Integrated Multicore Processors for the Software-Defined Network: A Heavy Reading Competitive Analysis

EXECUTIVE SUMMARY

Integrated multicore processors are now the heart of almost every type of networking device, enabling network system developers to support network functions in software, and to support industry developments such as software-defined networking (SDN) and network functions virtualization (NFV). Multicore processors are highly integrated system-on-chip (SoC) devices with up to 72 cores and hardware acceleration for security and low-level packet processing. Multicore processors can be programmed in C or other high-level languages and are directly supported by multicore operating systems and applications software from companies such as 6WIND, Enea and Wind River.

Integrated multicore processors are becoming the dominant processor solution for networking applications. Network processors, originally developed to provide programmable high-speed packet processing, have been replaced by integrated multicore processors for all but the most demanding applications. Many multicore processors integrate hardware acceleration engines that were originally developed for network processors.

General-purpose multicore processors have become steadily more integrated. Intel and AMD have general-purpose multicore processors for high-performance applications and integrated multicore processors for lower-performance applications. Both companies are developing integrated multicore processors that will address high-performance networking applications.

The market for integrated multicore processors in networking continues to grow. Many companies are using common platforms with multicore processors for a wide range of applications, including SDN and NFV. This reduces development costs and allows telecom equipment makers to deliver flexible networking functions on standardized platforms, with hardware acceleration where necessary. Most processor vendors now have a range of devices with different numbers of cores and hardware acceleration engines, allowing system developers to meet a range of different performance and functional demands using multicore processors that are software-compatible across all their systems.

Integrated Multicore Processors for the Software-Defined Network: A Heavy Reading Competitive Analysis surveys high-performance multicore processors for networking applications. The report also reviews the strategy, product mix and product architectures of 15 multicore processor, intellectual property (IP) and software vendors. As such, the report provides not only granular information on the components themselves – of interest to chip manufacturers and purchasers – but also insights into how the overall market for multicore processors is likely to develop – of interest to a wide audience, including carriers and investors.

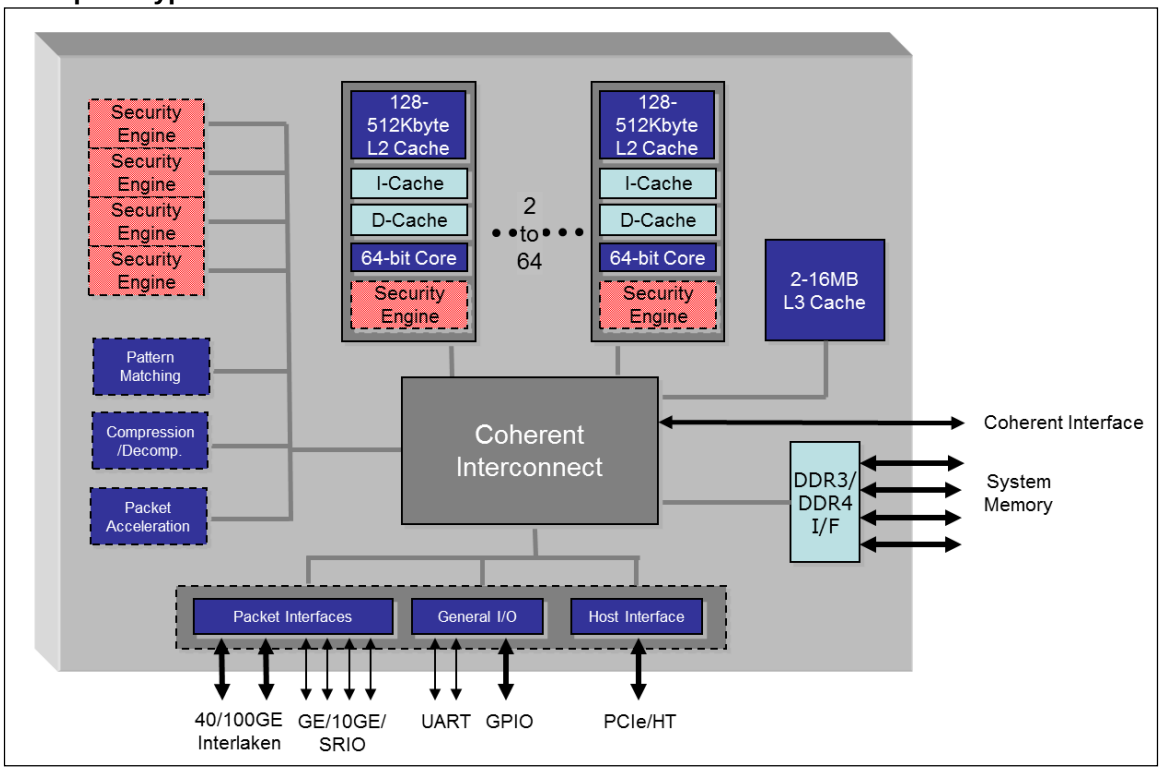
This report analyzes the multicore processor market by parsing devices into three groups:

- **General-purpose multicore processors** – multicore processors based on general-purpose CPUs that can be used in high-performance networking systems
- **Integrated multicore processors** – multicore processors with integrated packet-processing instructions, hardware acceleration engines and networking-specific interfaces
- **10-500Gbit/s network processors** – network processors with a mix of high-performance packet engines and hardware acceleration engines

This report delivers a complete competitive analysis of multicore processors, IP and software, covering more than 80 products from 15 components suppliers. It offers detailed information on all types of high-performance multicore processors, covering key product features as well as power, package and availability. In-depth interviews with component suppliers conducted for this report offer insight into how the market for multicore processors is likely to develop.

