AMD WHITE PAPER

AMD Smarter Choice

IMS: The migration path towards converged IP-based networks

IP Multimedia Subsystem (IMS) is not a service but a new network architecture designed with building blocks that give telecom operators more flexibility to deliver new services.

EXECUTIVE SUMMARY

Consumer demand for multimedia services encompassing voice (POT, mobile, and VoIP), video (multimedia), and data (Internet), aptly referred to as triple play services, has created a multi-billion dollar opportunity for telecommunication incumbents and new service providers. The convergence of these services allows service providers to earn more revenue dollars per given customer and also reduce the customer "churn rate" by bundling attractive service packs.

In the past, telecom service delivery was limited by and closely associated with the network that delivered the services to the end user. For example, a data network could only deliver data but not telephony, while a telephony network could only deliver telephony traffic but not high speed data. This network dependency meant that the service provider could not change, enhance or provide new services to respond to customer and market opportunities in a timely manner.

The emerging IMS (IP Multimedia Subsystem) networks promise service providers a network-agnostic service delivery capable of delivering convergent services (voice, video, data, and messaging) to end-users, irrespective of the type of network on which they are being run, with a Quality of Service (QoS) that is either consistent with or better than legacy networks.

In this new IMS network, the AMD Opteron™ processor is rapidly being established as the processor of choice for computing platforms, as AMD Opteron processor-based platforms provide industry-leading performance-per-watt, high compute density, and a potentially lower total cost of ownership than competing platforms.

THE MARKET OPPORTUNITY

In-Stat estimates that IMS has the potential to generate over $15 billion annually by 2010 for US carriers alone, from services such as network-based IT applications, hosted data center services, and professional managed services.

"IMS provides enterprises with the means of accommodating secure data transmittal and communication between remote workers, outsourced third-party vendors, and trusted corporate partners," says Keith Nissen, In-Stat analyst. "Carriers can use IMS-based network applications and services to become more than just suppliers of enterprise transport facilities."

IMS NETWORK BASICS

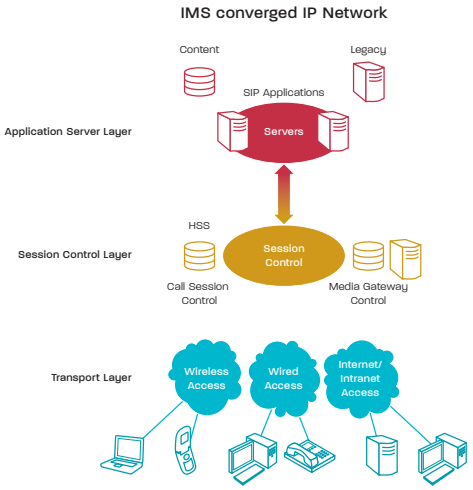
The need for a unified network capable of handling all types of IP-based multi-media traffic has become indisputable. However, the foundation for IMS did not begin until Quality of Service (QoS) was introduced to the 802.xx standard and the standardization work for the 3rd generation mobile phone systems began.

Once the foundation was in place, the work began to build the IMS based network architecture. Early in the development cycle a decision was made to separate the three main layers of the network, namely the access layer, control layer, and service layer, from one another. In this scenario, the control layer becomes independent of the service layer and the service layer is independent from the access layer.

The AMD Opteron™ processor can help telecom operators to increase compute density in central offices, and may allow them to increase server capacity without costly facility upgrades. Technical features of AMD64 technology can help operators achieve ongoing cost savings in power, cooling, management, and ease of upgrades.

Though independent, interfaces between the layers are standardized, making it easier to interconnect systems.

It was also decided to provide a unique subscriber identity to each user, thus enabling customers to roam within different networks, independent of their location and the access technology they might be using. The end benefit was that it no longer mattered which consumer device (mobile phone, PDA, or computer) or which physical access channel (cable, UMTS, WLAN, DSL, or PSTN) was used to access the network. As long as the user had a connection to the network, access to all services was made available with high QoS and adequate bandwidth.



IMS system design varies with the service delivered. However, a high level view of some of the key components of the IMS architecture is described below.

Transport Layer – Initiates and terminates Session Initiation Protocol (SIP) signaling to initiate sessions and provide bearer services. It includes the media gateways and media servers that provide conversion and media related services.

Session Control Layer – Includes the Call Session Control Function (CSCF), which manages the SIP signaling messages to the appropriate application server and guarantees quality of service. The Home Subscriber Server (HSS) is a centralized database that contains the service profile of each subscriber. The Media Gateway Control Function (MGCF) performs the signaling conversion between SIP and the signaling used by the media gateway.

Application Server Layer – Includes content and the application servers that provide end-user services including legacy services and applications.

IMS architecture is expected to continue evolving. The next evolutionary iteration of IMS — aptly named Advances to IMS (A-IMS) — was announced by Verizon Wireless in July, 2006. A-IMS adds support for both SIP-based and non-SIP applications. Verizon developed A-IMS with vendor partners Lucent Technologies, Cisco Systems, Motorola, Nortel Networks, and Qualcomm. Verizon estimated their A-IMS deployment would begin 12 to 18 months from the announcement date.

