Putting Server Virtualization to Work

Enterprises have been using virtualization technology on mainframes and RISC-based systems for years to enable better utilization of hardware resources. As x86 servers have become a mainstay in the enterprise, more companies are exploring virtualization with these servers to enable more productive, flexible, and scalable datacenters while reducing costs and boosting data availability. Computing technologies from AMD are providing the foundation for today's — and tomorrow's — enterprise virtualization solutions.

In the 21st century, the promise of the Information Age is being fulfilled. Bits and bytes of data, information and knowledge rocket around the globe in milliseconds. Product cycles have been condensed from years into weeks, and supply chains are interwoven into a complex fabric. Paper is giving way to pixels and e-business is rapidly evolving from an elusive dream into reality.

In this post-industrial environment, an enterprise that has a well-defined data management strategy is at a tremendous advantage. Such an organization can harness the power of information technology to achieve remarkable results. Conversely, companies lacking the right server and data management strategy risk missing out on the promise and opportunities of the digital age.

Achieving success is no simple task. As organizations have adopted a mélange of hardware and software systems — with servers scattered across an enterprise — the solution has often created a new problem. Today's complex data-server environments have grown exponentially, leaving companies with larger and more rigid datacenters. Not only does it become cost-prohibitive to administer these datacenters, it is difficult to achieve optimal value and return on investment (ROI) as well as return on assets (ROA). Hard-to-find data, old and inaccurate data, aging hardware and software, and sluggish performance can all conspire to drag down service levels and profits. In the end, an organization can find its customers, business partners and employees dissatisfied.

Enter virtualization—a technology that enables corporations to make more effective use of the computing resources within the datacenter and move legacy software and data to newer, more efficient hardware platforms.

Virtualization partitions a server into several "virtual machines," each able to run its own separate operating system and application environment. This moves businesses away from a "one server, one application" model in which computing resource use can average less than 25 percent, and toward an infrastructure that lets a business manage its servers across a heterogeneous environment far more effectively. The ability to run different operating systems and applications on the same physical server lets organizations consolidate the workload placed on servers. If one virtual system fails, another can take over instantly and perform the same tasks.

Virtualization isn't a new idea. It is a time-tested concept that IT professionals have used for years to manage mainframes and UNIX computing environments. Advances in x86 technologies such as AMD64 technology with Direct Connect Architecture have made virtualization ideally suited for today's conventional PC and server-centric environments. With computing demands increasing every year, and as much as 80 cents of every IT dollar spent on software and operations maintenance, the need to streamline has become paramount.

STREAMLINING TESTING AND DEVELOPMENT ENVIRONMENTS WITH VIRTUALIZATION

For many enterprises, development and test environments — while a necessary part of doing business — also present challenges when it comes to cost of operation and time to market:

- Capital and space requirements for multiple physical systems, particularly servers, may be prohibitively high, in today's budget-conscious environments.

- Length of required setup cycles and lack of sufficient hardware reduces workflow efficiencies.

- Actual test and deployment cycles may be longer than necessary due to frequent system reconfigurations.

As any bottom-line-minded business knows, all of these challenges end up costing money in one way or another. With virtualization, corporations can overcome these hurdles.

The combination of AMD's Direct Connect Architecture and the ability to run 32- and 64-bit applications underlie many of the real-world benefits. As a result, successful companies are integrating AMD Opteron™ processors into their operations.

For years, enterprises have used virtualization technology on mainframes and RISC systems to enable better utilization of hardware resources. As x86 servers have become a mainstay in the enterprise, increasing numbers of companies are exploring server virtualization to build more productive, flexible, and scalable datacenters while reducing costs and boosting data availability. And computing technologies from AMD that enable 64- and 32-bit software to run side by side are providing the foundation for today's — and tomorrow's — enterprise virtualization solutions.

With the right software and systems in place, a company can manage and automate an array of complex processes. It can create a "utility" computing environment that serves up data on demand. Armed with greater flexibility in its server and storage infrastructure, an enterprise can attain the flexibility it requires to compete in today's global economy.

BUSINESS IN A VIRTUAL WORLD

Virtualization can provide well-documented benefits to organizations of all sizes and across a wide spectrum of industries. When an enterprise has the right virtualization solutions in place, it can achieve efficient utilization of server resources to more effectively test and deploy new application environments. A well-tuned computing engine can supply an enterprise with the power it needs to ratchet up business goals as well as customer and management expectations.

Ultimately, an organization can more effectively utilize all of its assets across the entire enterprise. Several key business drivers are spurring the adoption of virtualization. Among them are:

- The need to simplify management of complex hardware devices. Today, multiple hardware platforms, operating systems, and programming environments lead to a jumble of systems and resources. The proliferation of single application servers — and resulting data silos —can wreak havoc on data accessibility and network performance. It is not unusual for an organization to overuse some equipment while other devices remain vastly underutilized. The resulting imbalance and cascading inefficiencies typically lead to higher costs, reduced response time, and more complex provisioning.

