



QorIQ Processing Platforms

Highly integrated multicore SoCs featuring a secure, balanced architecture to deliver leading performance per watt for new virtualized networks

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Accelerating the Network's IQ

With the number one position in wired and wireless markets and over 300 million communications processors shipped, our company is leading the way in next-generation systems for intelligent infrastructure and mobile networks. How have we continued to be the leading supplier of communications processors for the last 20 years? How do we do it? The answer lies in our ability to continually innovate in technology and solutions that accelerate the network's IQ.

The PowerQUICC processor line revolutionized the industry with its multiprotocol support for key communications protocols. The QorIQ communication processor portfolio expanded on this by

introducing a broad range of multicore products that pioneered data path acceleration architecture (DPAA), which provides the infrastructure to support simplified sharing of on-chip resources (interfaces, accelerators) with multiple CPU cores. Today, the QorIQ communications platform is the industry's broadest portfolio of communications processors with performance, power and price options addressing the full spectrum of networking applications across enterprise and data center, service provider, military and industrial markets.

Expanding upon the success of the QorIQ communications processors, the QorIQ Qonverge platform

combines a proven communications platform with StarCore DSPs for baseband processing. The result is the industry's first base station-on-a-chip family of multimode solutions, an innovative and award-winning platform for small to large cell base stations with a scalable hardware and software architecture.

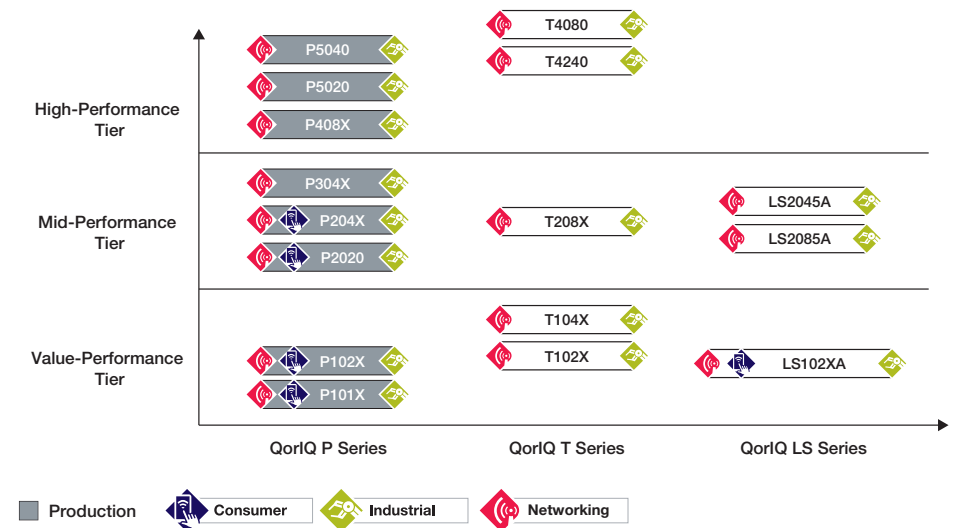
These multiprocessing architectures are not just about great silicon. Through our in-house software solutions and together with our partners, we help to simplify development and provide performance-optimized solutions under the umbrella of an industry-leading product longevity program that guarantees your products will be in market for a long time.

Portfolio

QorIQ Communications Processors

The QorIQ communications portfolio delivers a smarter approach to multicore—providing a coherent migration path from single core to multicore—and from 32-bit to 64-bit. Now over 35 products strong, the QorIQ platform is the industry's broadest portfolio of communications processors, which enable customers to address opportunities and deploy their solutions across a wide range of performance, energy dissipation and cost points from power-constrained devices to the highest performance multicore devices. While the QorIQ portfolio has been widely deployed in a large number of networking segment applications, these high-performance system-on-chip (SoC) solutions are continuously being adopted by industrial markets, as well. [More](#)

QorIQ Communications Processors: Product Portfolio



The portfolio is organized into three tiers of processors representing value-, mid- and high-performance devices.



