

CONVERGENCE OF WEB AND ENTERPRISE APPLICATIONS DEMANDS A NEW PARADIGM

Enterprises need to squeeze more value from legacy applications while reducing total cost of ownership for the new applications they're banking on for the future.

They were strong, capable, dependable and fairly easy to manage. Although one couldn't call them nimble or cheap, those hulking mainframes dominated enterprise computing for decades, often running 24/7 to process unimaginable volumes of data.

With the introduction of less expensive, more versatile technologies into the enterprise environment, that dominance began to fade—a phenomenon IT managers viewed with some ambivalence. The new components for the client/server computing model came with myriad standards and protocols and, coupled with the opening of the Internet for commercial purposes, pushed the previously well-ordered enterprise IT environment to the brink of chaos.

There the enterprise IT environment remained until the evolution of the TCP/IP communication standard that not only seamed together the disparate fragments but also made them, working together, more powerful than they'd ever be standing alone. Coupled with the widely accepted x86 architecture, TCP/IP enhanced the ability of the enterprise to pool a wide variety of technology resources. Legacy back-end databases gained even more value as central repositories of enterprise information.

On another tier, applications handled on smaller, nimbler x86-based servers provide enormous flexibility while greatly enhancing end-user productivity. With the Web as the enterprise "backbone," clients around the globe remain in instant contact with the information they need. Users pushed the definition of 24/7 to mean not just around-the-clock processing of data, but also "anytime/anywhere" access to information.

What appeared for a brief moment to be the brink of chaos was merely the threshold of convergence. Lines now blur between established enterprise architectures, client-server architectures and the more outward-looking service-oriented architectures.

Although the "one-stop shopping" ideal for enterprise data still has great value, the migration of conventional enterprise software to the Web provides broad new benefits and capabilities. As need for more data storage or more computing power to handle all this information increases, the standards-based, layered approach to the enterprise computing model makes it easier to grow without disruption or loss of productivity, without changing technology directions and without sacrificing valuable corporate assets.

At the same time, the heterogeneous enterprise becomes easier to manage as well as less expensive to operate and maintain. The model also makes it easier for IT managers to identify overused and underused components and more efficiently balance the workload.

The key component in this new enterprise IT model is the continued improvement of standards-based processors for Web and application server platforms. Consider "Moore's Law," which says the data density on integrated circuits doubles every 18 months. The next evolution of microprocessor design will include multicore processors, which don't need to run as fast as single-core processors. AMD is currently extending overall throughput with the development and introduction of fast, cool-running dual-core technology.



Processor speed, however, is meaningless without context, and therein lays the problem: What good is all that cool speed if as much as 75 percent of it is never used at all, or if what is used is not used effectively and efficiently? What value is it to the enterprise if it requires a complete rebuilding of legacy systems and technology architectures?

PERFORMING IN THE REAL WORLD: AMD TECHNOLOGY BENEFITS THE URGE TO CONVERGE

Convergence of Web and application server platforms bring many tangible benefits to a business. Using AMD Opteron™ processor-based servers to power those efforts significantly enhances the benefits by enabling:

- Decreased complexity
- Increased flexibility, efficiency of infrastructure, and utilization
- Rapid application deployment
- Migration to the power of 64-bit computing, while maintaining world-class 32-bit performance
- Reduction in the amount of real estate required for data centers
- Higher return on investment
- Lower cost of ownership

PERFORMING IN THE REAL WORLD: LOWERING COSTS, INCREASING PROCESSING CAPACITY

The needs of enterprises for Web and application server technology vary widely from industry to industry as well as from enterprise to enterprise:

- Government and academic or institutional organizations require a high level of security, high availability and flexibility for Web-based and citizen-centric applications.
- Financial services organizations are dependent on security to protect customer information and also need high-performance solutions for compute-intensive transactions and Web applications.
- The engineering, research and scientific community requires raw computing power while also presenting a greater demand for collaboration, and integrated resources and data.

Servers built with AMD processors have met and exceeded those requirements. In fact, one of the most-visited Web sites on the Internet needed:

- **Assurance that performance showed no degradation** on days when the normal millions of visits to the site spiked to tens of millions of visits.
- **A path to 64-bit applications** while continuing to run 32-bit applications.

to the next. Ironically, with the initial introduction of 64-bit processors, the industry seemingly abandoned its own migration model. It yanked the rug from under users by opting to introduce an architecture that would require hardware manufacturers and software developers to start all over again. The move also rendered questionable the backward compatibility of billions of dollars of still useful hardware and software deployed on enterprise networks around the globe.

