

Best Ways to use Billions of Devices on a Wireless Mobile SoC

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Abstract

A rapid growth in the field of Information Technologies (IT) over the last decade gave us unimaginable possibilities and lots of convenience in our life, *i.e.* high-speed Internet, mobile-TV, High-definition digital TV, 3D-gaming, mobile multimedia player, Ultra-Mobile PC and so on. Nowadays, the technology is even exceeding market demands. Apple produced 160GB iPod which stores 40,000 songs. Samsung showed a world-first mobile phone with 10Megapixel camera on it. HSDPA-based video telephony service was commercialized in Korea.

In near future, a CMOS integration technology will enable us to put a billion of transistors on a single chip. This is a great opportunity undoubtedly, but it can be also a hazard to IDM or fabless companies. Recently major IDM companies have chosen to take fab-lite model and foundry joint-development programs because of skyrocketing expenses of nanometer processes development [1]. As the SoC NRE cost also increases exponentially with the system complexity, a single failure in a product or a project can bring an unrecoverable damage to the company. Therefore a market-oriented and market-driven approach should be taken rather than a technology-oriented or product-driven approach.

In the approach, a SoC development project must be kicked off by surveying market requirements first. In the wireless handset market for example, there are customers' requirements such as (1) wireless broadband access, (2) ubiquitous connectivity, (3) less frequent battery recharging, (4) stylish look, and (5) low-cost hardware. These requirements can be translated into more technical and engineering terms as shown in second row of the following table. These requirements bring up Modern SoC design issues such as high-speed protocol processing, programmability and reconfigurable hardware for multi-standard support, system-level low-power design, and system integration issues. These design challenges are more crucial in a wireless SoC market rather than the ultra-high-density integration issues.

In this panel discussion, we will discuss the various solutions to deal with these wireless SoC design issues and their solutions as elaborated in the last row of the table. These solutions will finally lead us to the best way to use billions of devices on a chip.

References

- [1] Jackson. Hu, "Recent Business Model and Technology Trends and Their Impact on the Semiconductor Industry," IEEE Asian Solid-State Circuits Conference, pp. 139-142, Nov. 2007

TABLE I Market Requirements, SoC design issues and solutions for Wireless Mobile SoC

Market Requirement	Wireless Broadband Access	Ubiquitous Connectivity	Less frequent battery re-charging	Stylish Look & Low-Cost
Technical & Engineering Terms	Higher-bandwidth Real-time computing	Multiband-Multimode Seamless Handover	Lower Power Wireless battery charging	Elegance User Interfaces Intuitive I/O device Smaller Form-factor Less discrete parts
SoC Design Issues	HS Protocol Processing Memory Bandwidth	Programmability Reconfigurability	Ultra Low-Power	System Integration
Solutions	Multicore computing Networks-on-Chip Embedded Memory GALS clocking	Software-Defined-Radio Reconfigurable-Processor	Cross-layer Power-Management	SoC / SiP / 3D-LSI Fault-tolerant architecture