Layerscape Architecture

Layerscape is the underlying system architecture of the QorIQ LS series. The architecture enables next-generation networks with up to 100 Gb/s performance and enhanced packet processing capabilities. Design effort is simplified with a standard, open programming model and a software-aware architecture framework that enables customers to fully exploit the underlying hardware for maximum optimization, with the capability to easily adapt to network changes for real-time “soft” control over the network. A uniform hardware and software model provides the compatibility and scalability required for designing end-to-end networking equipment from home-to carrier-class products. The unique, core-agnostic architecture incorporates the optimum core for the given application—ARM® cores or Power Architecture® cores. [Explore](#)

Portfolio

Value-Performance Tier

The value-performance tier of QorIQ communications processors offers entry-level devices with scalable performance, high integration and advanced power management. This tier offers pin-compatible families that feature aggressive performance-per-watt profiles targeting small form factors and fanless designs by delivering up to 1.4 GHz CPU core performance under 10 watts. [More](#)

Product Spotlight

The QorIQ LS1021A dual-core processor provides extensive integration and power efficiency for fanless, small form factor enterprise networking applications. Built on dual ARM® Cortex®-A7 cores running up to 1.0 GHz, the processor is engineered to deliver performance up to 6,000 CoreMarks as well as virtualization support, advanced security features and the broadest array of high-speed interconnects and optimized peripheral features ever offered in a sub-3 W processor.

Distinguishing features of the value-performance tier:

- ▶ Cores: Single- to quad-core SoCs up to 1.4 GHz
- ▶ Performance: Up to 10 Gb/s
- ▶ Power: 3–10 W, optimized for fanless applications
- ▶ Other: Integrated gigabit Ethernet switch available in T1040 and T1020 processors

Target Applications

- ▶ Enterprise: Router, switch, WLAN, storage, security appliance, printing and imaging
- ▶ Industrial: Single board computer, robot, factory automation
- ▶ IoT and home gateways, network attached storage



Portfolio

Mid-Performance Tier

The mid-performance tier of QorIQ communications processors optimizes packet processing performance and I/O richness for control, service and mixed data plane processing while delivering up to 2.0 GHz CPU core performance under 25 watts. Devices in this tier

offer pin compatibility from the value tier to maximize R&D investment in both hardware and software. Additionally, the mid-performance tier devices offer significant performance increases generation to generation while optimizing power and cost. [More](#)

Product Spotlight

The QorIQ T2080 processor is primarily intended to succeed our successful P3041 and P2041 mid-range series of quad-core devices as a control plane or integrated control and data plane processor. It provides an excellent migration path, as it offers 2x or better in core capability, cache size, SerDes bandwidth and Ethernet connectivity, within a similar power budget. It also provides a value-engineering opportunity for P4080 customers, as T2080 provides equivalent performance at much lower price and power points. The mid-performance tier also includes the T2081, which offers pin compatibility to the T1042 device, thus enabling one of the industry's broadest portfolios of pin-compatible communications processor families.

Distinguishing features of the value-performance tier:

- ▶ Cores: Two- to eight-core SoCs, single- and dual-threaded
- ▶ Performance: Up to 40 Gb/s
- ▶ Power: 7–25 W

Target Applications

- ▶ Enterprise: Router, switch, storage, security appliance
- ▶ Service provider: Router, switch
- ▶ Data center: Converged network adapter (CNA), intelligent network interface card (NIC), SDN/OpenFlow™ switching, NFV solutions
- ▶ Industrial: Single board computer, machine vision and camera, robot, aerospace and defense



Portfolio

High-Performance Tier

The high-performance tier of QorIQ communications processors continues to offer additional feature sets for control, service and mixed data plane processing while delivering up to 2.4 GHz CPU core performance within an embedded power envelope. This tier of devices offers scalability from value- and mid-performance tiers with upward migration to maximize R&D investment in both hardware and software. The high-performance tier devices, which include

the QorIQ P4, P5 and T4 families, offer balanced compute performance density within a fine-grained power envelope from generation to generation. [More](#)

Distinguishing features of the value-performance tier:

