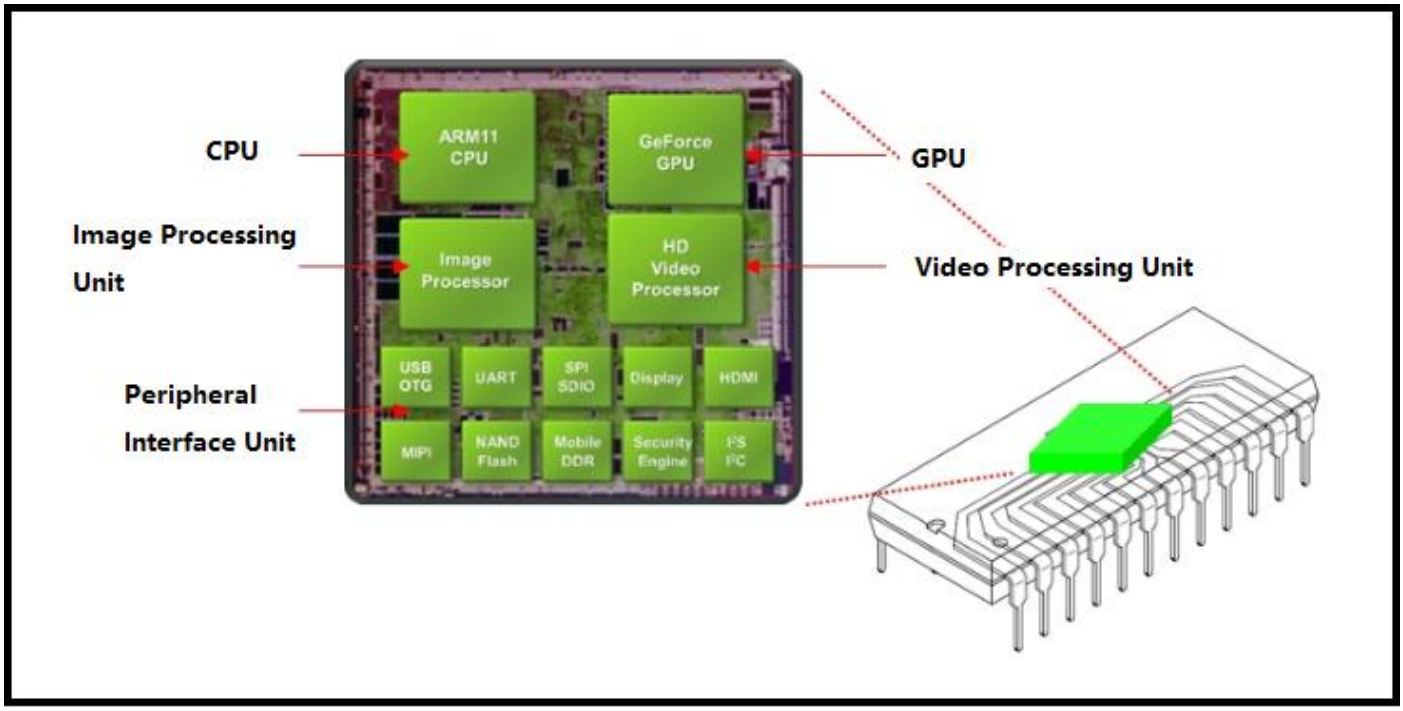
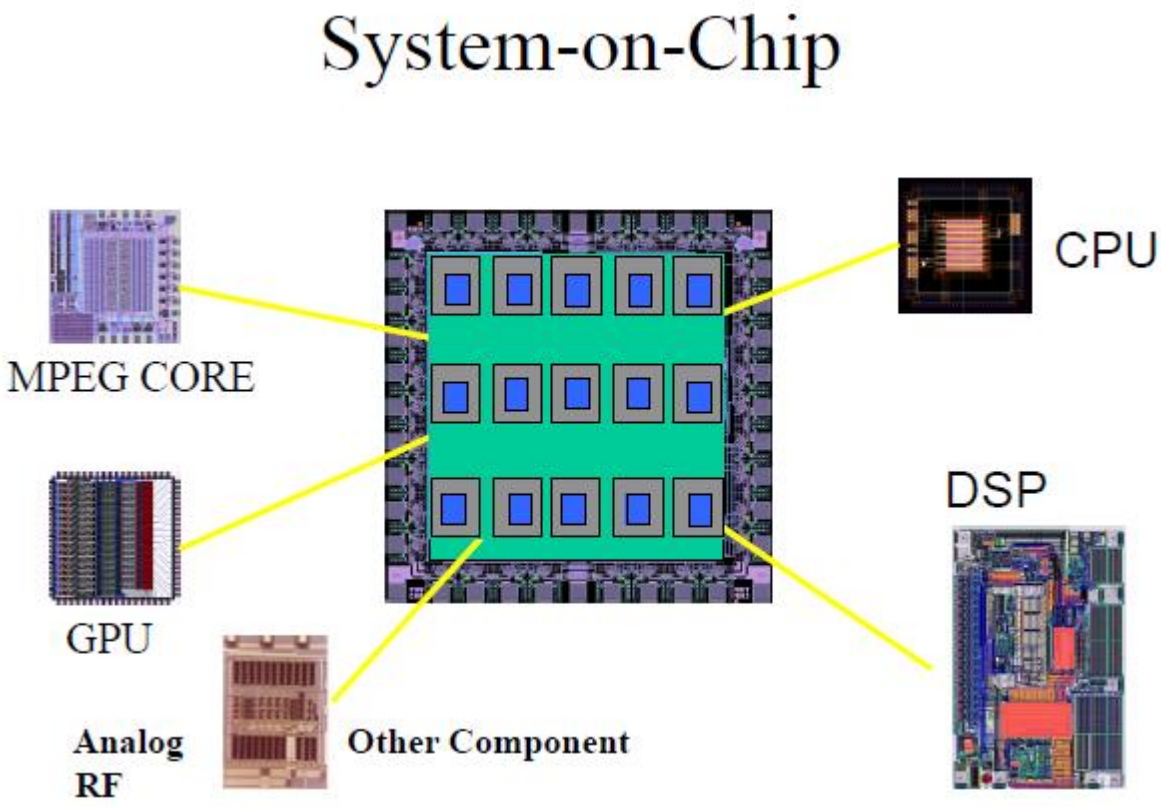
System on a Chip (SoC)

