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REQUIREMENT OF ARCHITECTURE CHANGE IN MOBILE PROCESSORS AS COMPARED TO PC PROCESSORS

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Abstract :
In today's mobile phone dominating world, performance is the main challenge with the processor architecture designers. Various fields which requires high speed in processing like high definition Audio and Video, Gaming, and other Graphical applications are totally based on the mobile phones performance. With such a compact design of mobile phone circuit board, the increase in speed is the tedious task. We will consider various parameters those have impact directly on the performance of the microprocessor, also we will talk about the effect of those parameters on the architecture of mobile processor with respect to processor used in personal computer(PC). At last we will conclude with if there is a possibility of using same architecture and design of microprocessor in mobile phones that is used in PC.

***IndexTerms* -** High Speed computing, MIPS, ARM processors, DSP.

INTRODUCTION

Mobile phone has become a vital component of our daily life. Technological advancements have resulted in significant changes in the processor architecture of mobile phones; transforming the typical mobile phones of 1990's to modern smart phones. The design and deployment of mobile processors over the years is largely affected by Communication, performance, and low-power operation. The transition from analog to digital telephony has resulted in mobile devices delivering a wide range of data services. To support these services, processor architecture has now become much more complex. Mobile processors are growing rapidly with each passing generation. processors come in essentially two classes – mobile and desktop. Mobile processors, whether they be for laptops, smart phones, or IOT devices, are generally designed for efficiency first and performance second. Desktop processors being less limited by thermals and not at all by potential battery life, are by far the performance champs and will on average have more cache, higher stock and Turbo speeds, and higher TDP (Thermal Design Power).
Furthermore, the big players in the desktop chip-making market—Intel and AMD—don't have much say in the smart phone microprocessor market. Both manufacturers sold their smart phone divisions, deciding against competing with Qualcomm, Apple, Samsung, and other mobile chip manufacturing giants. That said, the Intel Atom CPU powers a handful of ASUS Zenfone models and there are rumors that they may re-enter the market during the upcoming 5G mobile generation. Smartphone hardware mainly consists of application processors (System-on-a-Chip), RAM (mobile SDRAM/mobile DDR), DSP, CPU (ARM processor), etc. Processors that are used for mobile phones are subject to design metrics that emphasize cost, time-to-market, and low power. Because of the constrained resources of power and cost, and the real-time computation requirements, the processors for use in mobile applications possess number of distinct characteristics such as limited programmability. Processor architecture of mobile devices delivering data services must provide support for much more complex user interface, dynamic operating environments, and support for additional services. To provide for these additional requirements, advanced architectures may include multiple DSP's or hardware coprocessors. Here are some mobile processor manufacturers:

- Qualcomm Snapdragon
- Apple Mobile processors
- Intel Atom and Core M processors
- Nvidia Tegra
- MediaTek
- HiSilicon
- Samsung Exynos.

I. OBJECTIVE

The objective of this paper is to find out the knowledge about necessity of processor models and their uses in different motherboards. Mobile microprocessors use much of the same terminology as their desktop counterparts, but they are different. In fact, processors come in two classes: mobile and desktop. Furthermore, the “mobile” tag is a little misleading as it covers such a broad spectrum of devices; smart phones, laptops, internet of things (IoT) devices, and more.

II. RESEARCH METHODOLOGY

APPLICATIONS COMPARISON

Table 2.1: comparison for Applications for different parameters

Parameters	Desktop application	Mobile application
Screen size	Due to larger screen size, user can see most of the contents on a single page	Due to smaller screen size, user has to scroll up and down to see the contents
Font visibility	Fonts are clearly visible due to big screen size	Font visibility is not good due to small screen size
Processor speed	Interfaces can be generated fast due to high processing speed	Mobile have less processing speed due to cost and battery life so interface generation sometimes have lags
Requirement for dynamic generation	Xhtml is used to generate dynamic interfaces	Required data is extracted from xhtml to generate dynamic interfaces
Output	Output is shown in a web browser	Output is shown as a separate activity within application

A. Mobile and Desktop Processor Differences

There are a few key differences between smartphone processors and desktop processors that set the latter apart.

