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## A Comprehensive Survey on Contemporary Mobile Phone Processors

Dr. G. Shankar Lingam<sup>1</sup>

Professor, Dept. of CSE, Chaitanya Institute of Technology & Science, Warangal, Telangana, India<sup>1</sup>

**ABSTRACT:** Mobile processors form a massive and really rapid growing segment of semiconductor marketplace. Technological improvements have resulted in vital modifications within the processor design of mobile phones; remodelling the everyday mobile phones of 1990's to trendy proper phones. The appearance and preparation of mobile processors over the years is basically suffering from Communication, overall performance, and low power operation. The transition from analog to digital telecommunication has ended in mobile devices delivering a huge range of knowledge services. To help these services, processor design has currently emerged as some distance more superior. Mobile processors vicinity unit developing with every passing generation. The goal of this paper is to study several processor structures for mobile phones.

**KEYWORDS:** Mobile Processor, DSP, SoC, Qualcomm, Nvidia, ARM processors.

### I. INTRODUCTION

The processor is the "brain" of each devices. The Processor handles the instructions of the software applications. All mobile phones have a processor of a few different which can be integrated into the principle mobile smartphone chip, or be a separate PC chip. A faster processor lets in applications to run quicker. The pace of uncooked processor is measured in MHz or GHz. However a few processors are more effective than other processors, so even supposing two distinctive processors both run at a pace of 1 GHz, if one processor is more powerful, it could run software applications a good deal quicker. Other elements frequently affect the perceived pace of a mobile smartphone, For instance, the wireless radio and network determine how speedy the facts receives downloaded. Also, mobile phones may additionally have a separate image processor that determines the speed of visual elements, particularly with games and other regions with complex animations.

A mobile processor [1] is a device on a chip designed to support applications that are going for walks in a cellular smartphone's running device. A mobile processor affords a self-contained working environment that presents all device capabilities required to guide a mobile applications, together with memory management, graphics processing and multimedia. Mobile processors can be unbiased from other specialized processors inside the same tool, together with a phone's baseband processor. Some service manufacture their own mobile utility processors. Other companies buy their cell utility processors, the use of them as authentic device producer additives. For instance, the Qualcomm Snapdragon cell phone application processor is contained in lots of smart phones that use Qualcomm Snapdragon to run the Android mobile phone operating device and Android mobile packages. A huge style of mobile devices incorporate mobile processors, including characteristic mobile phones, smart phones, tablets, eReaders, netbooks, car navigation devices and gaming consoles.

### II. RELATED WORK

The configuration of the hardware platform presently used in Fujitsu's smartphones is proven schematically in Figure.1. The platform consists of a software processor, a modem (baseband), a twine- much less unit, and power supply, an audio LSI, synchronous dynamic random access memory (SDRAM), and flash memory. As described within the following subsections, various technology that form the center of the rapidly evolving application processor had been evolving swiftly.

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Snapdragon is a circle of relatives of mobile system on a chip (SoC) processor design provided by means of Qualcomm. In U.S. Markets, Qualcomm leads the approach in android phone implementations with the snapdragon SoC (System-on Chip) platform. Flower starts off evolved with an ARM-well suited principal processor center of Qualcomm's personal style. Currently, the valuable processor center in snapdragon processors is referred to as krait, and is loosely similar in velocity to ARM's Cortex A15 reference fashion. Paired with krait is Qualcomm's Adreno snap shots technology. This GPU line started existence at ATI under the brand name Image on, and turned into picked up by way of AMD in 2006 as soon as it purchased ATI. Two years later, AMD bought-out off the Imageon technology to Qualcomm that re-branded them Adreno. It's a nervy pass Qualcomm's part: Adreno is admittedly an anagram of Radeon, the brand call nonetheless utilized by using AMD for its snap shots cards. Qualcomm became initial out of the 4G LTE gate with an integrated SoC implementation for the Wi-Fi fashionable. This area Qualcomm at a large benefit in markets similar to the U.S., wherever LTE help became vital characteristic. Direct SoC integration moreover earned the snapdragon a right away numerous phones, because the unique is to function a separate LTE modem chip—hence elevating cost, strength usage and generating complexness for mobile phone makers.

