

HW: Assignment 4: GPU Architectures

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1.Difference between Intel and AMD GPU Architectures

From our experience, We feel that Intel ("**Integrated Electronics**") more inclined towards power consumption and performance for lower-end PCs. Most of the PCs has primary and secondary graphic cards. The Primary graphic cards in most of the PCs are supported by Intel's integrated graphic cards which supports photo editings, slight gaming, playing videos etc. AMD provides support for handling huge applications, hardcore gaming, and other performance-driven tasks. Here we take reference of AMD Radeon 530 and Intel's UHD graphics 630 to compare the Intel and AMD GPU architectures which are both found in entry-level desktops. Intel mainly focuses on adding a GPU that supports its CPU and which does simple video, audio rendering tasks. Intel UHD 630 is found in various notebook and desktop processors. The "GT2" version of this GPU offers 24 EUs(Execution Units) where the clocks depend on the CPU model of the host and also the UHD 630 has to access the main memory because it lacks dedicated graphics memory or eDRAM cache. The current Intel HD graphics are embedded into the Intel Processor itself unlike to that of AMD which are discrete that is own dedicated CPU and memory modules. The Radeon 530 is a dedicated entry-level graphics card for laptops. There are several different versions with 320 or 384 shader units and GDDR5 or DDR3 64-bit graphics memory using the same architecture as the Radeon R7. AMD claims that the clock speed of the Radeon 530 can reach 1,024 MHz. The integrated graphics pale when compared to dedicated GPU especially when considered high end-performance applications like gaming. The performance of the UHD Graphics 630 depends on many factors like L3 Cache, TDP, the maximum clock rate of the specific model and memory (DDR3/DDR4). AMD's GPU function as a General Purpose GPU rather than a GPU function only for designated graphics computations

and thus supporting high-end applications(huge graphical computations) unlike to Intel which supports general basic activity which is not GPU intensive.

2.Difference between Intel and Nvidia GPU Architectures

As we have already described the GPU architecture of Intel in the before comparison, now let's see the GPU architecture of Nvidia and later compare them. Nvidia is a discrete GPU that offers entry-level to high level professional graphic cards. Nvidia graphic cards have their own dedicated CPU and memory modules which are designed primarily for graphics processing and since it is discrete it also carries its own cores, pipelines, pixel shader and Texture Mapping units, etc. In recent years, Nvidia also introduced and developed many different features such as Raytracing Graphics (RTX series) and Deep Learning Super Sampling (DLSS) which are presently in demand. DLSS uses the built-in tensor Cores which uses AI to simulate high resolution rendering in games without any other extra overheads. Additionally, over the years, Nvidia has implemented CUDA (Common Unified Device Architecture) which allows the GPU to function as a GPGPU(General Purpose GPU). The General-Purpose GPU or GPGPU concept looks at utilizing the significant computational power of GPUs for general workloads rather than just graphics, outside of which GPUs sat largely idle. . This is significant because until this point GPUs had existed purely for graphics workloads with every aspect of their design accordingly specialized. Another feature on Nvidia cards is the presence of Physx PPU (Physics Processing Unit). Simply put this allows the GPU to compute the Physics effects like water flow, fire, explosion and other dynamic effects more realistically and efficiently. On the other hand, Intel mainly focuses on adding a GPU that supports its CPU and which does simple video, audio rendering tasks. Intel bundles its GPU with the chipset on your motherboard or with the CPU as in recent Core i series Processors. Due to limitations of design, these GPUs have limited cores, limited pixel shader units and pipelines, Texture Mapping Units as well. Intel GPUs are targeted at regular low-end computing whereas Nvidia's target audience is high-end computing like content creation and gaming.