The excerpt below shows a typical fourth-generation integrated multicore processor. At the center are two 64-bit RISC cores. Some devices integrate floating-point units and enhanced instruction sets for networking related functions. Each core has instruction and data caches, typically 32KB to 78KB each. The RISC cores are closely coupled to multiple Level 2 caches, which are typically shared between two cores averaging 128KB-512KB per core. Several multicore architectures support hardware multithreading, in which each core runs several threads in parallel, switching between threads as hardware resources become available. This increases processor performance per core but requires additional resources in each core.

Excerpt 1: Typical Fourth-Generation Multicore Processor



Source: Earlswood Marketing

There are seven manufacturers with integrated multicore processors in production: Applied Micro, Avago, Broadcom, Cavium, Freescale, EZchip and Texas Instruments (TI). The highest-performance product from each company is shown in the excerpt below.

Excerpt 2: Leading Integrated Multicore Processors in Production

COMPANY/DEVICE	CPU TYPE	32/64 BIT	MAX CPU SPEED	CPU #	THREADS PER CORE	HARDWARE VIRTUALIZATION	TECHNO-LOGY
Applied Micro X-Gene	ARMv8	64	2.4 GHz	8	1	✓	40nm
Avago Axxia AXM5516	ARM Cortex-A15	32	1.6 GHz	16	1	✓	28nm
Broadcom XLP800/ 400 Family	MIPS 64 r2	64	1.6 GHz	Up to 8*	4	×	40nm
Cavium Octeon II CN68xx	MIPS 64 r2	64	1.5 GHz	16, 24 or 32	1	×	65nm
EZchip TILE-Gx72	VLIW	64	1.5 GHz	72	1	×	40nm
Freescale QorIQ T4240	Power Arch. e6500	64	1.8 GHz	8	2	✓	28nm
TI Keystone II AM5K2E0x	ARM Cortex-A15	32	1.4 GHz	2 or 4	1	✓	28nm

* Cache coherency supported up to 32 cores with four devices.
Source: Heavy Reading

Report Scope & Structure

Integrated Multicore Processors for the Software-Defined Network: A Heavy Reading Competitive Analysis is structured as follows:

Section I is an introduction to the report, including the key findings of our research.

Section II presents an overview of multicore processor applications and architectures, including generic block diagrams. It also covers multicore IP and software with architecture diagrams.

Section III focuses on general-purpose multicore processors, including detailed vendor profiles, architecture diagrams and a competitive analysis of products now in production and announced products not yet available in production quantities. Full details for these products are presented in **Appendix A**.

Section IV examines integrated multicore processors, with detailed vendor profiles, architecture diagrams and a competitive analysis of products both current and forthcoming offerings. Full details for these products are presented in **Appendix B**.

Section V explores 10- to 500Gbit/s network processors, including detailed vendor profiles and a competitive analysis of products both current and announced. Full details for these products are presented in **Appendix C**.

Integrated Multicore Processors for the Software-Defined Network: A Heavy Reading Competitive Analysis is published in PDF format.

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PROFILED MULTICORE PROCESSOR SUPPLIERS (15)

6WIND S.A. / www.6wind.com

Advanced Micro Devices Inc. (NYSE: AMD) / www.amd.com

Applied Micro Circuits Corp. (Nasdaq: AMCC) / www.amcc.com

ARM Ltd. / www.arm.com

Broadcom Corp. (Nasdaq: BCRM) / www.broadcom.com

Cavium Inc. (Nasdaq: CAVM) / www.cavium.com

Enea AB (Nasdaq: ENEA) / www.enea.com

EZchip Semiconductor Ltd. (Nasdaq: EZCH) / www.ezchip.com

Freescale Semiconductor Inc. (NYSE: FSL) / www.freescale.com

Imagination Technologies Group plc (LSE: IMG) / www.imgtec.com

Intel Corp. (Nasdaq: INTC) / www.intel.com

Marvell Technology Group Ltd. (Nasdaq: MRVL) / www.marvell.com

Netronome Systems Inc. / www.netronome.com

Texas Instruments Inc. (NYSE: TXN) / www.ti.com

Wind River Systems Inc., a subsidiary of Intel Corp. (Nasdaq: INTC) / www.windriver.com