By : Mohamed Fezari

What Does System on a Chip (SoC) Mean?



Ilustration of some components in Soc: CPU,GPU, IPU, VPU,PIU Memories and Communication interfaces.



An exemple of contentof SoC

Meaning of Soc, many componentsintegrated into chip

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).

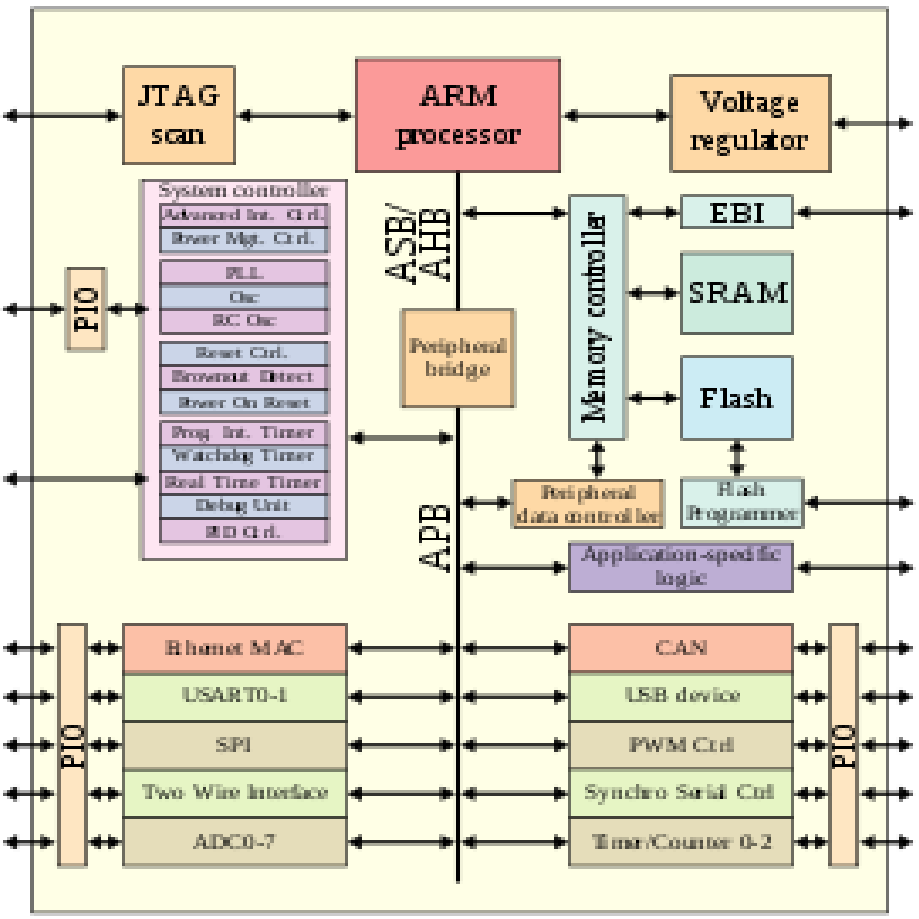
Because SOC includes both the hardware and software, it uses less power, has better performance, requires less space and is more reliable than multi-chip systems. Most system-on-chips today come inside mobile devices like smartphones and tablets.

Techopedia Explains System on a Chip (SoC)

An SoC is specially designed to meet the standards of incorporating the required electronic circuits of numerous computer components onto a single integrated chip. Instead of a system that assembles several chips and components onto a circuit board, the SoC fabricates all necessary circuits into one unit.

The challenges of an SoC include higher prototyping and architecture costs, more complex debugging and lower IC yields. IC is not cost

effective and takes time to manufacture. However, this is likely to change as the technology continues to be developed and employed.



Type of SoC based ARM Processor

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

Evolution: Boards to SoC

Evolution:

- IP based design
- Platform-based design

Some Challenges

- HW/SW Co-design
- Integration of analog (RF) IPs
- Mixed Design
- Productivity

Emerging new technologies

- Greater complexity
- Increased performance
- Higher density
- Lower power dissipation