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Business Benefits of Deploying Next-Generation IT in the Midmarket

Sponsored by: Sun and AMD

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BUSINESS AND TECHNICAL CHALLENGES FACING THE MIDMARKET

Executive Summary

IT managers in midsize companies have "inherited" IT infrastructure that was built up, over a period of many years, based on decisions made by past IT administrations. The resulting infrastructure can be complex in its design, difficult to manage, and expensive to operate. Many sites have found that, by pairing virtualization with workload consolidation, they can change the way that workloads are running on x86 server architecture and become more efficient in the process. In some cases, midsize firms work with channel partners to accomplish the goals of a workload consolidation project — and in others, they do the work themselves, depending on whether they have enough onsite IT staffers to do so.

While it is not possible in today's economic climate to do "rip-and-replace" IT projects, due to the high cost of replacing all IT resources, a more moderate path can often achieve important reductions in operational costs. They can then redirect the savings to fund other projects. Key to this process is identifying the systems that would benefit most from replacement, such as systems that are aging in place and thus require more power/cooling than new servers based on energy-efficient designs.

Simplification of IT management, reduced power/cooling, and reduction in floor space required are goals of workload reduction projects, often involving the use of virtualization software to manage more workloads on fewer server "footprints" in the datacenter. Channel partners have been working with midsize companies to simplify the complexity in the datacenter, including simplification of IT infrastructure, reduction in the total number of physical servers supported, reduction in the amount of cabling between servers and other devices, and easier management.

Many midsize businesses have discovered that by replacing older infrastructure with new, more efficient systems, they have been able to reduce operational costs, allowing some of the savings to be redirected to other business needs. Often, many of these operational benefits are gained within one year of purchase of energy-efficient systems and new server form factors that allow more computing power to be fit into the current space allotted for computer systems and storage.

This paper describes server products from Sun Microsystems and AMD that address ongoing operational costs, including energy efficiency, reduced maintenance requirements and systems management. Often, many of these operational benefits are gained within one year of purchase of energy-efficient systems and new server form factors that allow more computing power to be fit into the current space allotted for computer systems and storage.

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Challenges Facing the Midmarket

Operational issues associated with the IT environment in midsize firms have taken center stage in recent years. This is especially true for firms that have dedicated space, beyond just a server closet, where IT equipment can be maintained in a secure, properly regulated environment. For midsize firms in general, but particularly for those with such a datacenter, three concerns are especially important:

- Power/cooling issues relating to rising energy costs and high densities of servers packed closely together
- Management and maintenance of large numbers of servers
- Underutilized computing resources

Once considered critical concerns only for the largest and most advanced companies, these issues affect even midsize firms as IT expansion comes into conflict with pressures for improved performance and efficiency.

Today's midsize business focuses on reducing operational costs, including management and IT staff costs, power/cooling costs, and the opportunity costs associated with resources being unavailable in downtime events. (IDC defines midsize companies as those having 100 to 1,000 employees.) Next-generation systems, including x86 servers with energy-efficient technologies, can be leveraged to support consolidated workloads, reducing operational costs. While it is important to identify which systems would benefit most from updates, upgrades, and replacement, the introduction of new systems can be seen not only as an up-front investment in efficient technology but also as a means to reduce ongoing operational costs over time.

The rapid growth of server units, most of them x86 servers, at customer sites has caused a number of unintended consequences in recent years, mostly because of the installation of large numbers of servers within the datacenter or computer room. Although capital expenses for acquiring servers have certainly decreased in recent years, due to reduced average sales prices per server, several types of operational expenses have increased since 2001:

- **Power and cooling costs.** IDC research shows that power/cooling costs are at the top of the list of IT managers' concerns regarding the housing and operation of servers. Energy costs are rising, compared with levels of a decade ago, and tight packing of many servers in a small space leads to overheating of some spaces within a computer room.
- **Management and maintenance costs.** System management has become more complex as the number of servers has grown. Wiring/cabling of the hardware itself, application of software updates and security patches, and upkeep of each individual server over its useful life cycle have combined to increase operational costs in recent years (2001 to present).
- **IT staff costs,** including costs associated with addressing downtime and ongoing maintenance of large numbers of servers. Increasing both automation and remote management is seen as a way to address these growing operational costs.

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Inefficiencies in the Datacenter

Today's datacenters and computer rooms reflect the history of computer buying decisions that were made in the 1980s, 1990s, and 2000s. SMBs in general and midsize firms in particular have been especially active in acquiring servers in the past five years. Over time, the amassed server inventory has led to a series of information "silos" in which some "silos" cannot interoperate easily with others, from a software perspective.

To be sure, the rise of the Internet and Internet networking standards has aided interoperability in the datacenter between these information "silos" — via Web-enabled applications (e.g., Java-based applications that run on multiple platforms and SOA designs for end-to-end applications) — but opportunity for improvement remains in allowing all of these servers to move workloads easily and quickly from one server to another. Further, most servers have their own cabling and peripherals, which are not easily shared among all of the servers on the datacenter floor.

The Drive to Reduce Operational Costs

The drive to reduce opex is now a front-burner topic for business and IT executives, even as server prices continue to be reduced, due to competition in the marketplace combined with the economic crisis. Why? As Figure 1 shows, the growth in operational costs has outstripped the growth in capex in recent years. With the rapid growth and deployment of x86 servers worldwide, the installed base of all servers grew to an all-time high of more than 30 million units worldwide in 2007 — dramatically more than in 1996, when the worldwide installed base was between 5 and 10 million server units.

