Co-processors & GPUs

The main component of the computer that carries out operations and calculations is the central processing unit (CPU).

In earlier days of computing there was just a single CPU that controlled all instructions. Modern computers are more advanced with special co-processors being required due to raised demands.
These are specialised to carry out a specific task. They improve the overall speed of the computer by executing concurrently with the main CPU to relieve strain on the CPU. The CPU and a co-processor operate on different tasks at the same time.

Coprocessor = Any additional processor built into a system that is designed to handle a specific task (embedded processors), for example, a graphics processing unit, 3-D accelerators, sound cards.

Graphics cards are responsible for processing video data on a computer system. Most modern graphics cards will have a dedicated GPU processor (Graphics Processing Unit) and VRAM (Video RAM).

Some common types of coprocessors are

Floating point units (FPU)	These are built into the CPU and run floating point mathematical operations. These tend to be more processor intensive than standard arithmetic.
Digital signal processing (DSP)	Commonly used to process sound effects and merge sound channels so that they can be output in stereo or surround sound.
Graphics processing units (GPU)	Most modern computers have this installed on either the motherboard or on separate card in a PCI slot. They perform massively complex £D calculations needed by games.

The GPU is a graphics processing unit that performs rapid mathematical calculations to render graphics. They have a highly parallel structure with thousands of cores (each slower than a CPU core) specialised to handle large workloads of simple tasks.

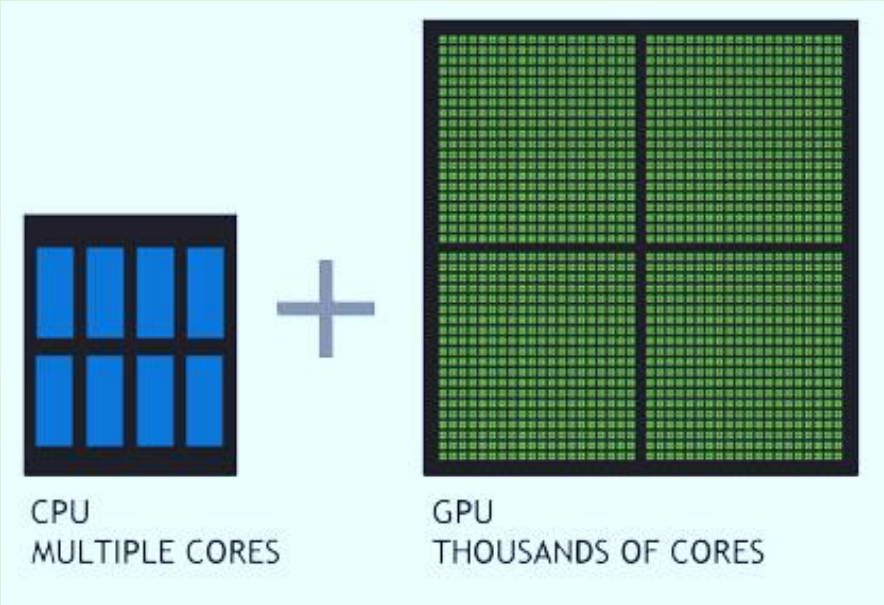
The large number of cores in GPUs over CPUs are exploited to handle **many strings of data parallel at the same time no matter** what the **data type** may be. This does not have to be related to graphics. While there are thousands of more cores in a GPU, each one runs slower with fewer features.

A GPU is specialised to carrying out **simple similar functions many times on large sets of data**. This is why having thousands of cores proves advantageous; in graphics processing often the same operations are required many times.

CPU		GPUS	
Complex operations to small data sets		Simple manipulations on larger data sets.	

They may be very useful in 3-D applications for **rendering lighting** and **transforms** of objects every time a 3-D scene is drawn. These are mathematically intensive tasks, which otherwise, would put quite a lot of strain on the CPU.

A **CPU consists of a few cores** optimised for **sequential serial processing** while a GPU has a **massively parallel architecture** consisting of thousands of smaller, **more efficient cores** designed for handling **multiple tasks simultaneously**.



Performance of GPUs

Videos are made up of a series of images called frames. Each is made up of a two-dimensional grid of pixels. The number of pixels is known as the resolution and the number of bits used to store each pixel is called the bit depth. The frame rate is the term used to describe the number of

frames(images) that are captured per second when recording a video. Higher frame rates refer to better quality as they appear smoother. However, the effect of high frame rates, bit depths, resolutions will put more demand on the GPU to process such graphical data.

Nowadays, GPUs can be used for tasks other than just graphics. Their highly parallel structure makes them more effective than general-purpose CPUs for any algorithms where processing of large blocks of data is done in parallel (e.g. weather modelling, sound rendering).