EXECUTIVE SUMMARY

The market for network processors has undergone significant changes since the first devices debuted just over five years ago. Initial enthusiasm among components makers and equipment manufacturers fell sharply with the bursting of the telecom investment bubble, leading to an extended period of lackluster product demand. But unit sales of network processors began to grow in 2003, leading to significant recovery in 2004 – with year-end estimates placing the worldwide market for network processors at about $150 million, a 150 percent increase over 2003. Expectations for continued growth are fueled by anticipated demand from the access equipment market.

Semiconductor vendors are now shipping a wide range of programmable devices that can be considered network processors. First-generation network processors were defined as programmable devices that handle fast-path packet processing in excess of 1 Gbit/s. This fast-path device, known as the network processing unit (NPU), was intended as a direct replacement for packet-processing application-specific integrated circuits (ASICs), which were very inflexible and could not be quickly modified to handle new protocols and services. Today's NPUs handle packet processing at rates up to 10 Gbit/s.

Network Processors: A Heavy Reading Competitive Analysis delivers the industry's most extensive analysis of this emerging product category. It draws on product data and direct interviews with every component supplier in this market sector to provide a complete accounting of not only currently available devices, but also products that are scheduled for release over the next year. The report not only provides granular information on the components themselves – of interest to chip manufacturers and purchasers – but also offers insights into how the overall market for network processors is likely to develop – of interest to a wide audience, including carriers and investors.

The report parses network processor devices into the following four groups:

- **2.5-Gbit/s NPUs**: Fast-path network processors capable of handling packet processing of 2 Gbit/s to 4 Gbit/s.
- **10-Gbit/s NPUs**: Fast-path network processors capable of handling packet processing of at least 10 Gbit/s.
- **Control-plane processors**: General-purpose processors networking I/O.
- **Communications processors**: Programmable devices with fast-path acceleration to handle packet processing up to 1 Gbit/s. Most communications processors have integrated control-plane processors.
The report evaluates and analyzes the products and strategies of the following suppliers:

- Agere Systems Inc. (NYSE: AGR.A)
- Applied Micro Circuits Corp. (AMCC) (Nasdaq: AMCC)
- Bay Microsystems Inc.
- Broadcom Corp. (Nasdaq: BRCM)
- Cavium Networks Inc.
- EZchip Technologies Ltd.
- Freescale Semiconductor Inc. (NYSE: FSL)
- Hifn Inc. (Nasdaq: HIFN)
- Intel Corp. (Nasdaq: INTC)
- Mindspeed Technologies Inc. (Nasdaq: MSPD)
- PMC-Sierra Inc. (Nasdaq: PMCS)
- Raza Microelectronics Inc. (RMI)
- Sandburst Corp.
- Vitesse Semiconductor Corp. (Nasdaq: VTSS)
- Wintegra Inc.
- Xelerated Inc.

**Key Findings**

Key findings of the report include the following:

**Network processors are now a mainstream technology.** The world's largest telecom equipment vendors are now using network processors for applications from the edge to the core of the network. These manufacturers include Alcatel SA, Cisco Systems Inc., Huawei Technologies Co. Ltd., Lucent Technologies Inc., Siemens AG, and Samsung Corp.

**Sales of NPUs grew sharply in 2004 and are expected to continue on that growth curve.** Several vendors shipped more NPUs in the first half of 2004 than in the whole of 2003. Year-end revenues for NPUs are projected at $150 million for 2004, up from just $60 million in 2003.

**Carrier access is the key market for NPU suppliers in 2005.** Demand for network processors is highest in the access network. Components vendors are developing fast-path NPUs and integrated communications processors to address this market.

**10-Gbit/s NPUs are now shipping in volume.** Five components vendors are now in commercial production of 10-Gbit/s NPUs: AMCC, Bay Microsystems, EZchip, Intel, and Sandburst.

**Integrated packet switching is fast becoming a standard feature of control-plane processors.** New control-plane processors from Broadcom, Freescale, and PMC-Sierra integrate a packet-switching capability.

**Communications processors are pushing the 1-Gbit/s boundary, putting them closer in performance to 2.5-Gbit/s NPUs.** Communications processors from Wintegra, Freescale, and Intel can handle fast-path packet processing at 1 Gbit/s and above, in addition to delivering control-plane functionality.

**Report Scope and Structure**

*Network Processors: A Heavy Reading Competitive Analysis* is based on interviews conducted with all 16 network processor vendors in the third and fourth quarters of 2004, as well as on product documentation supplied by these vendors. The report contains detailed product and performance specs and pricing information for more than 80 devices.
Excerpt 1: Intel IXP2350 Access Processor

Excerpt 2: High-Performance Control-Plane Processors in Production

<table>
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<th>COMPANY</th>
<th>DEVICE</th>
<th>ESTIMATED PERFORMANCE (DHRYSTONEMIPS)</th>
<th>CPU #</th>
<th>CPU TYPE</th>
<th>CPU SPEED</th>
<th>LAYER 2 CACHE</th>
<th>POWER</th>
<th>PRICE</th>
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<td>RM9000 x2GL</td>
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Source: Heavy Reading

The report is structured as follows:

**Section I** provides a complete overview and full key findings of the report.

**Section II** presents an overview of the network processor market, including a full breakout of product types and supplier product lines.

**Section III** focuses on control-plane processors, including a competitive analysis of products now in production and of announced products not yet available in production quantities. Full details for these products are presented in Appendix A of this report.

**Section IV** covers communications processors, with full feature comparisons for both current and forthcoming offerings. Full details for these products are presented in Appendix B of this report.

**Section V** includes feature comparisons for current and announced 2.5-Gbit/s network processing units. Full details for these products are presented in Appendix C of this report.

**Section VI** includes feature comparisons for current and announced 10-Gbit/s network processing units. Full details for these products are presented in Appendix D of this report.

**Section VII** presents detailed product and strategy analyses for the nine public companies that manufacture network processors covered in this report.

**Section VIII** presents detailed product and strategy analyses for the seven private companies that manufacture network processors covered in this report.

The report is essential reading for a wide range of industry participants, including the following:

- **Components suppliers:** How does your current product line compare with the competition? Will your product plans keep you a step ahead of your rivals, or do you need to revise your strategy to keep your competitive edge? What are the likely demand trends for different types of network processors? Are you in position to capitalize on those trends?

- **Equipment manufacturers:** What is the current state of the art for network processors, and how will that change over the next year? Are you getting the best price/performance from your suppliers, or are there better deals available? What kinds of performance gains can you expect from products that are still in development or just now coming to market? How long will you have to wait for those products to be available in production quantities?

- **Investors:** Which suppliers are in the best position to capture market share in this emerging product category? What are the hot private companies in this sector, and what are their prospects for profitability? Where is the most significant growth coming in this market, and which new products will meet that demand?

*Network Processors: A Heavy Reading Competitive Analysis* is published in PDF format.