SOC (System On Chip)

What does System on a Chip (SoC) mean?

A system on a chip (SoC) combines the required electronic circuits of various computer components onto a single, integrated chip (IC). SoC is a complete electronic substrate system that may contain analog, digital, mixed-signal or radio frequency functions. Its components usually include a graphical processing unit (GPU), a central processing unit (CPU) that may be multi-core, and system memory (RAM).

Because SOC includes both the hardware and software, it uses less power, has better performance, requires less space and is more reliable than multi-chip systems. Most system-on-chips today come inside mobile devices like smartphones and tablets.

Components Of SOC

An SoC usually contains various components such as:

- Operating system
- Utility software applications
- Voltage regulators and power management circuits
- Timing sources such as phase lock loop control systems or oscillators
- A microprocessor, microcontroller or digital signal processor
- Peripherals such as real-time clocks, counter timers and power-on-reset generators
- External interfaces such as USB, FireWire, Ethernet, universal asynchronous receiver-transmitter or serial peripheral interface bus
- Analog interfaces such as digital-to-analog converters and analog-to-digital converters
- RAM and ROM memory

Advantages of an SoC

- An SoC consumes less power. Usually 90% of power consumption is in data and bus address cabling. Since all the components are on the same chip and internally connected, and their size is also very small, the power consumption is hugely decreased.
- A smaller size means it is lightweight and of small size.
- Overall, the cost of an SoC is small due to advancements in VLSI technology. As mentioned in the first point, cabling is not much required and so the cost of cabling is conserved.
- An SoC provides greater design security at hardware and firmware levels.
- An SoC provides faster execution due to high speed processor and memory.

Disadvantages of an SoC

- Initial cost of design and development is very high. If the number of SoCs is small, the cost per SoC will be very high.
- Even a single transistor or system damage may prove to be very costly as the complete board has to be replaced, and its servicing is very expensive.
- Integrating all systems on single chip increases complexity.

- It is not suitable for power-intensive applications.

Applications for System-on-a-Chip

- Digital Signal Processors
- Embedded Systems
- Video Decoders
- Mobile Phones
- Cable and Satellite TV Set Top Boxes
- Portable Media Devices

What is GPU(Graphics Processing Unit)

A graphics processing unit (**GPU**) is a **computer** chip that performs rapid mathematical calculations, primarily for the purpose of rendering images.

Need Of GPU

In the early days of computing, the CPU performed these calculations. As more graphics-intensive applications such as AutoCAD were developed; however, their demands put strain on the CPU and degraded performance. GPUs came about as a way to offload those tasks from CPUs, freeing up their processing power.

A GPU may be found integrated with a CPU on the same circuit, on a graphics card or in the motherboard of a personal computer or server.

NVIDIA, AMD, Intel and ARM are some of the major players in the GPU market.

GPU vs. CPU

A graphics processing unit is able to render images more quickly than a central processing unit because of its parallel processing architecture, which allows it to perform multiple calculations at the same time.

A single CPU does not have this capability, although multicore processors can perform calculations in parallel by combining more than one CPU onto the same chip. A CPU also has a higher clock speed meaning it can perform an individual calculation faster than a GPU. Therefore, a *CPU is* often better equipped to handle basic computing tasks.

Advantages of Graphic Card(GPU)

- Graphic or Video cards are small and slim that's why they are easy to handle and adjust.
- They have light weight.
- Actually graphic card has 4 main types but they have numberless model number.
- Their design is also simple and looks like a DVD player.

Disadvantages of Graphic Card(GPU)

To use graphic card in your computer, you need a special type of hardware as well.
The power supply of graphic card always remains open.
Length of the graphic card's power cable is small.

If they move from its place, then you need to open whole CPU to adjust or manage its location again.