



# An Innovative Blueprint for Next-Generation Mobile Networks

## Enabling Any-to-Any Communication with Future-Proof Infrastructure Nodes

Whitepaper

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The mobile industry closed the 2009 calendar year with over 4 billion global customers and generating over \$700 billion in revenues. Ericsson, the leading mobile equipment provider, anticipates 50 billion connections by 2020. And while the global economic downturn appears ominous, it looks as if its impact will be minimal for the mobile industry.

The industry as a whole is expected to continue to grow, which is good news for all members of the wireless service domain. There is, however, a caveat: While strong growth in the sector is expected, that growth will occur in one specific area: mobile data. This growth is largely due to the flattening of the voice and Short Message Service (SMS) markets in the developed world as those markets saturate.

Prior to making significant investments to upgrade the mobile infrastructure, it is important to analyze technology trends and determine the most effective use of investment resources. Therefore, it is necessary to identify which processors will best support future growth demands. New processor architectures must offer single software support, while incorporating heightened levels of communication security.

The revolutionary blueprint from LSI for

an advanced communication processor architecture enables equipment manufacturers and service providers to overcome the challenges associated with future mobile networks. The LSI™ solution will incorporate a communication processor built on proven, programmable, and scalable elements, and will enable communication companies to increase their share of the estimated \$850 billion market.

### Market Impact Analysis

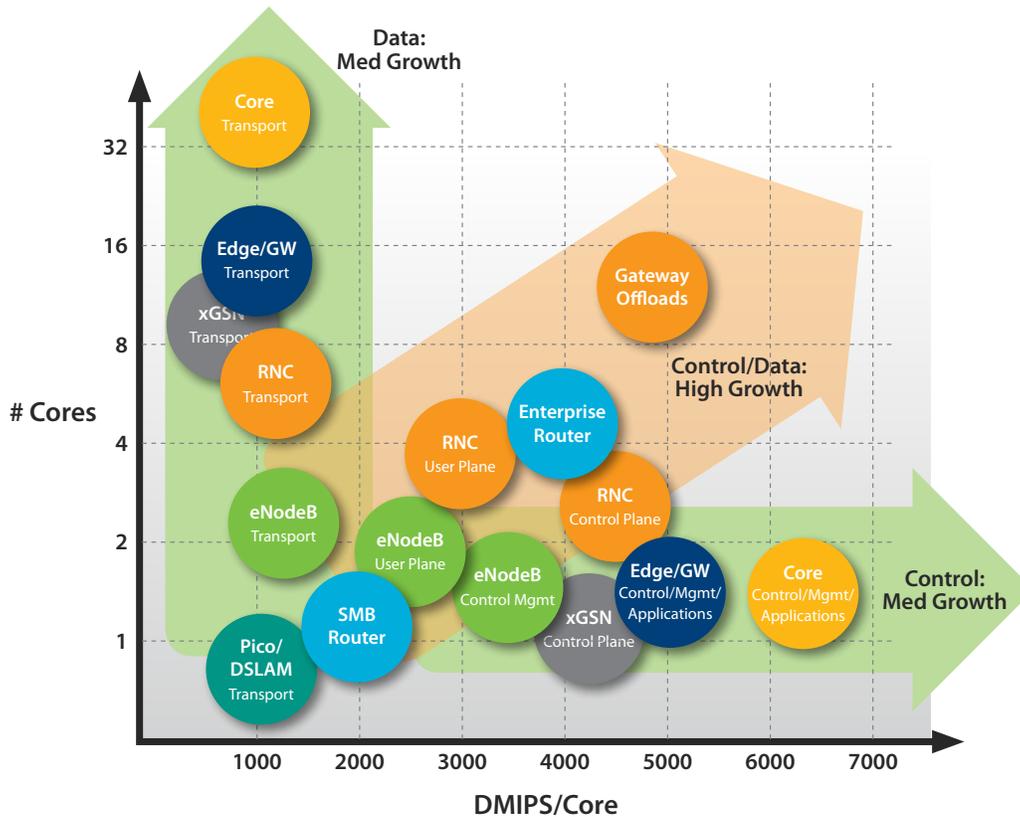
Two of the largest forces driving the communication industry are demand for mobile services and mobile broadband access. By analyzing mobile applications from two parameters with regard to the underlying processor or CPU, one can see associated trends. One parameter is the CPU core performance based on the application demands. The other parameter is the number of cores or threads that are demanded by the application. Plotting these two parameters against each other reveals several underlying trends in the processor market. Figure 1 plots the performance-per-core against the number of cores required for a broad range of devices. Analyzing the intersection of applications on the graph that follows reveals these observations. Some applications are CPU-bound and require more CPU power. The CPU-bound applications tend to be the pure control plane applications, such as an xGSN control plane card;

