

## **CPU-GPU Processing**

The main CPU and GPU designing goal is to achieve higher performance in computing. A CPU is a must in a computer consisting few cores embedded with ALU and CU while a GPU consists of thousands of cores having access to a huge array of memory at once to enhance solving the same kind of problems parallelly. The GPUs is used for general purpose (GPGPU) computing like grid computing, machine learning and data mining, cryptography or neural networks, bioanalysis and in molecular dynamics. However, GPGPU vector processing is not the solution of everything and CPU still do much better than GPU for certain problems.

The CPU(s) and GPU were separate microchips but steps were taken to fuse them into a die sharing a single memory to reduce the memory latency due to the overhead in communication between them. Accelerated Processing Units (APUs), Fermi and Heterogenous Microchip were some such chips over time. It reduces cost and memory management is not required. It was not successful in the manner of using GPU for general purposes initially. GPU was controlled by CPU earlier but modern GPUs can be operated independently.

GPUs were used for image rendering but are used for general purposes to solve some problems that were processed by CPUs efficiently compared to the CPU with General Purpose GPU Architectures. Compiler and runtime system are then permitted to utilize a GPU as a general-purpose processor to increase performance. The CUDA by NVidia, DirectCompute by Microsoft, OpenCL by Apple/Khronos and OpenGL or DirectX are some the popular architectures which enable GPGPU pipelines without any need of data conversion in graphical form. Floating-point computation was impossible but adopted over time for GPGPU and high precision graphics processing.

Heterogenous Computing is an evolving architecture, improves latency between CPU and GPU and reduces power consumption and expected to be the future of CPU and GPU. It is designed as one chip consisting of two multicore CPUs for two specific tasks, and a GPU. Heterogeneous computing has all the benefits described above and is amazing that it can process video in HD to translation and interpretation in real-time.

- [1] Z. Memon, F. Samad, Z. Awan, A. Aziz and S. Siddiqi, "CPU-GPU Processing", IJCSNS International Journal of Computer Science and Network Security, Vol.17, No.9, September 2017. [Accessed on: 30- Dec- 2019] [Online].

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