- ▶ Cores: Quad- to 24-core SoCs, single- and dual-threaded
- ▶ Performance: Up to 80 Gb/s
- ▶ Power: 15–40 W
- ▶ Other: High-performance multicore platforms for symmetric and asymmetric multicore implementations, embedded hypervisor support for advanced marriage of hardware and software virtualization

Product Spotlight

Featuring 24 virtual cores and based on our dual-threaded e6500 core built on Power Architecture® technology, the QorIQ T4240 processor achieved the highest CoreMark™ benchmark performance-per-watt profile and overall performance score ever recorded for an embedded processor. Along with the 16-virtual-core T4160 and 8-virtual-core T4080, the high-performance T4 devices offer frequencies scaling to 1.8 GHz, large caches, hardware acceleration and advanced system peripherals, targeting applications that benefit from consolidation of control and data plane processing in a single SoC.

Target Applications

- ▶ Enterprise: Router, security appliance, Network Function Virtualization (NFV), micro-server, SDN Controller
- ▶ Data center: Application delivery controller, server to storage bridging, 64-bit server, Network Function Virtualization (NFV), SDN Controller
- ▶ Service provider: Router, switch, metro and macro base stations
- ▶ Industrial: Aerospace and defense, control, networking



C29x Crypto Coprocessors

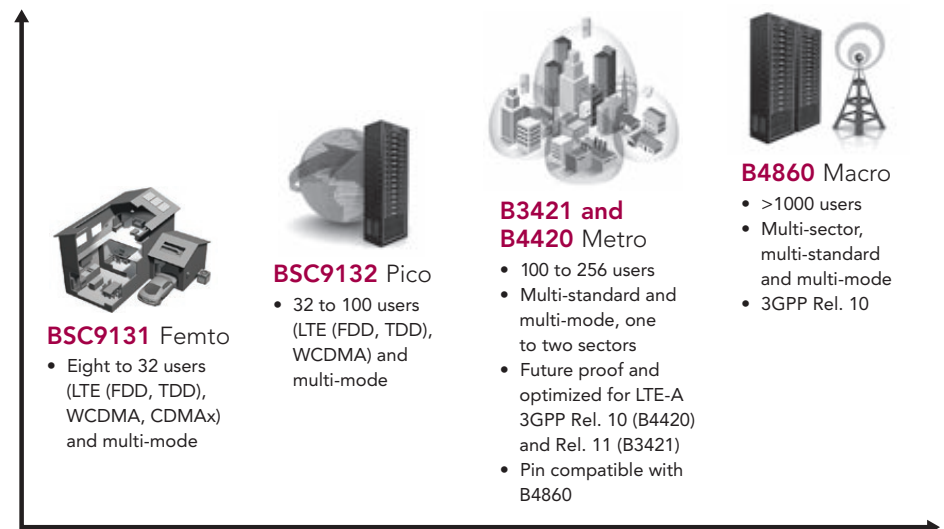
The C29x family of crypto coprocessors is a public key offload solution targeting network infrastructure across the enterprise and data center. By providing public key acceleration, the C29x family enables appliances to efficiently scale with the increase in secure network traffic. The C291, C292 and C293 coprocessors offer between 8 KB and 32 KB, 2048-bit RSA transactions per second with power consumption from 4 to 10 watts. Designed to offload over a PCI Express® (PCIe) bus, the C29x family of devices can be used as a companion to a QorIQ communications processor, or other host processors on the market. [Explore](#)

Portfolio

QorIQ Qonverge Platform

The QorIQ Qonverge platform is a highly integrated base station-on-chip portfolio built on advanced heterogeneous multicore technology. The platform combines our SoC expertise with market-proven cores built on Power Architecture® technology, high-performance StarCore DSPs and application accelerators for packet and baseband processing, security and more. The QorIQ Qonverge platform provides customers with a scalable family of products sharing the same architecture to address multi-standard requirements spanning from small to large cells. Our comprehensive R&D scale and ownership of fundamental IP, combined with system knowledge, enables heterogeneous multicore innovations for next-generation systems. Additionally, the QorIQ Qonverge platform is a complete solution with ready-to-go software and services, a broad ecosystem and comprehensive development platforms to ease your development and speed time-to-market in your wireless infrastructure applications. [More](#)

