



QorIQ Processing Platforms

QorIQ Communications Platforms

A smarter approach to multicore

The QorIQ communications platforms encompass a new level of performance and low power for Freescale's networking product portfolio. They span the market with a broad range of solutions from single- to dual- to multicore devices. These products are all built on Power Architecture® technology and include both 45 and 28 nm process technologies, with a roadmap to future technology nodes.

QorIQ platforms are PowerQUICC evolved, meaning Freescale is leveraging our embedded processing heritage into the next era of networking. To date, Freescale has shipped

more than 250 million communications processors, and we bring forward much of our tried and true PowerQUICC IP, as well as new innovations, into the QorIQ communications platforms. The PowerQUICC and QorIQ product lines will coexist in the marketplace for a long time, offering a cohesive roadmap to the future.

Freescale introduced the first QorIQ P series products in 2008. Today, we have more than twenty P1–P5 products in the market. The next generation of processors, the Advanced Multiprocessing (AMP) series was recently

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QorIQ Communications Platforms	QorIQ Qonverge Platform
<p>AMP series (T1 to T5)</p> <ul style="list-style-type: none"> • Advanced multithreaded e6500 64-bit Power Architecture cores <ul style="list-style-type: none"> ◦ Up to 24 virtual cores ◦ AltiVec technology • CoreNet coherency fabric and enhanced acceleration engines for data path, security, pattern matching and decompress/compress • Cascading power management • Hardware virtualization and advanced debug • 28 nm process technology 	<ul style="list-style-type: none"> • Industry's first comprehensive portfolio of multimode solutions • Heterogeneous processing platform <ul style="list-style-type: none"> ◦ e500 Power Architecture® cores ◦ StarCore SC3850 DSP technology ◦ MAPLE multimode baseband accelerator ◦ Acceleration engines for security and data path • 45 nm process technologies
<p>P series (P1 to P5)</p> <ul style="list-style-type: none"> • Enhanced Power Architecture cores <ul style="list-style-type: none"> ◦ e500 32-bit core (P1–P2 series) ◦ e500mc 32-bit core (P3–P5 series) ◦ e5500 64-bit core (P5 series) • CoreNet coherency fabric and acceleration engines for data path, security and pattern matching • Hardware-assisted hypervisor and on-chip debug • 45 nm process technology 	



announced with products beginning in 2012. These processors will be designated as T1–T5.

The QorIQ Qonverge platform was announced in early 2011 and offers heterogeneous cores consisting of Power Architecture and StarCore DSP technologies. In addition, the QorIQ Qonverge platform integrates wireless acceleration technologies to form base station-on-chip products optimized for next-generation femtocell, picocell, metrocell and macrocell base stations.

With our QorIQ platforms, Freescale remains your long-term partner for embedded communications. We have the level of expertise and ecosystem engagement needed to help make your next-generation products a success.

Performance

When gauging multicore performance levels, it's important to not only consider the total aggregate frequency of the cores, but also the full system-on-chip (SoC) architecture. Freescale's QorIQ architecture excels on both counts. Two highlights of the architecture are our cores built on Power Architecture technology and acceleration engines—both of which advance performance while lowering the complexity of the software environment.

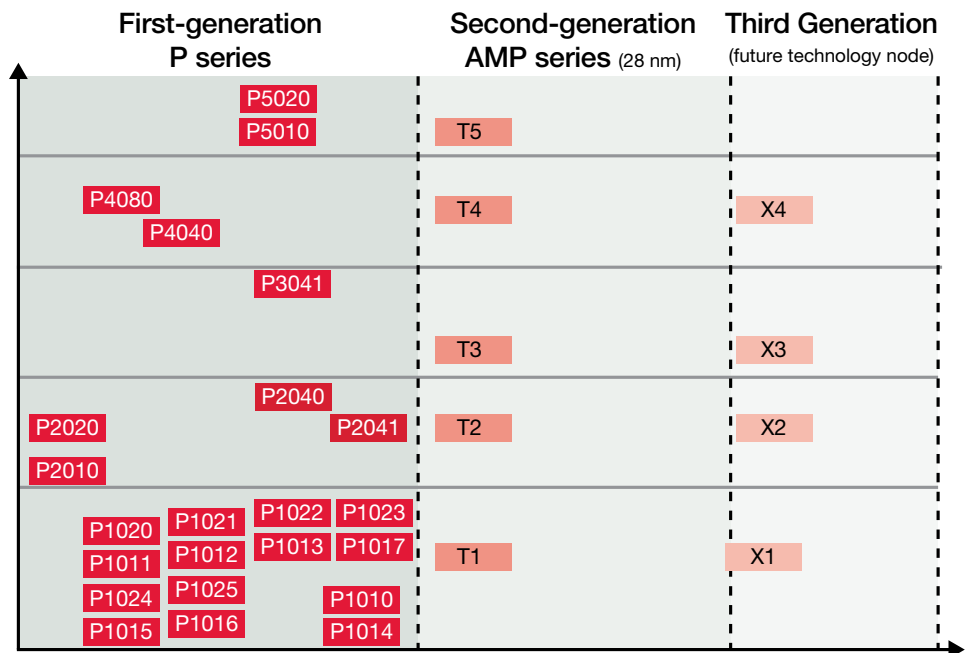
High-performance cores built on Power Architecture technology: Do more with fewer cores

The QorIQ communications platforms consist of Freescale cores built on Power Architecture technology for scalability and compatibility.

