Commentary and Analysis...
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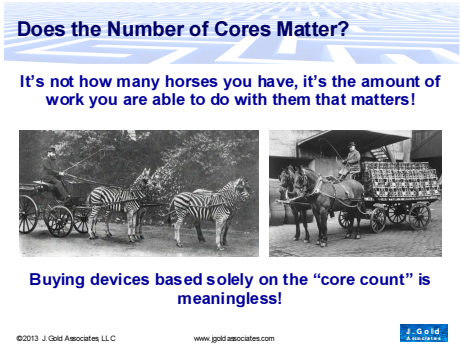
The Battle for Mobile Chip Supremacy

A battle is simmering in the mobile device chip market, and all the vendors are trying to out maneuver each other for a leadership role.

In the past, smartphone and tablet marketing has been about OS, amount of memory, screen size, device thinness, battery life, best high speed connectivity, color, etc. Lately, we've seen a new approach – touting the prowess of internal technology by enumerating the number of "cores" inside. It's a "Core the Merrier" approach to marketing mobile devices. But is that a reasonable method to evaluate device prowess? Generally, the answer is no.

Some chip vendors see highlighting their device's core count as a way to fight for consumer awareness, After all, 4 must be better than 2, right, just like 64 bits must be better than 32 bits? Not necessarily. The questions that need to be asked are just what is a core, and can my device really utilize each of the cores effectively?

Recently, some device makers have claimed they have dozens or even hundreds of cores in their mobile chips. That's a stretch of what would normally be considered a core. It's not how many but what you do with them that counts. Many optimized 4 cylinder cars can run rings around general purpose 8 cylinder ones for fuel economy, speed and user experience. Most software (OS, apps) can't fully utilize the increased number of cores in any event. No phone OS is currently optimized for 8 cores let alone the apps. So how do more cores help the user experience?



It's a "Heterogeneous Computing" World

Optimizing overall chip performance without trading off device size, battery life, and network connectivity is an important compromise that all product vendors make. Is it better to perform a task in a specialized "functional core" in the chip, or to do it in software in the general purpose CPU? Users are demanding extreme graphics (e.g., HD, 4K, gaming), advanced camera functions (e.g., real time multi-image processing), true multi-tasking, multi-radio and LTE+ connectivity, etc. This is what "Heterogeneous Computing" is all about.

As a result of ever increasing consumer expectations, chip creators have to design internal functions for speed, cost, performance, battery life, time to market, etc. What is becoming apparent is that those vendors who have expertise in specialized functional cores (e.g., graphics

processor unit (GPU), digital signal processing (DSP), wireless modems) have a design advantage over those vendors that don't and who consequently need to compensate by running algorithms in general purpose CPUs. Adding a bit of task-specific silicon adds little cost to the chip, but has dramatic benefits in performance, battery life and functional software design through optimized hardware acceleration. Getting a task started in silicon and completing it quickly as compared to slower general purpose code running in the CPU dramatically reduces power drain and positively increases user experience.

Finesse vs. brute force

Just throwing cores at things does not mean the overall chip is better or that the resultant device will be superior. Brute force does not always win, especially with all the required tradeoffs in mobile (e.g., size, heat, battery, radios, screen, camera, I/O). Optimum performance and execution are the weapons of efficiency and can add significantly to battery life (by as much as 25%-30%). Vendors who employ a balanced approach by including frequently used functions in hardware and providing maximized algorithms for designers (e.g., image processing, video conversion, audio optimization, streaming) enable a more efficient end product, with reduced processing time and battery drain, and they get to market faster as a bonus.

How tightly coupled the functional blocks are, how they all interact, and how well the code execution works is an important consideration in enhancing overall user satisfaction, both at the OS and app level. Knowing how best to trade off hardware acceleration with general purpose computing algorithms only comes from knowledgeable designers who have lived with the problems in successive generations of devices. Experienced chip vendors have both a technological and experiential edge when it comes to these problems. Many of the newcomers are still learning, and have been trying to acquire needed technologies (e.g., GPU, modem, DSP).

There are a great number of ARM licensees producing chips for mobile devices. Some are veterans while others are relative new comers. Some have deep graphics experience to parlay (e.g., NVidia, AMD, Imagination Tech, Qualcomm), while others have depth in modems (e.g., Qualcomm, Intel/Infineon, Broadcom), and still others expertise in CPUs (e.g., MediaTek, Qualcomm). But in looking at the field of players and their breath leads to the conclusion that Qualcomm has the largest amount of expertise amongst the current ARM-based mobile players.

Conclusions: Users looking for the best overall performance in mobile devices should not be swayed simply by the number of cores claimed by the vendor. Performance and user experience are not directly related to the core count. What's more important is to find devices powered by highly tuned chips that take maximum advantage of needed hardware and software optimizations. This is the only way to get the best device that maximizes battery life, user experience and advanced functionality in a cost effective package. We expect more marketing emphasis going forward on which manufacturer's chips are powering the products. Chips powering the new age mobile devices are not all created equal. Buyer beware!

Commentary written by Jack Gold, Principal Analyst.
For more in-depth comments or analysis on this or other subjects, feel free to contact us.

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