Complete Femto to Macro System-on-Chip Portfolio





QorIQ Qonverge BSC and B Series

The QorIQ Qonverge BSC series of devices offers operators a comprehensive portfolio of multimode solutions built on a common architecture with balanced system partitioning between SC3850 StarCore DSPs for layer 1 and the e500 core, based on Power Architecture® technology, for layer 2 and above. The QorIQ Qonverge B series of devices brings together the processing power of the e6500 Power Architecture core and the computational power of the SC3900 StarCore-based DSP along with proven application accelerators for packet and baseband processing, security and more. The BSC and B series are designed to allow operators to easily scale from small cells to large cells with minimal redesign and investment. The B series offers base station designers a low-power and cost-effective solution based on 28 nm process technology and is scalable from small cell to large cell base stations supporting LTE, WCDMA and LTE-Advanced standards, delivering optimum performance while driving down overall costs. Both QorIQ Qonverge BSC series and B series devices integrate the industry's best combination of efficient, high-performance cores and application-specific accelerators while balancing power and cost. The QorIQ

Qonverge platform also addresses the diverse processing needs of connected industrial nodes by combining a DSP with a network processor to give designers the ability to reduce chip count, board space and power consumption. The combination of these two core technologies provides industrial applications, such as power relays/power protection, factory automation, defense unmanned vehicles and software defined radio, a cost-effective solution to specialized designs that might currently be done in ASICs or discrete processors.

Target Applications

- ▶ Service provider: Femtocell base station, picocell base station, metrocell base station, macrocell base station
- ▶ Industrial: Factory automation, image analytics, JTRS, media gateway, voice-over IP gateway, power protection, power relays, smart munitions, software define radio, uninterruptible power supply, unmanned vehicles (ground, air, water)

Find It **QorIQ Qonverge BSC Series** **QorIQ Qonverge B Series**

Technology

Our company has always been known for excellence in customer service, support and engineering, from the days of 68 K and PowerQUICC to the introduction of our QorIQ multicore SoC platform. Today, our SoCs are much more complex, combining leading core integration, DPAA, virtualized I/O, advanced power management and security. These innovative technologies are how we continue to offer differentiated solutions and industry-leading products to the market after more than 20 years.

Leading Core Integration



Introduced in the QorIQ T series, the advanced multi-threaded e6500 core based on Power Architecture® technology is a 64-bit dual-thread engine that enables each core to act as two virtual cores. Each thread has dedicated fetch, decode, issue and completion resources. Each thread also has a dedicated branch unit, load/store unit and simple fixed point execution units. The complex fixed point execution unit, floating point unit and Altivec technology vector engine are shared between threads. The e6500 64-bit instruction set architecture allows developers to use 32- or 64-bit mode. A hybrid 32-bit mode supports e500 legacy software and a smooth transition to the 64-bit architecture.

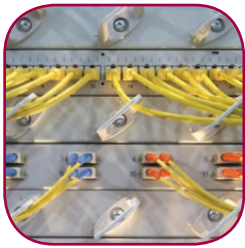
The e6500 core includes a 16 GFLOPS Altivec technology execution unit to improve the performance of algorithms such as the scheduler algorithm and media processing by a factor of four over a C-optimized implementation traditional floating point operations. Altivec technology is a vector engine, or single instruction multiple data architecture, which allows the simultaneous processing of multiple data for floating point and integer items in parallel.

More



Technology

DPAA



Data path acceleration engines, working in concert with general-purpose processors, manage packet routing, security, quality of service and deep packet inspection—freeing more processing cycles to focus on the customer's value-added services and application processing while reducing software complexity. DPAA is a set of hardware components on specific QorIQ P and T series multicore processors. This architecture provides

the infrastructure to support simplified sharing of networking interfaces and accelerators by multiple CPU cores, and the accelerators themselves.