- e500 32-bit core operates up to 1.2 GHz for P1 and P2 processors
- e500mc 32-bit core operates up to 1.5 GHz for P3 and P4 processors
- e5500 64-bit core operates at up to 2.2 GHz for P5 processors
- e6500 64-bit multithreaded core with Altivec technology operates up to 2.5 GHz for the AMP series of processors

These are the most advanced cores available in an embedded multicore architecture today. Thanks to the high-speed CoreNet

QorIQ Communications Platforms Roadmap



fabric, there's no contention for resources in the high core-count processors. Each core is able to operate fully independent of the other cores. Accesses to memories, data path accelerators and network interfaces are completely contained, ensuring safe and autonomous operation of multiple individual operating systems.

Advanced acceleration engines

For many applications, more cores may not result in increased performance. By offloading fixed function processing to acceleration engines, the cores are more readily available to perform core processing tasks. This distribution of processing results in a more balanced and efficient SoC.

We've been integrating data path processing for many years. However, the bandwidth-intensive multimedia and mobile traffic affected by social patterns and new services creation (for example, social networking and video conferencing) are driving new demands for network architecture responsiveness. By working in concert with the cores, Freescale's data path acceleration architecture (DPAA) enables very high networking performance while executing dynamic network functions: parse and classify, load steering, network acceleration and multi-level prioritized queuing.

With this increase in mobile traffic come inherent security risks throughout the network. By integrating security and pattern matching functions in hardware, overall system performance is improved through the reduction of software demand on the cores. Additionally, the QorIQ platforms incorporate a trust architecture, which is a set of hardware and software techniques designed to support a trusted boot environment and maintain the trusted environment during runtime.

The AMP series of processors introduce the decompress/compress engine (DCE) targeting the data center with its need to transfer large blocks of data across the infrastructure. The DCE supports the raw DEFLATE algorithm (RFC1951), GZIP format (RFC1952) and ZLIB format (RFC1950), as well as Base64 encoding and decoding (RFC4648).

Power Efficiency

To offer the level of performance needed within embedded power budgets, Freescale understood that we had to make a significant step forward in process technology. QorIQ platforms P1 through P5 are all designed for 45 nm to reduce power and increase integration. QorIQ P1 and P2 dual-core processors have driven the industry's best performance-to-power ratio. The QorIQ P4

processors enable advanced frequency and voltage management under control of the system developer.

The AMP series of processors further reduce power consumption by up to 50 percent through the move to 28 nm process technology and the introduction of cascading power management. Developers can exercise more control and get greater power granularity with the ability to change individual core frequencies and use six core power management states. This balance of performance needs with power consumption helps to maximize overall system efficiency.

Programmability

Freescale understood from the outset that our multicore implementation could not just be about great hardware, but had to focus on the software and the developer's experience. We responded with the QorIQ multicore software development kit (SDK) and CodeWarrior tools, which embed extensive visibility and access into our processors so that the developer can fully utilize the cores and resources, as well as debug the complex on-chip interactions. We also developed VortiQa software application solutions that complement our customers' offerings and help ease multicore software development. And we continue to collaborate closely with leading software and tools

companies in the embedded industry to ensure comprehensive solutions that take full advantage of the QorIQ architecture.

Freescale has the ecosystem to streamline the migration to multicore architectures. Choose from our strategic alliance partners, including ENEA, Green Hills, Mentor Graphics and QNX, who provide integrated solutions optimized for maximum performance on QorIQ platforms. Or, leverage the strengths of a broad array of partners, including 6Wind, Critical Blue and Wind River, to help accelerate migration to multicore and reduce time to market.

Platforms

The QorIQ platforms enable you to easily move to multicore starting with pin- and software-compatible P1 and P2 platforms that offer single- and dual-core products. Applications at this level demand performance and extensive integration at very low power and cost. Together, the two QorIQ platforms deliver an impressive 4.5x aggregate frequency range, scaling from a single core starting at 533 MHz (P1011) to a dual core at 1.2 GHz (P2020).

Freescale also offers the revolutionary QorIQ P3, P4 and P5 platforms that include both 32- and 64-bit cores. The P3 and P4 platforms are built on the e500mc core and feature four to eight cores running up to 1.5

GHz. The P5 platform consists of single and dual e5500 64-bit cores with frequencies up to 2.2 GHz. These pin-compatible devices have a performance-boosting architecture with a tri-level cache hierarchy and advanced DPAA.

The AMP series of products will consist of T1-T5 processors with products at varying levels of performance and integration. The series introduces the new e6500 multithreaded 64-bit core at frequencies up to 2.5 GHz. The e6500 incorporates an enhanced version of the proven, high-performance, widely adopted AltiVec vector processing unit. AltiVec technology addresses high-bandwidth data processing and algorithmic-intensive computations, delivering DSP-level performance and distinct performance benefits for Freescale customers. The AMP series of products will provide customers with a scalable platform of processors with more than four times the performance of Freescale's previous highest performance QorIQ P4080 processor.

Freescale is providing a comprehensive roadmap with the necessary stepping stones that enable you to access the level of performance and capabilities needed for your next-generation applications. Join us on the path to multicore today.



To learn more about Freescale QorIQ communications platforms, please visit freescale.com/QorIQ

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