Currently, the snapdragon 800 series is Qualcomm's high giving, that consists of up to 4 krait cores jogging at as much as two.46 GHz, and partnered with Adreno 330 pix. Arguably, this represents the foremost complete processor package deal for android devices nowadays, offering superb performance altogether regions among an inexpensive energy price range. Snapdragon-based totally devices additionally get themore proportion of publish-release study-most effective memory improvement from fans.

Just next door is that the snapdragon 805, a platform refresh that may feature faster krait cores, AN stepped forward Adreno GPU, and quicker RAM statistics measure. Oddly, Qualcomm's initial 64-bit mobile elements can arrive these 12 months in the fashion of the low- to mid-variety snapdragon 410. High-end factors location unit predicted quickly later.



Figure 1: Qualcomm Snapdragon Processor

ARM Cortex processors cores are categorized into the following variants:

- Cortex-A Processors (ARM Application Processors)
- Cortex-R Processors (ARM Embedded Real-time Processors)
- Cortex-M Processors (ARM Embedded Processors)

Securicor Processors (ARM Secure Processors) as an example, contemplate the design of ARM Cortex-A8 portrayed in Figure 4. This design is predicated on neon SIMD media and signal process technology for providing audio, video, and

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3D graphics to mobile applications. Instruction set design of ARM Cortex-A8 implements Thumb-2 instruction set encoding consisting of 16-bit long directions that need less external memory. AMBA (Advanced Microcontroller Bus Architecture) bus interface supports input and output information buses that are either sixty four or 128-bit wider. It performs L2 cache fills and non-cacheable accesses for each instructions and information.



Figure 2: ARM Cortex-A9 Processor

A single core ARM Cortex A8 processor with 1.4 GHz clockspeed was considered reasonably enough till 2011. In the year 2014, ARM processors clocked at 3 GHz will become a reality. These upcoming 20 nm manufactured processors are expected to offer 25% less power consumption and will allow up to 30% faster clock speeds. Mobile computing is gearing up for a drastic change this year with the advent of 64-bit ARM based processors which are expected to provide up to 50% performance improvement over existing 32-bit ARM processors. ARM's new Cortex-A50 processor series based on the ARMv8 architecture includes the Cortex-A53 and Cortex-A57 processors. The Cortex-A57 is a performance-oriented applications processor, while the Cortex-A53 is a power-efficient application processor.

In the near future, Android 5.0 will efficiently utilize the new ARMv8 64-bit architecture. Apart from the proposed 64-bit architectures, upcoming mobile phones will be equipped with 4 GB of RAM to support increasing complexity of 3D games on Android.

### 3.3 Samsung Exynos 5 Processor

Samsung has been producing SoCs based on ARM architectures for more than a decade. In fact, Samsung chips appeared in every iPhone released before the iPhone 4. Samsung's current Exynos series SoCs are fairly traditional ARM variants, featuring Cortex A9 and A15 cores, and ARM's own Mali GPU design. However, a few Samsung chips—such as the Exynos 5 5410 found in one variant of the Galaxy S4—use PowerVR's potent SGX core to handle graphics. PowerVR's excellent GPU designs are most commonly found in Apple products, which is too bad because Exynos could use a little love when it comes to GPU horsepower.

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Figure 3: Samsung Exynos 5 Processor

The Exynos 5 Octa features 4 “big” high-performance cores paired with 4 “little” cores that offer lower performance but big battery savings. While the Exynos 5’s raw CPU performance is generally superior to Qualcomm’s Krait performance, the Mali GPU falls behind competing Adreno and PowerVR graphics solutions. Samsung’s own Galaxy Note 3 implementation is a good example of this. The Note 3 variants featuring Snapdragon chips offer more features and a better user experience, despite being virtually identical to the versions that include Samsung’s own Exynos chips. A15 cores are power hungry, so ARM implemented a scheme called “big. LITTLE” wherein each high-performance core is shadowed by a lower-power, lower-performance core that takes over whenever workloads permit. The current crop of Exynos 5 Octa SoCs employs this feature to keep the A15’s appetite for power in check, although some implementations of big. LITTLE have cache issues that hinder performance.

