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# Mobile Processors 101: Why smartphones are smarter with an all-in-one processor

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The performance of your smartphone is influenced by many factors, including the operating system, manufacturer, and wireless carrier. But there's one essential and often-overlooked element that's largely responsible for the speed, efficiency, and battery life of your smartphone—the processor. Here's a simple guide to how it works, and what makes an all-in-one processor so powerful.

## The Processor

The processor is the central hub of your smartphone. It receives and executes every command, performing billions of calculations per second. The effectiveness of the processor directly affects every application you run, whether it's the camera, the music player, or just a simple email program. Pick the wrong one and you could experience sluggish, stuttering

multiplayer game with 3D–intensive graphics or capturing 1080p video, the load put on a processor can be immense. The ability of the processor to coordinate efficient communication between all its components—the modem, graphics, and multimedia engines—is essential to smooth operation.

The CPU, GPU, audio and video engine, connectivity features (GPS, WiFi, FM), and 3G/4G modem are the major components of a Qualcomm® Snapdragon™ mobile processor that control the operation of some of the most powerful and power-efficient smartphones. In contrast, other processors may not integrate as many components, which is why the all-in-one name is key. Let's take a look at what a Snapdragon processor is designed to do, and how the parts of the processor work together to enable seamless actions.

- **CPU, or Central Processing Unit**. This is the "brain" of your smartphone. The CPU receives commands, makes instant calculations, and sends signals throughout your device. There are multiple ways to gauge the performance of a CPU besides checking the Gigahertz (GHz) speed or the number of CPU cores (a.k.a dual-core and quad-core). One of the most important ways to gauge performance is by looking at its supporting cast. In the past, the CPU handled the visuals that were sent to the screen in addition to its other duties, but the demands of high quality graphics led to the development of another component to lighten its load— the GPU.

- **GPU, or Graphics Processing Unit**. The GPU assists the CPU by handling the visuals, particularly the kind that are delivered on games and other graphically-rich applications. By offloading work to the GPU, your phone can do a much

and fast-moving objects won't appear pixilated. What's more, the GPU frees up the CPU, allowing it to conserve or redirect its resources.

- **Camera ISP (Image Signal Processor)**. An integrated Image Signal Processor provides the "oomph" for many of your smartphone's camera functions. It is designed to deliver a tightly bound image processing package and enable an improved overall picture and video experience. An integrated ISP can also be invaluable when it comes to things like instant image capture, high-resolution support, image stabilization, and other image enhancements.

- **Audio and Video.** A good processor will also have dedicated processing units that handle audio and video. In a Snapdragon processor, a component called the Digital Signal Processor (DSP) handles music playback and other audio processing scenarios that the CPU would otherwise have to do. The same applies to video capture and playback, for which there is a dedicated video engine designated to handle these tasks. The concept of distributing work among these areas is what makes processing so fast and efficient in a Snapdragon powered device.

- **Radio (RF Transceiver) & 3G/4G Modem**. These components control your connection to the world. Broadly speaking, the RF Transceiver receives and transmits voice connections and the modem enables your phone to send and receive digital signals. When enabled with 4G LTE, the radio and modem have a high-speed cellular wireless network at their disposal, capable of speeds that mimic your home Wi-Fi connection. When working closely with

Sometimes these components exist as different chips in a device, but the exceptionally powerful and power-efficient processors have all of them situated on a single chip. When they're grouped together onto the processor, it's referred to as "integrated." Bringing them closer together provides advantages for the operation of your phone, like faster communication and optimal battery life. Old-style, un-integrated processors and their scattered circuitry simply can't keep up. The pinnacle of the integrated design, though, is the "all-in-one" processor.

The all-in-one Qualcomm® Snapdragon™, is custom built to include the CPU, GPU, DSP, camera, radio, modem, and more. It also integrates voltage regulators for better power management, designed to improve battery life even further. By bringing all of these pieces together, and being the first processor to integrate a 4G LTE modem, Snapdragon processors are designed to provide amped up performance, improved battery life, smooth multitasking, and high-speed data. Many popular smartphones, like the Samsung GALAXY S4, the HTC One, and the Nokia Lumia, run on Qualcomm Snapdragon all-in-one processors.

## The Big Picture

You don't need to wrap your head around all of the billions of complex interactions inside your smartphone in order to appreciate how it works. An all-in-one processor hosts your phone's most essential components, driving your music, games, videos, Web surfing, email, and more. The more your processor is capable of, the more you're likely to enjoy your mobile device.

Find your next smartphone powered by a Snapdragon all-in-one processor.

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