DPAA components include fundamental multicore infrastructure components such as the queue manager and buffer manager, frame manager for network I/O, RapidIO® message manager for high-speed serial interconnect and hardware accelerators for cryptography (SEC), regular expression scanning (PME) and compression (DCE). These data path elements help with load spreading and prioritization, packet order preservation and restoration and device virtualization. Together, the DPAA benefits system designers by significantly simplifying the networking software architecture while increasing system performance. [More](#)

Layerscape Architecture



Layerscape architecture is the next step in the evolution of our DPAA, offering true deterministic wire-rate performance between all network interfaces supporting L2+ switching capabilities. The architecture is specifically designed for ease of programming and implementation with a general-purpose processing domain, the advanced packet processing domain and the wire rate I/O domain. The general purpose

processing domain layer is designed up front to be compatible with cores built on either ARM or Power Architecture® technology, as dictated by the application and SoC. The new partitioning helps to optimize scalability and makes software development faster and easier so that a developer of any skill set can program the device. The advanced packet processing domain provides a level of fast packet processing capabilities that is completely customer programmable, differentiating it both from current-generation DPAA devices and from competing multicore SoCs. The primary purpose of the wire rate I/O domain is to intelligently receive and transmit data for the SoC including interfaces such as Ethernet, HiGig, Interlaken, SRIO and PCIe®. Layerscape architecture is available in QorIQ LS series devices. [More](#)



QorIQ Virtualization Technology



In a multicore system, a task should not be physically mapped to a processing resource. If resources are virtualized, then any task can access any virtual resource to get its job done. This makes computing resources flexible, elastic and not hard-bonded to any task. One of our differentiators is how we apply virtualization and increase performance in the SoC. Our company enables virtualization with QorIQ processors by combining high-

performance, hypervisor-enabled cores and virtualization-ready SoC platforms. Together with QorIQ software-based virtualization solutions, a complete, high-performance virtualized system can be achieved. Our embedded hypervisor—the first and highest performance in the embedded communications processing space—is important for virtualization. A hypervisor is system-level software that allows multiple operating systems to access common peripherals and memory resources and provides a communication mechanism among multiple cores. The Linux® kernel-based virtual machine (KVM), for example, is supported on our Power Architecture-based multicore SoCs as a choice for virtualization in embedded applications.

While virtualization is a complex area, we invest heavily to provide our customers one of the most important benefits of multicore systems: flexible resource use.

[More](#)

Security Technology



Security technologies not only create barriers between assets and threats, but also help to identify the threats. Our security technology efforts are concentrated in five principal areas: cryptographic technology, cryptographic export control, National Institute of Standards (NIST) certifications, signature detection and trust and platform assurance.

Network security protocols and applications use a variety of cryptographic algorithms to achieve these high-level goals. We've developed a range of crypto accelerators tailored to the applications of performance of various product lines. The SEC block in QorIQ SoCs supports single algorithms, single pass ciphering and message integrity, and protocol encapsulations for IPsec, 802.1ae, SSL/TLS, SRTP, 802.11i, 802.16e RSA, Diffie-Hellman and Elliptic Curve.

A trusted system does what its builder and users expect it to do, and specifically doesn't do other things the OEM and/or users would consider attacks that result in a loss for any member of the value chain. Our products with trust architecture provide system developers with the hardware anchor points they need to develop a trusted system. [More](#)

Ecosystem

Our software and development solutions go beyond silicon, helping to bring embedded applications to life. We equip design engineers with comprehensive solutions, including silicon, software and tools, ecosystem solutions and reference boards that are the best fit for their needs—reducing design complexity and accelerating their time-to-market.