however, other applications are threads-bound and require more threads-per-processor. Threads-bound devices tend to be classic data plane-centric applications, such as transport cards in an RNC. Figure 1 shows that a set of applications that demand a balance of both core performance and number of cores is key to the market. For example, to meet the demands of mobile broadband, an RNC user-plane application requires the right mix of subscriber density, the demand for four to eight cores in a processor, and subscriber peak throughput (with CPU performance greater than 1.5 GHz). Therefore, future communications processors must incorporate the correct balance of multicore processors and powerful CPU cores.

### Challenges of Reinventing the Networking Infrastructure

The mobile communications market requires multicore processors to meet consumer trends. However, today's multicore solutions are narrowly focused and do not provide the performance and flexibility needed to adequately address future communication demands. Figure 2 shows that the capabilities of current communication processors are either control plane-centric or data plane-centric and, therefore, do not effectively meet consumer demand for both mobile services and data-intensive applications.

Figure 1 Networking Applications Landscape



Security is another challenge facing the mobile industry. Previous generation cell phones transmitted data over private networks using Asynchronous Transfer Mode (ATM) communication. However, mobile communication is transitioning to use public, unprotected, all-IP-based networks. Therefore, equipment manufacturers and service providers must develop new methods to ensure privacy for their customers. Furthermore, silicon designers must also contribute by incorporating security engines into their designs to protect data transmission over public networks.

**LSI Leading the Way by Providing Innovative Solutions**

LSI is leading the way by applying its vast knowledge in the networking space to address the challenges facing the mobile communication industry. First, the blueprint from LSI will incorporate proven high-performance

computing cores. The processor cores it uses will be built on standardized Instruction Set Architecture (ISA) so that equipment manufacturers can use industry-standard development tools. The cores are compatible with a widely deployed software base and enable a Symmetric Multiprocessing (SMP) architecture, which further supports the development of a portable software architecture. Second, the LSI solution will use a Virtual Pipeline™ system-on-chip (SOC) architecture, which is an ultra-efficient message-passing architecture for intra- and inter-processor communications. The Virtual Pipeline architecture provides the deterministic behavior essential in next-generation networking applications. Deterministic performance is needed in order to comply with service level agreements (SLAs) where network operators must be able to predict the overall system performance of the networking node irrespective

of packet size, system loading, or the type of protocol. Finally, the processors are scalable, which enables equipment manufacturers to implement the LSI solution on a broad range of network applications. Figure 3 shows the key strengths of the LSI multicore solution.

Figure 4 shows how the LSI multicore processors meet projected industry trends. The asymmetric multicore approach enables the processors not only to complete data and control plane operations but also enable LSI to provide solutions for gateway offloads and enterprise routers that require both multicore and high-performance-per-core capabilities. Working together, all the key sub-components create synergies, which enable equipment manufacturers and service providers to excel in the dynamic mobile communication market.

