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The Anatomy of the GPU

The Graphics Processing Unit (GPU) is one of the most integral parts of a home computer, allowing the user to view their actions on a monitor. Sometimes, the computer's motherboard has an integrated GPU, but in order to display a clearer image at higher resolutions, a much stronger GPU is required. The PC gaming scene has created a push in innovation when it comes to making GPU's more powerful and efficient, and in order to better understand what makes a GPU operate, I dismantled an Nvidia Geforce GTX 660 from EVGA and conducted research on the inner parts and the function of each part within the unit.

After removing the casing, the board and cooling system are revealed[1]. The dual-slot cooling system, meaning the system requires the GPU to take 2 slots in the computer case, consisted of a heatsink with a copper heat pipe and fan that connected to the GPU's board for power[2]. The main board, the most complex part of the GPU, consisted of many various chips. The main, large components of the GPU include the processor, VRAM (Video Random Access Memory), video outputs, and the Graphic Card Interface[3]. The various outputs included DisplayPort, HDMI, and Dual Link DVI-I and

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[1] A picture of each individual component can be seen on Picture F

[2] See Picture G for a detailed view of the cooling component

[3] See Picture H for a detailed view of the board

DVI-D slots[4]. The Graphic Card Interface was a PCI Express 3.0 port. There were no TI components.

While there are not many technical aspects to the cooling component, I conducted research as to how it functions. The heatsink is placed on top of the GPU's processor, and cools the processor by adding more surface area for the heat to travel, relieving the processor of conducted heat. A copper heat pipe goes through it and transfers deeper into the heatsink to space out the heat more evenly. For added cooling, a fan lies right next to the heatsink to cool the board as a whole. The various chips throughout the board process the various graphical operations, while the VRAM contains all the space for memory needed for the processor's data to operate.

The "heart" of the GPU is the processor, which is also the largest component on the board. The processor does most of the heavy work, and most of that work is reflected by what you see on the monitor of your computer. Within the processor are "CUDA cores". CUDA (Compute Unified Device Architecture) is programming language created by Nvidia and is used to process video or to create calculations for software. The various video outputs transfer the data from the board to your monitor to display an image created by its operations. The various ports perform the same function, only with slight differences in performance. DisplayPorts can carry video and audio, and has been a top competitor against HDMI, because of higher resolution capability, up to 8K on newer models. HDMI was thought to be the end-all-be-all of display connections, until the introduction of DisplayPorts. Nowadays, they are capable of 4K image at a 60hz refresh rate. DVI-I and DVI-D are slightly dated ports, only being capable of 2560x1600 resolu-

[4] Detailed photos from different views of the video outputs can be seen on Pictures D, I, and J

tion image. Lastly, the Graphic Card Interface consists of a PCI Express port, which is used to connect the the GPU to the motherboard. The industry standard has been PCI Express.

Overall, I learned how much work and function lies within the GPU to simply create a display for the user. It's fascinating how many operating parts work together towards one task, and the work and innovation put into each component to improve the GPU's function and efficiency.

Work Cited

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