1. CPU Architecture: System on a Chip
2. Instruction Set Architecture: ARM vs. x86
3. Power and Heat

CPU Architecture: System on a Chip

When we talk about a desktop CPU, we invariably are referring to that specific piece of hardware. A desktop CPU is the brain of the computer. When we talk about a smart phone CPU, the term “processor” more closely refers to the System on a Chip (SoC) architecture. While your PC's technical specs change, its function remains the same. Here we're going to set out exactly what each component does, why it does it, and why that is important. the SoC is a single chip roughly the same size as a desktop CPU, but it also houses a GPU (a graphics processing unit, another separate PC component), various radios, sensors, security layers, and device features. Remember, manufacturers pack all of this into a single chip. The following image shows the Samsung Galaxy S8’s Exynos 8895 SoC CPU capabilities. That’s a lot of punch, requiring a lot of power. Consider that all of those components are separate hardware on a desktop.

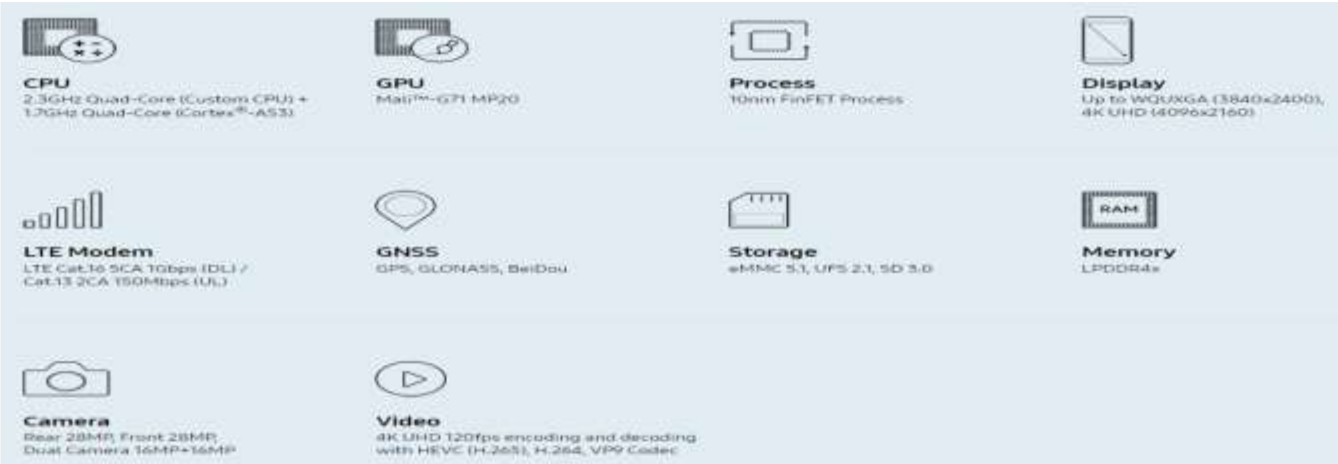

Figure 1: components associated with processor in desktop

2. Instruction Set Architecture: ARM vs. x86

The second CPU architecture aspect to consider is the overall CPU design. Intel licenses their x86 CPU design to AMD and VIA Technologies. Regardless, the Intel design dominates the desktop processor market. x86 CPUs are designed for high-end computational power, able to execute millions of instructions. And because your desktop computer draws power directly from the socket, the CPU can go wild, resulting in more powerful machines (as well as more heat!). Smart phones are different. ARM design and license the majority of smart phone processors to manufacturers such as Qualcomm, Apple, and so on. But the key difference is knowing that an ARM smart phone microprocessor design favors both performance and battery life, rather than the outright power of a desktop CPU. Here's why.