- A reduction in costs associated with reduced server management and administration. At many organizations, network administration is an expensive and unwieldy task. As the number of servers grows, IT staffing and tasks spike as well.

However, virtualization can tip the balance back in favor of the enterprise. In some cases, a 5 to 15 percent drop in basic IT operating expenses may be achieved. A well-planned virtualization strategy can also reduce the time it takes for IT staff to manage devices. Some companies report gains of 50 to 70 percent or more. This leaves hardware specialists, programmers, and other professional staff free to handle more strategic work.

- A more flexible and scalable environment. Many organizations find themselves awash in data — flowing from multiple databases, data marts and data warehouses, and in addition to the vast array of unstructured data that floods the typical enterprise today. The number of documents in various formats, e-mail messages, photographs, and video files is growing at a rapid clip. The fast pace of business demands a computing environment that allows fast and easy access to this growing mountain of data. Any lag in performance can slam the brakes on a company's overall performance and light up its bottom line in red ink. As the organization's data environment continues to grow, so does the need to ensure that its applications continue to operate at their maximum potential. Virtualization enables legacy applications and data to be run on modern hardware platforms, providing more security and performance benefits.

- Reduced financial risk. Loss of data can prove fatal for an organization. Ironically, the greatest losses often aren't the result of the immediate disaster, but of ongoing lapses during the recovery phase. Organizations first lose critical files or information, and loyal customers follow. Even brief disruptions could result in lost opportunities. But with virtualization, companies that previously weren't able to justify the expense of a disaster-recovery solution (for small applications or smaller IT environments) may now do so. When implemented within the context of virtualization, the ROI for a disaster-recovery solution is high.

- Governance and regulatory concerns. Sarbanes-Oxley, Basel II, and the Health Insurance Portability and Accountability Act (HIPAA) have all created an environment that forces organizations to take regulatory issues seriously. Strict reporting rules and tight internal controls translate into a need for better data management. Security and privacy issues have also emerged at the forefront of business. Centralized administration and tighter control of resources made possible by virtualization can help an organization avoid problems sometimes associated with highly

fragmented and distributed data and computing resources. Virtualization efforts may also contribute to a more secure and controlled datacenter, since the IT organization will typically manage fewer servers within this type of environment.

TAKING VIRTUALIZATION TO A HIGHER LEVEL

Virtualization is increasingly attractive to organizations looking to maximize the potential of server-based applications and computing resources. Among their other benefits, virtual servers can help reduce dependency on old, out-of-warranty servers that require more power and cooling than today's more energy efficient models. In many cases, these aging machines, which rely on legacy hardware and operating systems, require a disproportionate amount of attention and support. In contrast, virtualization lets IT managers clear away the 'deadwood' by consolidating servers running line-of-business applications and help enable an optimized infrastructure, higher server utilization, and reduced management. This, in addition to the improved energy efficiency of the newer systems, contributes to lower power, cooling, and datacenter space usage costs.

Virtualization also helps organizations extend the life of their own custom-written applications. In the past, companies that had to keep these applications in service faced skyrocketing support and maintenance costs for the accompanying legacy hardware and operating systems. But with virtualization, there's no need to rewrite existing custom applications to run on the latest hardware and OSes. Now, companies may simply create a dedicated virtual machine for their legacy application, and run it alongside other virtual machines running newer applications — all on the latest power-efficient, multi-core, server hardware. With virtualization, software investments can be protected while taking advantage of newer, cost-efficient hardware.

Another advantage of virtualization is its ability to streamline and accelerate deployment of software and systems. An enterprise can deploy a new version of the operating system and continue to run a legacy application in a virtual machine. Using virtual machines to test migration plans, including debugging systems and analyzing performance, makes it easier to isolate and solve problems before migrating to new environments. It reduces the cost and risk of rewriting, porting or integrating existing applications with new systems and lets an organization deploy new systems with minimal

disruption to users. Consequently, customers, employees, and supply chain partners can work in a familiar way.

In addition, by separating hardware and software management issues, an enterprise can often manage and maintain discreet systems far more effectively.

A virtual environment also excels at managing workstations, departmental servers, datacenter servers and other devices. Virtualization's ability to separate hardware and software management issues and manage discreet virtual systems can escalate network performance to a higher level. In fact, by allocating and reallocating resources on the fly, an organization can often gain a level of flexibility unimaginable only a few short years ago.

LAYING THE FOUNDATION WITH AMD

Along with the many benefits it provides, virtualization technology is a memory intensive application that places a heavy demand on servers. Virtualization software must manage multiple virtual environments while still delivering application and data services to users in a timely fashion. That's why top server performance within this type of environment is crucial — and it's being delivered today by the AMD64 computing platform, namely AMD Opteron™ processors.