AMD filled that x86 architecture void with the evolutionary AMD64 Direct Connect Architecture, an industry-standard approach to 64-bit technology. The AMD Opteron™ processor—a 64-bit CPU that's backward-compatible with 32-bit applications—is built on this standard. Both 32-bit and 64-bit applications run natively on the AMD Opteron processor, with no emulation required, thus no performance penalties are incurred.

This design provides enterprises with much-needed flexibility, letting them protect their investments in 32-bit code while providing an easy migration and upgrade path to 64-bit applications that they can deploy as needed. More importantly, the flexibility of the AMD Opteron processor allows for simultaneous 32- and 64-bit computing on a single machine.

Multiply the Power

In 2004, AMD demonstrated the industry's first x86 dual-core processor, which is scheduled to be available in 2005. The company's common-sense enterprise migration strategy helps ensure that an investment today in AMD single-core technology is far from a dead end. The forthcoming dual-core processors will be pin-compatible with 90nm single-core processors, easing the upgrade process.

In addition to providing for backward compatibility, AMD64 processors also help enterprises with another concern: 32-bit processors simply have run out of gas for many enterprise applications, especially those that are bumping into limitations of addressable memory. In the 32-bit world, applications must share the 4GB of available addressable memory with other running applications and the computer's operating system. Modern server applications, especially those that use databases, routinely require more than 4GB of virtual addressable space, which includes both physical RAM and virtual memory.

The AMD64 architecture provides for a 256-terabyte flat address space, which 64-bit applications can access directly. The available memory bandwidth scales with multiple processors up to 6.4GB per processor. And memory access does not occur through the standard front-side bus bottleneck, but is directly connected to the CPU to optimize memory performance.



AMD64: The New Standard for Delivery of Web and Application Servers

As the x86 architecture evolved from 8-bit to 16-bit to 32-bit, one of its key selling points was backward compatibility, enabling enterprises to migrate sensibly from one technology

PERFORMING IN THE REAL WORLD: ANALYZING RISK AT THE SPEED OF AMD OPTERON™ PROCESSORS

A Fortune 100 company with billions of dollars in foreign currencies, fixed instrument and equity investments around the globe relies on sophisticated compute-intensive statistical modeling and risk analysis software to manage its investments and make quick decisions on moving money.

Its 32-bit processor-based systems—with their accompanying 4GB memory limitations—simply were not up to the task.

The memory barrier disappeared, however, with the software running on a cluster of four-way and two-way AMD Opteron processor-based servers. The organization realized a 325 percent increase in overall system performance, reducing time required to run the risk analysis software from 40 hours to 13 hours.

PERFORMING IN THE REAL WORLD: POWERING THE NEXT-GENERATION DATA CENTER

An e-commerce and Web infrastructure company needed a platform that was capable of running multiple operating systems to:

- Consolidate servers
- Simplify data center operations
- Reduce software licensing costs

The deployment of a server farm of four-way AMD Opteron processor-based servers helped it not only achieve its goals, but also improve performance.

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The company's AMD64 standard and the AMD Opteron processor have gained wide industry acceptance. Top computer manufacturers, including Hewlett-Packard Co., IBM Corp. and Sun Microsystems Inc., have incorporated the processors in their servers for enterprises demanding top price-to-performance ratios. Support from software developers continues to grow.

Today hundreds of ISVs produce:

- Operating systems, including Unix, Windows® and Linux
- Development tools
- Database engines
- Infrastructure applications
- Vertical applications

Now, even the competition has adopted the AMD64 instruction set, albeit rebranded. The primary difference is that other x86 processors still manage memory in a slower, old-fashioned way: through the front-side bus bottleneck.

Launchpad for Expanded Solutions

What does all this buy for the enterprise? Flexibility and a reduction in the total cost of ownership for technology systems. According to The Economist, enterprises spend almost \$50 billion a year on servers, but the utilization rate for these systems is often below 30 percent.