- **ARM SoC CPUs** use what is known as Reduced Instruction Set Computing (RISC). RISC instruction sets are smaller, require less energy to process, and complete quickly, freeing up system resources or allowing the device to "idle" to save battery.
- **Intel x86 CPUs** use what is known as Complex Instruction Set Computing (CISC). CISC instruction sets are vastly more complex, adding together strings containing multiple instructions. In addition, all modern CPUs use something known as microcode. Microcode is the type of internal CPU code that tells the CPU what actions to perform, breaking down operations into minute instructions. But microcode also works differently on RISC CPUs. Because RISC instructions are already comparatively small, breaking them down into smaller microcode operations is faster.

3. Power and Heat

CPU marketing tells us to look at the number of cores and the clock speed of the processor. But smart phone processor values differ in two ways: First, they do not correlate to desktop CPU measurements and, second, they are somewhat misleading because of this. The numerical values don't illustrate the other important side of smart phone CPUs: power generation versus heat dissipation. When the processor runs, it generates heat—a lot of it. A desktop CPU dissipates heat using a fan or heat sink; your smart phone CPU doesn't have that same luxury. Also, the smart phone CPUs are packed into a confined space, sometimes in your hot pocket, next to your hot leg, on a hot day… getting really hot.

Why Your Android Phone Is Overheating and How to Stop It Why Your Android Phone Is Overheating and How to Stop It Is your Android phone overheating? We show you why your phone gets hot, how to cool it down, and keep it from heating up again. Smartphone CPU manufacturers know this and, as such, limit the overall speed with which the processor can run. A desktop CPU might advertise its consistent running speed, whereas a smart phone CPU is likely advertising its theoretical maximum capacity.
Take this example. The average Intel i7 CPU produces around 65-watts of heat; an ARM-based SoC CPU only produces around 3W—around 22 times less than the Intel chip. To be fair to Intel, we're comparing a grape to a watermelon. The latest Intel Atom chips (designed for mobile and smart phone devices) have much better heat dissipation, as you would expect.

So, in theory, ARM could develop smart phone SoC CPUs that vastly increase clock speed—but your smart phone and its battery will critically overheat and die. And the good people at ARM really do not want that. In some cases, smart phones are replacing desktop and laptop solutions. Recent handsets easily multitask, running multiple applications concurrently. Furthermore, the sheer range of apps available on Android and iOS means that finding desktop-equivalent apps is simple. Many of your favorite desktop apps have mobile equivalents too, like Microsoft Word. And then there are integrated docking systems. Continuum was introduced by Microsoft with the release of Windows 10, allowing you to connect your smart phone to a screen. Similarly, Samsung's DeX Docking Station connects to a screen and mirrors your smart phone display. In both instances, you can somewhat rely on your smart phone as a productivity hub. However, those using resource heavy software will continue to rely on more powerful desktop solutions. (There's heaps of hardware to help you out, too.)

III. RESULTS

The Question comes here is "Will Smart phones Ever Match Desktops"? In all honesty, it is difficult to say. Desktops should retain their dominance because smart phones are critically limited by their battery power and capacity. It is hard to imagine a time when smart phones are more powerful than the latest desktop CPU—but never say never. The key thing to remember is that smart phone and desktop CPUs have different expectations and different goals. Measuring them accurately against one another isn't always useful because of the vast differences in usage, as well as the continually shifting smart phone market. Today's smart phones can do more than just call or message. They are equipped with features like Bluetooth, Wi-Fi, NFC, USB connectivity. Even the basic smart phones come with an accelerometer, gyro sensor, GPS, proximity sensor and some top end smart phones even come with heart rate monitors.

IV. CONCLUSION AND FUTURE WORK

So does a laptop with a desktop processor mean better performance? In short, yes. Because desktop processors have higher clock speeds and less power restrictions than their mobile brethren, you'll get much better performance, especially with higher demand applications like photo manipulation, 3D design, and video editing. The downside is that desktop processors do run warmer and because of the higher power draw, are not conducive to long battery life, so it is a bit of a trade off. Make sure you choose appropriately for your specific use-case and applications.

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