Figure 2 The Problem with Existing Multicore Solutions

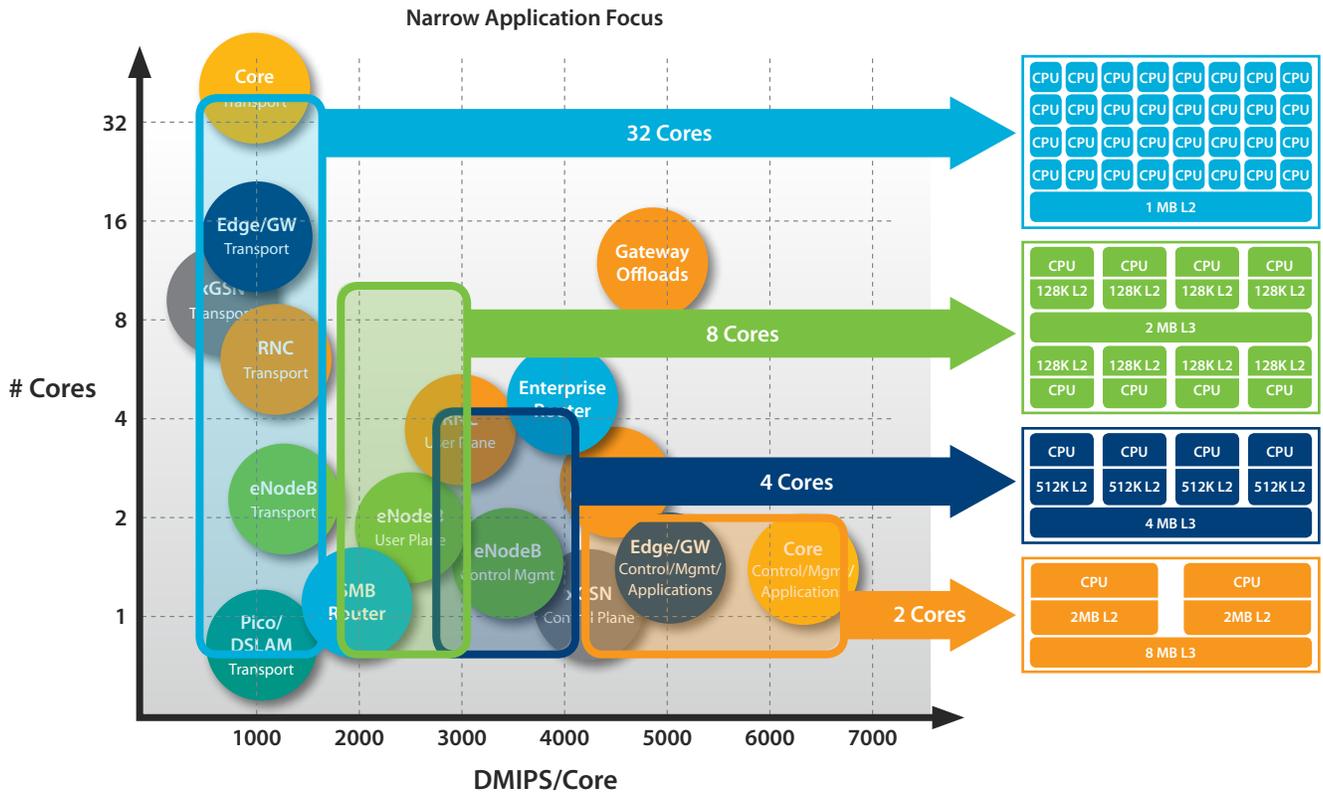


Figure 3 Key Features of the LSI Solution

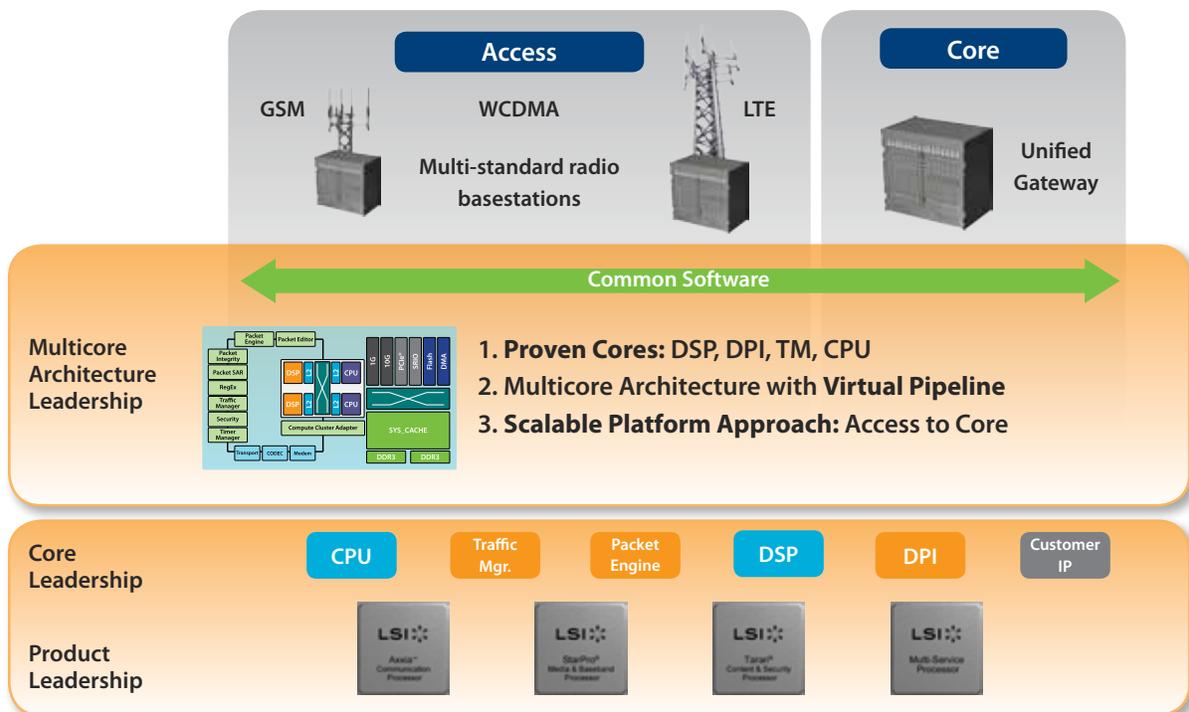
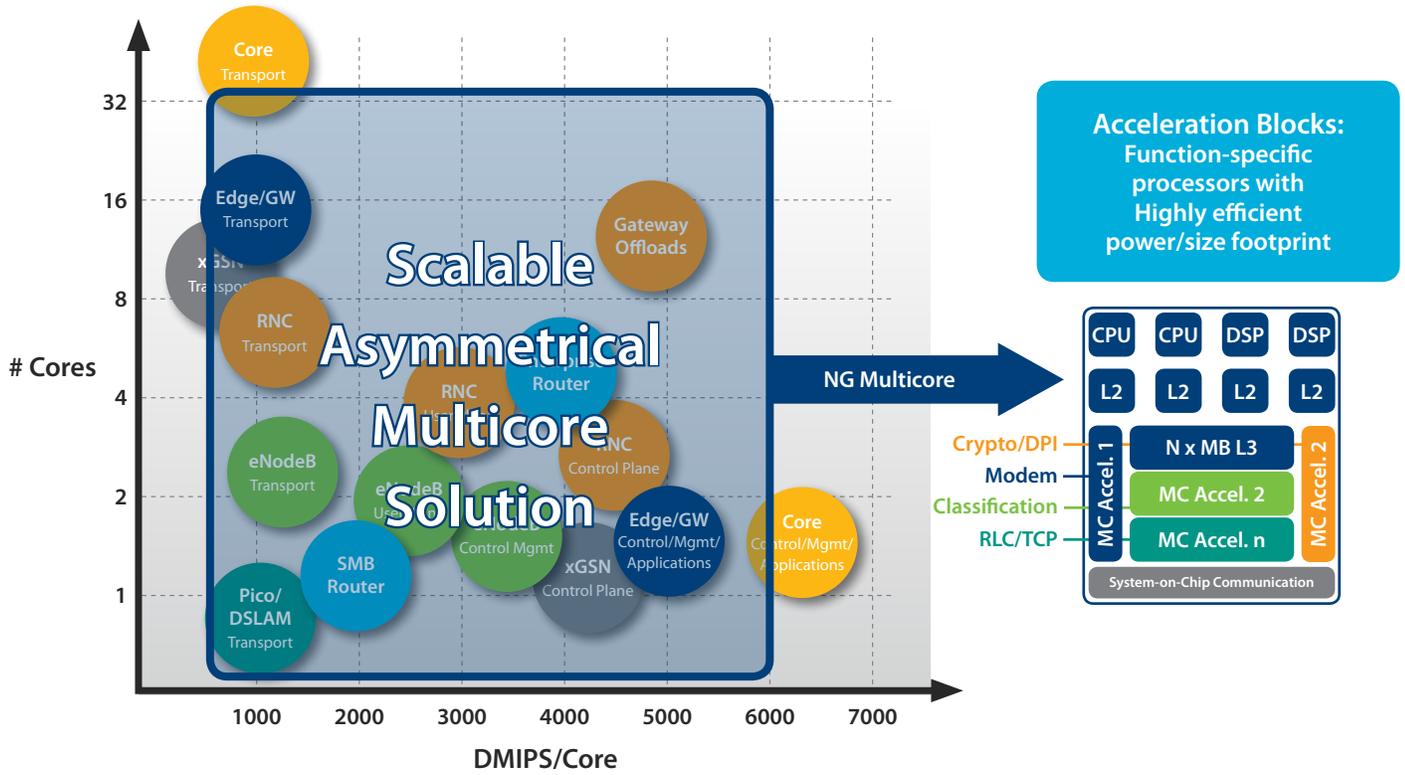


Figure 4 LSI Multicore Approach for Networking Applications



**Summary**

Analyzing the communication industry reveals that mobile consumers are stretching the traditional data plane and control plane capabilities of today's networks. Equipment manufacturers and service providers must develop and install a more robust infrastructure to offer mobile services and virtually unlimited access to online content. Unfortunately, current silicon solutions fall short in supporting future network operator requirements of achieving cost reductions while meeting and exceed-

ing performance targets. However, LSI provides a solution that incorporates proven cores, an innovative Virtual Pipelines SOC architecture, and a scalable platform to simplify the transition as the communication market changes. The LSI blueprint for asymmetrical multicore architecture will be a leading platform that will enable service providers and equipment manufacturers to excel in the future mobile communication market.

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