So why embrace a technology that will make servers even more powerful? To prepare for the inevitable. The convergence of Web and application server platforms will continue to drive a requirement for greater efficiencies. The enhanced power and expanded capabilities of 64-bit processing enables the most efficient management of enterprise IT resources to date. Today, effective IT managers use several strategies to fine tune the enterprise infrastructure, including:

- **Server consolidation.** As groups of older servers need replacing, the separate applications they each run can easily be consolidated onto a single server. A benefit of using AMD Opteron processors is that 64-bit and 32-bit applications can run on the same server. Because AMD Opteron processors aren't hamstrung by memory restrictions and other inhibitors of the older servers, the many-to-one consolidation may accommodate both the new and old applications. Configurations of servers with two 64-bit processors, for example, provide an option to replace quad-processor 32-bit servers, and fewer processors means lower software licensing costs.
- **Grid computing and clustering.** The AMD Opteron processor facilitates enterprise migration to grid computing. Instead of simply establishing communication between disparate machines in the data center or far-flung geographic locations, grids

PERFORMING IN THE REAL WORLD: DELIVERING RELIABILITY AND SCALABILITY TO FINANCIAL SERVICES

A Fortune 500 financial services company has thousands of geographically dispersed employees who work one-on-one and often face-to-face with clients seeking instant results. The consultants needed a reliable and scalable technology that could accommodate constantly changing software and simplify orderly deployment of new applications. AMD processors met those needs.

harness the collective power of networked resources by driving them to function as one. AMD Opteron processor-powered servers provide the linchpin for the grid, improving performance and efficiency of the existing infrastructure, driving up use and usefulness of all components, providing for levels of redundancy to protect data and keep applications available, reducing TCO of those components and delivering a greater return on investment.

Also, by not breaking binary compatibility with 32-bit applications, the AMD Opteron processor gives customers a much simpler route to 64-bit computing. One reseller, who specializes in placing servers in the enterprise environment, reports that AMD Opteron processor sales represented 20 percent of his volume in 2003 but jumped to 40 percent in the first quarter of 2004, driven by enterprise interest in the processor for databases and enterprise applications.

- **Blade servers.** Technology that can scale up to improve efficiency and increase returns on investment also can scale downward, i.e., harness immense power in small packages. AMD Opteron processors in blade server configurations will provide the enterprise with many cost-saving advantages, including reducing the amount of real estate required for data centers.
- **Server virtualization.** The typical enterprise spends more money on x86 server hardware than on mainframe hardware, but mainframes run at about 80 percent of capacity whereas x86 servers run at only about 10 percent of capacity. Enterprises can minimize these inefficiencies with server virtualization, which allows different operating systems and applications to run on the same physical server. And processor-enabled virtualization—coming to the AMD64 platform—will reduce the software overhead normally associated with virtualization while providing accelerated performance and improved security.
- **True e-commerce and CRM.** The convergence of Web and application server technology and the multitiered enterprise computing architecture help deliver on the promise of real-time, scalable e-commerce and real-time customer relationship management processes. As more customers and vendors enter your

e-commerce site and more users access your internal databases, scalability and performance of Web and application servers are essential considerations.

Horizontal scaling builds an infrastructure with many small, low-cost industry-standard servers, each running a separate instance of the needed software in response to increasing demand for Web content delivery and application processing. Enterprises must have the flexibility to add servers quickly to meet the incremental demand, and the new servers must have the load-bearing capability to maintain responsiveness.

Common-Sense Migration

Convergence of Web and application servers in the enterprise demands a new paradigm for underlying delivery systems and servers, as well as technology that is much more robust than previously was available. Driving business growth and underwriting the success of new applications supporting that growth will be the continued availability of legacy applications and data.

That will require the strength and flexibility of a common-sense migration path to the 64-bit world, one that lets organizations protect their investments in existing technology and leverage those resources for the future. AMD provides that path with its technology and the AMD Opteron processor.

Today's enterprise is more cost-conscious than ever before. Although the cost of hardware continues to decrease, that represents only a fraction of the total cost of ownership of technology systems. The AMD64 strategy, by facilitating approaches such as use of blade servers, virtualization and grid computing, can help organizations today make maximum use of resources and drive some management and maintenance costs from the ownership scenario.

The AMD64 strategy further provides a pathway to the future, enabling enterprises to build platforms to accommodate new software that will help them continue to attract and keep new customers and operate business more efficiently.