AMD64 TECHNOLOGY: AN OPTIMAL PROCESSING SOLUTION FOR IMS

From a hardware point of view, key equipment within the IMS network is based on server computing technology. At this level, AMD64 technology provides several unique customer value propositions:

1) Industry-Leading Performance-Per-Watt
With the equipment changes and upgrades to accommodate new services and additional throughput, the costs from power consumption and air conditioning are becoming a major concern for service providers. AMD PowerNow!™ technology with Optimized Power Management provides power on demand computing, and can reduce CPU power consumption by as much as 43 percent while under an approximate 60 percent load, resulting in optimal performance-per-watt, or up to 75% reduction in CPU power when idle. Adjusting CPU power for the load creates a ripple effect of benefits in the data center that can increase dramatically as the number of processors increases. These benefits can include reduction in the amount of heat produced by the processor and other components, and reduction in the amount of electricity required to both run and cool the system. By offering a processor that provides for a dense server configuration with low overall power consumption, AMD helps make it possible to build or expand data centers and central offices with more computing capability and potentially lower utility costs.

Beyond standard server products for the IMS network, AMD Opteron™ processors are also available in open standard chassis platforms like AdvancedTCA (ATCA), BladeCenter and CompactPCI. These platforms are building blocks for solutions that provide the longevity and reliability required by service providers.

2) Scalability
Evolutionary deployment of new technology like IMS must be based on scalable architectures and the long-term protection of past investments. To this end, AMD64 technology offers an innovative solution that allows network operators and service providers to run 32-bit and 64-bit applications simultaneously – operators and service providers can grow into 64-bit computing without sacrificing their existing investments.

Perhaps even more importantly, AMD64 technology was designed from the ground up with multi-core computing in mind, resulting in high performance for multi-threaded and multi-tasking environments. Future Quad-Core AMD Opteron™ processors will be socket compatible with today's DDR2-based AMD Opteron processors, offering a seamless upgrade path to quad-core performance as demand increases.

This simplified platform approach to implementing multi-core technology is further enhanced by Direct Connect Architecture, which provides exceptional multi-processor scalability in up to 8-way systems.

3) Direct Connect Architecture
AMD64 technology with Direct Connect Architecture was designed to improve overall system performance and efficiency by directly connecting the processors, the memory controller, and the I/O to the CPU. Directly connecting these elements to the CPU helps eliminate the front-side bus bottleneck inherent in legacy x86 architectures. On the AMD Opteron processor, the integrated DDR2 DRAM memory controller changes the way the processor accesses main memory, resulting in increased bandwidth, reduced memory latencies, and increased processor performance. With dual channel RDDR2-667 available on the AMD Opteron 2000 and 8000 Series processors and UDDR2-800 available on the AMD Opteron 1000 Series processors, theoretical maximum memory bandwidth (per CPU) is between 10.6GB/s and 12.8GB/s. Another benefit of integrating the memory controller directly on the processor is that memory bandwidth scales with the addition of processors. This helps provide high-throughput responsiveness and scalability with multi-processor platforms.

AMD64 technology with Direct Connect Architecture features HyperTransport™ technology and provides up to 8.0GB/s bandwidth per HyperTransport link — sufficient bandwidth for interconnect technologies including PCI-Express, PCI-X, DDR, InfiniBand, and 10G Ethernet. AMD Opteron processors support up to three HyperTransport links per processor, providing up to 24.0GB/s peak bandwidth per processor.

These processor-level features can provide a tremendous competitive advantage at the control layer of the IMS network. The performance of IMS Call Session Control Function Proxies depends on the protocol translation capabilities of servers, which are based on high I/O to memory throughput for signaling packets and high memory throughput to and from the CPU to process the signaling packets — areas where AMD64 technology has exceptional performance. With Direct Connect Architecture, multiple data streams no longer have to share a single data pipe. More data can be moved more efficiently, allowing servers to support a high number of session initiation requests at any given time.

AMD's Direct Connect Architecture also allows each processor in the multi-processor compute node to access the memory of the other processors at low latency with high bandwidth. The up to 256 terabytes of memory address space of AMD Opteron processors helps the performance of applications when large (or many) datasets are held in memory, as is the case with subscriber data applications.

4) AMD Virtualization™ (AMD-V™)
IMS architecture details the multiple functions that form the building blocks of the infrastructure. Well-defined interfaces between these functions give vendors the choice of which functions to incorporate and how to distribute them across computing nodes. Several functions can be combined in one node, each function can reside in its own node, or functions can be distributed among nodes to allow for redundancy.

Next-Generation AMD Opteron processors are designed to help end the "one server, one application" problem. With hardware-assisted AMD Virtualization™ technology (AMD-V™), Next-Generation AMD Opteron processors can help streamline the Telecom infrastructure to achieve higher levels of efficiency and utilization.

Regardless of the specific IMS implementation chosen by a particular service provider, AMD-V helps enable a flexible, one–to-many relationship between hardware, operating systems, and applications, and contributes to functional flexibility, implementation, and distribution for IMS equipment vendors.

CONCLUSION

The IMS market is still in the early stages of development and technical specifications for the architecture continue to evolve. However, it is clear that IMS offers service providers the promise of significant revenue opportunities for converged services, network-based software applications, and simplified processes. At the same time, IMS offers end users personalized multimedia services independent of the transport media. IMS is significant in a future of converged, all-IP-based network architecture.
As a highly scalable building block for the current and future IMS network, the AMD Opteron™ processor provides an ideal computing platform for IMS. It gives network service providers the ability to buy industry-standard platforms, based on readily available x86 hardware and software, that offer industry-leading performance-per-watt, enable lower cost of ownership, and provide for simplified IT management.

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