Software Development Tools

Linux® Software Development Kit

We put so much technology into our software offering that instead of calling it a board support package, we call it a software development kit (SDK). Our SDKs know how to get the most out of the advanced networking accelerators offered in QorIQ processors. Should you need even more help, our partners can go that extra mile with you. [Explore](#)

VortiQa Software

The VortiQa software product line offers production-ready applications software addressing specific vertical market segments including wireless and wired infrastructure equipment, cloud, data center and small-medium business/enterprise network equipment. By using VortiQa software, customers can reduce overall product development costs and achieve accelerated time-to-market goals. VortiQa products are optimized to deliver maximum performance through full utilization of unique QorIQ processor technologies including DPAA, Layerscape architecture and a variety of acceleration engines. We offer commercial support and maintenance services for VortiQa products. The VortiQa product family consists of VortiQa application identification software (AIS), VortiQa software-defined networking (SDN) solutions which includes the VortiQa open network director software and VortiQa open network switch software for

the QorIQ processing platform, as well as VortiQa Layer 1 baseband software for the QorIQ Qonverge platform. [Explore](#)

CodeWarrior Development Suites for Networked Applications

CodeWarrior Development Suites for Networked Applications were designed to enhance the success of your networked design. The suites were created to address the differing roles within our customers' companies including software developers (Developer Suite), board bring-up experts (Specialist Suite) and network architects (Architect Suite).

Developer Suite Level: intended for designers with full system responsibility but no need for extra costs of the specialist and architect features. No matter what market your products serve, these tools would be the most useful tools and are what we would consider the workhorse set of development tools.

Specialist Suite Level: designed so you can do more than just compile and debug. Tools in this suite are useful for customers creating products for every market. Get all the software included in the Developer Suite plus additional board-analysis tools.

Architect Suite Level: created for personnel who have a need to dig deep into the networking aspects of a development project. In this suite, you will get all the software in the Specialist Suite plus software tools designed to give networking experts the extra capability to find out how their system is really working. [Explore](#)

QorIQ Processor Expert Software

Processor Expert software is a development system to create, configure, optimize, migrate and deliver software components that generate source code for our silicon. There are four offerings in the Processor Expert software suite designed specifically for our QorIQ platform. The configuration suite helps you set up and boot up a sophisticated multicore SoC in a fraction of the time for free—then browse additional packages that help you get more out of your system, including validation tools, scenario tools and more. [Explore](#)

Hardware Development Tools

Our company offers a number of platforms to jump-start design, including development systems, reference platforms and our award-winning Tower System. Many of our reference platforms include schematics, layout and software source files, along with tools and proven integrated software solutions, to help you more easily build comprehensive and efficient systems.



Partners

The QorIQ portfolio is supported by the largest and most established third-party ecosystem in the communications market. Choose from our Connect Program Preferred 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 to help accelerate migration to multicore. In conjunction with our expertise and worldwide support infrastructure, the ecosystem will help customers accelerate their migration from both competitive solutions and from our legacy devices, preserve investment costs and reduce time to market. The Connect partner program is your essential source for embedded designs based on our proprietary solutions. [Explore](#)

Product Longevity

Our company provides a product longevity program for the networking market and will make a broad range of devices available for a minimum period of 10 years. Life cycles for our participating proprietary products begin at the time of product launch and include the standard end-of-life notification policy. We will manage our program through our own factories, outside foundries and other manufacturing resources. If it becomes necessary to transfer the production of a participating product to an alternate manufacturing facility, our company will re-qualify that product. These actions demonstrate our intention to provide supply stability to our customers and complete transparency regarding the guaranteed minimum remaining lifetime of our products. www.nxp.com/productlongevity



Product Longevity



About NXP

We have been a market leader in the area of semiconductors for more than 30 years.

With the number one position in wired and wireless markets and over 300 million communications processors shipped, our company is leading the way in next-generation systems for intelligent infrastructure and mobile networks.

Technical Support

Our company takes pride in providing world-class support. Assistance is just a click away at www.nxp.com/support.

Technical Information Center

Our engineers offer assistance online or over the phone to meet specific customer needs around the world.

Local Technical Support

Our field application engineers are located close to direct customers and are available for direct contact and customer visits.

FAQs

Our vast knowledge base of frequently asked questions (FAQs) is online to offer support 24 hours a day, seven days a week. It is updated and maintained by product experts.

Technical Documents

Available on www.nxp.com

- ▶ Application notes
- ▶ Reference manuals
- ▶ Data sheets

www.nxp.com/QorIQ

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