AMD Opteron processors with Direct Connect Architecture provide a solid foundation for the evolution to x86-based virtualization. The AMD64 computing platform offers companies the ability to run both 32- and 64-bit virtual machines on the same physical server, without rewriting code, enabling them to maximize their IT investments. Direct Connect Architecture also directly connects the CPU to the memory, I/O, and other processors. The integrated memory controller provides high-speed, low-latency access to memory, and can help host and guest operating systems function more efficiently. HyperTransport™ technology provides a scalable interconnect between processors, I/O, and other chipsets. This can help support more guest OS sessions and more user access applications.

Second-Generation AMD Opteron processors, released by AMD in 2006, further advanced virtualization, by improving system performance and security of virtual environments to help boost the return on investment. AMD Virtualization™ technology (AMD-V™), consisting of hardware extensions to the x86 system architecture, is designed to help virtualization software more efficiently run applications in separate, isolated environments and

TOP 5 BUSINESS BENEFITS OF VIRTUALIZATION

1. Increase server utilization
2. Improve service levels
3. Streamline manageability and security
4. Decrease hardware costs
5. Reduce facility costs

THE BENEFITS OF VIRTUALIZATION WITHIN A DEVELOPMENT AND TEST ENVIRONMENT INCLUDE:

- Lower capital and space requirements. Virtualization enables the consolidation of multiple test and development systems into fewer physical machines. These machines may run several different operating systems simultaneously, while still maintaining system independence and integrity.

- Lower power and cooling costs. By consolidating legacy software through virtualization, businesses can switch out older, less energy-efficient machines with fewer, more energy-efficient systems.

- Increased efficiencies through shorter test cycles. Corporations can keep centralized libraries of virtual test environments and reuse them when needed, which may drastically reduce configuration times. Further, because these environments are essentially available on demand, server idle time may be reduced. Virtualization can also simplify the process of testing distributed server applications, which can be extremely time-consuming and resource-intensive.

- Faster time-to-market. Virtualization empowers developers to increase efficiencies and effectiveness, so products may ultimately come to market faster.

hide the complexity of hardware infrastructure to help simplify management. AMD-V leverages Direct Connect Architecture to provide fast and efficient memory handling, a must-have for memory intensive applications like virtualization.

Third-Generation AMD Opteron processors, to be released in 2007, will offer enhancements to AMD-V that will provide a balanced approach to improve virtualization performance and enable near-native performance on virtualized applications. One of those enhancements, nested paging, will reduce the overhead of switching between virtual machines. The use of nested paging by virtualization software will improve the performance of many virtualized applications. AMD Opteron processors with AMD Virtualization are engineered to help datacenter managers more easily migrate to virtualization applications and plan for future virtualization needs.

Finally, AMD has forged strong relationships with numerous hardware and software firms that have a strong interest in x86 virtualization technology, including VMware, HP, IBM, Microsoft, Novell, Red Hat, Sun Microsystems, SWsoft, Virtual Iron, and XenSource. This helps businesses harness the power of virtualization in far more robust ways. They can act and react to changing business conditions in a more agile manner by reallocating computing resources quickly and efficiently and pooling these resources on specific servers. The combined power and flexibility of AMD Opteron processors and virtualization will let organizations break the restraints of conventional strategy and take server management to a higher level.

BUILDING A VIRTUAL SUCCESS STORY

Companies that have taken advantage of virtualization have realized a solid ROI. Today, a wide range of organizations — including those in data-intensive industries such as financial services, healthcare, aerospace, and retailing — already have deployed virtualization successfully. Many other companies are following suit.

In fact, a growing number of businesses are turning to virtualization solutions to help them build more power efficient, highly flexible, and scalable solution platforms. As business decision-makers increasingly look to squeeze out additional gains from the x86 architecture, they are taking a closer and more critical look at the servers they purchase. Certainly, it is no longer feasible to buy a server for every application an enterprise uses. Managing IT resources efficiently is a necessity. Only then is it possible for an enterprise to ensure that it is maximizing revenues, return on assets, customer and partner loyalty, and shareholder value.

AMD is at the center of this emerging universe. As organizations move beyond the flat earth of CPU cycles and begin to examine I/O and chipset-based virtualization, they are discovering that it is possible to boost productivity and slash costs. Whether the focus is on system-wide performance, e-commerce, storage, or simply maximizing the use of data, tomorrow's solutions exist today. AMD Opteron processors with Direct Connect Architecture are ushering in a new era of server performance and making architectural level virtualization a reality. It demonstrates that virtualization can provide a giant leap forward in the evolution of computing and information technology. ■

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