Looking forward, Exynos 6 promises to bring cutting-edge 64-bit hardware and integrated 4G LTE to the table. Samsung says the caching problems that held back earlier variants of big. LITTLE have been resolved, and we should see Exynos 6 by springtime, perhaps in the Galaxy S5. That being said, Samsung’s phones and tablets are most appealing for reasons beyond processor performance, focusing instead on features such as advanced OLED screens and sophisticated stylus input. The conservative route of going with ARM’s reference designs allows Samsung’s engineers to look for more novel ways to differentiate their hardware. Given their market share, it appears Samsung may be on to something with this strategy.



Figure 3: Samsung Exynos 5 Processor

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Tegra is a SoC series for mobile devices developed by Nvidia. It integrates ARM architecture CPU, graphics processing unit (GPU), memory controllers, etc. on a single package. It enables high performance and low power consumption for audio/ video applications. Nvidia Tegra 4 processor is a quad-core SoC with increased GPU cores, faster clock cycles, and improved efficiency. The GPU architecture of Tegra 4 is shown in Figure 6. Vertices are processed by six VPE (vertex processing engine) units. Next, vertices are cached by IDX unit. Vertices are then passed to raster engine, which produces pixel fragments. Early-Z unit tests pixel fragments for Z-depth and passes only visible pixels. Early-Z processing in Tegra 4 GPU architecture results in improved performance and power savings. GPU includes four pixel fragment shader pipes which implement VLIW architecture. Each pixel shader unit also contains a texture filtering unit, with their own L1 and L2 cache. According to an analysis of upcoming ARM processors, it was revealed that Nvidia's Tegra 4 SoC beats the best Qualcomm Snapdragon processor in terms of performance. Though Nvidia have designed a technically faster SoC, but when it comes to power efficiency Qualcomm Snapdragon processors have an edge.

Nvidia has recently launched next generation mobile processor, Tegra K1. It is a mobile processor with 192 graphics cores for mobile gaming applications. Nvidia K1 was launched with a support for two versions: traditional 32-bit "4+1" ARM cores like Tegra 4, and dual core 64-bit version. It is said that Tegra K1 is even more powerful than either the Xbox 360 or the PlayStation 3



Figure 4: Nvidia Tegra Processor

This is a processor manufactured by Intel. It's supported X86 design averagely than on ARM system. Intel is currently serious about conquering mobile device market. The current version of Atom processors are totally different from those seen on netbooks. The Smartphone version has upgrade performance speed and fewer power consumption. Atom processors are good in analyzing websites and taking part in internet based games and videos. Recently Atom processors were created android suitable. With increased performance and since of recent changes, we are able to see slighter variety of handsets within the future from their partners Motorola and Orange. Intel Atom processors are the most effective preferred for using internet primarily based applications on Smartphones and Tablets. The list components mobile processors that go to require the market by storm very presently and also the ones that we want to observe out for within the near future.

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Figure 5: Intel Atom Processor

## III.CONCLUSION

Recently, cellular applications and cellular programmable processors have attracted a brilliant deal of attention. We charted embedded mobile processors, and offered their maximum vital characteristics, their system software, and related era. With more recent variations of mobile CPU's we are able to have greater powerful Smartphone with new GPU cores, memory interfaces, and lots of greater advanced functions. Future mobile SoC's will discover subsequent technology processor architecture to improve the tool performance. Mobile processing unit manufacturers are working tough to increase effective mobile phone devices. To assist next-technology data-centric mobile devices, processor structure must be designed considering new techniques.

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**Dr. G. Shankar Lingam** completed his MCA in Chaitanya Degree & P.G College and M.Tech in CSE from Ramappa Engineering College respectively. He is having teaching experience of more than 20 years in various Under Graduate and Post Graduate courses. He has guided lots of students in various Under Graduate and Post Graduate Research Projects. At Present, he is working Professor, Dept. of CSE, Chaitanya Institute of Technology & Science, Warangal, Telangana, India.