computer has a designated graphics unit. Some CPUs offer an "integrated GPU" which is basically using the CPU as a graphics processing unit (PC Magazine, n.d.). This method can be used for lighter application but won't be able to run games smoothly at high resolutions and settings. For the Alienware Area 51 build the computer has an 1080TI, which was released in the beginning of 2017. By the time it was advertised as the most powerful video card on the market, after TITAN X and TITAN XP (All of these graphic card models are owned by Nvidia). The 1080TI is able to run pretty much any game at it's highest settings even at higher resolutions (1440p, 2160p) (NVIDIA, n.d.) . It is still extremely powerful to this day but right now there are cheaper, newer cards on the market featuring the same performance.

Specs of 1080 TI (CNET, n.d.):

- Nvidia Founders Edition
- CUDA Cores – 3584 (The more the faster operations can be executed)
- Boost Clock (Max clock speed) – 1582
- Memory capacity – 11GB
- Memory type – GDDR5X
- Memory speed – 11Gb/sec
- Memory Bandwith – 484 GB/sec
- Connection type (To MB) – PCI-E 3rd generation
- Maximum digital resolution – 7680x4320 @ 60 Hz/sec
- Connectors – 1xDisplay port 1.4, 1xHDMI 2.0B
- Graphics card TDP – 250 Watts
- Connection from Power Supply – 1x 6-pin connector, 1x 8-pin connector

5. Storage

The storage in the computers is a hardware that is used for storing and extracting data files and objects. It can hold and store information in two manners; temporarily and permanently and can be implemented internally or externally to the computing device (Technopedia, n.d.). There is primary storage in which the data is stored temporarily (Ex: Ram) and secondary storage in which the data in stored permanently with a lot more storing capacity than the primary. In the Alienware desktop there is help for the M.2 class drive permitting the PCIe SSD drives into the storage options. The storage slots can obtain up to five drives of either SSD or HDD.

The storage specification of Alienware area 51 (CNET, n.d.):

- Capacity1 x 2 TB
- TypeHDD
- Interface ClassSerial ATA
- Installed Qty1
- Capacity2 TB
- Spindle Speed7200 rpm

6. RAM

The RAM, random access memory, is a computer memory that can be read and changed in any order, typically used to store working data and machine code (Martindale, 2018). A random-access memory allows data items to be read or written in almost the same amount of time with no regards to the location of data inside the memory. Its where the PC loads the information at a fast pace, depending on the capacity. The dual channel memory allows the Alienware Area 51 pc to double the flow of information processing of data. This prevents the possibilities of lagging and computer rebooting due to crashing.

The RAM features of Alienware Area 51 (CNET, n.d.):

- Memory Speed2400 MHz
- Features dual channel memory architecture
- TechnologyDDR4 SDRAM
- Installed Size16 GB
- Rated Memory Speed2400 MHz

7. Power supply

A power supply unit converts mains AC to low-voltage regulated DC power for the internal to feed the electrical necessities of all the components in a computer (Waligroski, 2011). Modern personal computers use switched-mode power supplies through an input button in the keyboard of the pc. It also controls overheating by regulating the voltage intake, which can be switched automatically or manually depending on the type of power supply. For the Alienware pc the maximum and minimum temperatures are high in both ends, since the main purpose of this desktop is to perform with speed processing of data and graphics for the gaming demographic.

The power supply features of Alienware Area 51 (CNET, n.d.):

- Min Operating Temperature41 °F
- Max Operating Temperature95 °F

8. Pros and Cons:

Pros – Extremely powerful, no software will be able to make this machine lag or stutter.

Pros- Robust configuration options

Cons – Very expensive, not quite customizable since it's a pre-built PC, might be loud under load because of Fans trying to dissipate most of the heat, heave, case shape is not appealing to me and it seems impractical.

9. Work Division

Valentin:

- CPU
- GPU

- CPU Cooler
- Motherboard
- Pros and Cons

Sebastian

- Storage
- RAM
- Power supply
- Pros and Cons
- Editing

10. References

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