Freescale QorIQ Qonverge Macrocell Base SoC Delivers Industry’s Highest Performance

Multi-sector B4860 system-on-chip combines 28-nm process technology, multimode support and optimal cost/power

Freescale Semiconductor is debuting its first large cell base station-on-chip product built on the innovative QorIQ Qonverge multimode platform. The new QorIQ Qonverge B4860 baseband processor delivers higher performance than other macrocell base station-on-chip SoCs supporting the LTE, LTE-Advanced and WCDMA standards. Offering unequaled throughput and capacity, the single-chip B4860 solution is compatible with Freescale’s QorIQ Qonverge small cell products and integrates efficient, high-performance cores, application-specific accelerators and optimal power/cost ratios.

Freescale introduces the B4860 product a year after announcing its QorIQ Qonverge small cell series as the first portfolio of multi-standard products sharing the same architecture and spanning from small to large cells. The QorIQ Qonverge portfolio of software-compatible base station-on-chip products is built on a common architecture integrating Power Architecture® microprocessors, StarCore digital signal processors and wireless acceleration technologies on a single chip. The architecture is based on proven technologies deployed in base stations of all sizes and supports software reuse, helping customers extend the value of their R&D investments.

“Freescale’s QorIQ Qonverge macrocell products provide the performance, energy efficiency and cost effectiveness that OEMs and service providers need to help address challenges associated with the growing tsunami of wireless data worldwide,” said Tom Deitrich, senior vice president and general manager of Freescale's Networking & Multimedia Solutions Group. “The QorIQ Qonverge B4860 macrocell baseband processor allows OEMs to develop differentiated products that help service providers ramp LTE, begin to deploy LTE-Advanced and address the stringent cost requirements of WCDMA base station processing.”

The B4860 macrocell baseband processor utilizes Freescale’s intelligent integration capabilities and advanced 28-nm process technology to deliver a significant leap in computational capacity, offering more than 21 GHz of raw programmable performance. The macrocell SoC integrates four dual-thread, 64-bit e6500 Power Architecture cores with AltiVec SIMD engines running at up to 1.8 GHz. The e6500 core is ideal for Layer 2, control and transport processing, and incorporates an enhanced version of the proven, high performance and widely adopted AltiVec vector processing unit, which boosts performance for Layer 2 scheduling algorithms. The e6500 core has achieved the highest CoreMark® benchmark performance-per-watt profile ever recorded for an embedded processor. The B4860

also integrates six all-new, high performance SC3900 StarCore FVP cores running at 1.2 GHz. Together, these technologies provide a balanced, programmable architecture for all baseband digital processing layers for next-generation base stations.

"Featuring next generation processing cores, intelligent integration, and software compatibility across the QorIQ Qonverge family of base station-on-chip products, Freescale's B4860 processor is impressive technology," said Stéphane Téral, principal analyst, Mobile Infrastructure and Carrier Economics for Infonetics. "This new device clearly places Freescale in the lead for performance in the base station-on-chip space, while directly addressing multiple needs of OEMs and service providers alike."

The B4860 is one of the first single-chip LTE base station products to support three sectors of 20 MHz, and is designed to replace today's channel cards that can include up to six discrete devices. In addition to simplified design and board-level efficiency resulting from reduced part counts, the B4860 provides 4x cost reduction and 3x power reduction compared to similarly deployed discrete solutions. It is one of the only solutions on the market that supports a true macro base station capable of processing from antenna IQ samples to backhaul IP network, and one of the first SoCs to comply with the LTE-Advanced standard (3GPP release 10, dated March 2011). It also supports Multi-RAT (i.e. multi-standard) and Multimode (i.e. LTE-A, LTE and WCDMA) standards simultaneously.

Introducing new StarCore SC3900 DSP technology

A major contributor to the B4860 processor's ultra-high performance is Freescale's all-new SC3900 StarCore DSP core, which recently earned the highest fixed-point BDTIsimMark2000™ benchmark score ever recorded by independent signal-processing technology analysis firm Berkeley Design Technology, Inc. (BDTI). At 1.2 GHz, the SC3900 core registered a BDTIsimMark2000 performance benchmark score of 37,460 – a mark nearly 2x higher than competitive DSP offerings in the market. (The BDTIsimMark2000 provides a summary measure of digital signal processing performance. See www.BDTI.com [1] for details.)

Key enhancements to Freescale's previous-generation StarCore technology include 32 MACs of 16-bit per cycle, the addition of baseband specific instructions, improved control code execution, up to eight instructions per cycle and up to eight data lanes vector in a single instruction (SIMD8). Other advancements include high memory bandwidth, core clustering and full hardware cache coherency within the core and throughout the whole device. SC3900 FVP cores are fully programmable and enable highly efficient and flexible implementation of the PHY layer for software definable radio systems supporting existing and next-generation wireless standards including LTE, WCDMA, TD-SCDMA, WiMAX and LTE-Advanced.

Freescale's MAPLE-B baseband acceleration platform, in addition to its support for FEC, FFT and UMTS chiprate processing, enables the development of advanced receiver algorithms such as parallel and successive interference cancellation techniques, single and multi-user MIMO, LTE relay and carrier aggregation for

improved spectral efficiency. This capability enables significant reduction of processing latencies compared to conventional techniques. Multicore cache-coherent fabric brings single core programming simplicity to the multicore SoCs. Industry standard interfaces ensure interoperability and built-in future-proof scalability with CPRI, Serial RapidIO, 10G Ethernet and PCI-express interfaces. Precise partitioning for system software is supported with best-of-breed DSP cores and baseband acceleration for Layer 1 processing and CPU cores with security and IP packet acceleration for Layer 2, control and transport processing.

Market traction

Industry leaders Fujitsu and Alcatel-Lucent have a long track record of using the key technologies powering the QorIQ Qonverge B4860 baseband processor, and Alcatel Lucent is already planning lightRadio™ base station designs built on Freescale's QorIQ Qonverge B4860.

"Game-changing solutions like Alcatel-Lucent's lightRadio™ that bring flexible mobile broadband capacity anywhere while producing dramatic cost and energy savings need components that provide giant leaps forward such as Freescale's new chip technology," said Wim Sweldens, president of Alcatel-Lucent's Wireless Division. "Freescale's large cell QorIQ Qonverge platform provides the integration, performance, energy efficiency and unmatched scalability that our innovative lightRadio™ product portfolio requires."

"We have had success using Freescale's current-generation QorIQ and StarCore products and are pleased that Freescale is advancing its silicon such that both of these high-performance technologies are integrated on a single chip," said Minoru Sakata, President, Access Network Business Unit of Fujitsu Limited. "We look forward to the opportunity to use Freescale's latest QorIQ Qonverge products to create even higher-performance base station solutions, while balancing power and BOM costs."

Enablement tools and software

Freescale offers a rich ecosystem of products and services to support the B4860 family, including the CodeWarrior Integrated Development Environment (IDE) based on Eclipse technology to provide a highly comprehensive multicore development environment. Available tools include the B4860QDS development board, C optimizing compilers for Power Architecture and StarCore platforms, multicore source level debugger, core and device simulators, optimized device drivers and software analysis tools for profiling and program/data trace. In addition, Freescale's partner network offers highly efficient DSP and MPU operating systems with BSPs and optimized device drivers.

Availability

Freescale expects to begin sampling of QorIQ Qonverge B4860 devices in Q2 2012.

For more information, visit www.freescale.com/QorIQQonverge [2].

Posted by Ron M. Seidel, Editorial Intern

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Links:
[1] http://www.BDTI.com
[2] http://www.freescale.com/QorIQQonverge