With this rapid growth came some very real growing pains in both management and IT costs. The IT costs were associated with applying software upgrades and security patches to all of the servers distributed around the business — a real drain on IT staff working hours. Other unintended consequences included dense packing of servers with processors that were being optimized to run at higher speeds, increasing power/cooling demands.

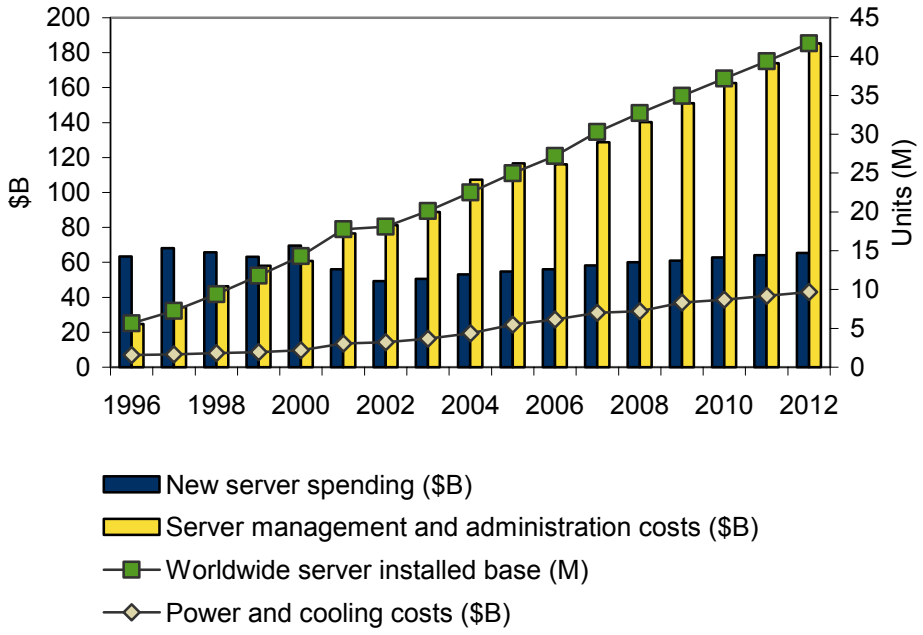
Today, new technologies are addressing these issues:

- Multicore processors allow each individual core to be tuned to lower frequencies, generating less heat for each server.
- Overall energy efficiency is being improved on a system level. The more power that is required to operate a system, the more heat energy is dissipated during its operation.
- System software has the ability to identify and to control "hot spots" throughout the datacenter. These hot spots are found where many small servers are packed closely together, but the situation is made worse when older servers, with fewer energy-efficient features, are deployed. In fact, power/cooling costs have grown by a factor of four compared with the cost of acquiring new servers.

Today, energy efficiency is a top design requirement for system vendors; it also reduces power/cooling requirements — which had been growing at four times the growth rate of the overall server market. In 2008, the cost of power/cooling for the average x86 server topped 50% of the cost of acquiring that server.

FIGURE 1

Worldwide IT Spending on Servers, Power and Cooling, and Management/Administration



Source IDC, 2008

Importantly, virtualization of server hardware is also improving the operational cost picture. Previously, it was not uncommon for many servers to be running at 10–15% of their capacity, or sitting idle altogether, for periods of time. Today, virtualization is being rapidly adopted in the x86 server space — with more than 20% of all x86 servers virtualized in 2008; the outlook is for more than 40% to be virtualized by the end of this year. In some sites, which have been working with virtualization for two or more years, the majority of x86 servers are already virtualized.

Virtualization/Consolidation

Virtualization of server hardware, which allows many "virtual" machines, or VMs, to run on each physical server, has become a strong leverage point in workload consolidation efforts. In this way, fewer server "footprints" can take on workloads that were formerly running on large numbers of small servers while also adding new capacity in the form of multicore processors, memory, and I/O. These virtualized servers replace the functionality that used to run on dedicated servers — in which one application or one database was running, in a dedicated mode, on one server. Today, through the use of hypervisor technology, one physical server can support multiple operating system "images"; the average number of VMs per physical server, which was often in the range of two to four VMs in 2006, rose to eight or more in 2008. This means that workloads (applications and databases) can be run more efficiently on virtualized server hardware.

These virtualization/consolidation efforts are continuing to take place during the economic crisis as companies seek to reduce the number of servers in their IT infrastructure. For some, virtualization is a key element in gaining cost reductions of

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20% or more through savings in computer room space requirements and power/cooling costs, compared with the previous year. It has also been reported by respondents to IDC's ongoing virtualization studies that nearly half of those savings are being returned to the business. This means that IT simplification is harvesting savings in IT and allowing some of those benefits to flow back to the business itself.

Reducing Energy Costs

Much has been said about "green IT" and its ability to reduce ongoing costs for power and cooling in the datacenter. The reason for this is that new technologies are allowing servers and storage to run cooler than was possible in years past. These technologies include:

- Energy-efficient microprocessors
- Advanced server "packaging" that allows improved airflow through rows of servers and storage devices
- Technologies that monitor and manage servers and turn off idle components until demand for computing increases (The ability to "scale up" and "scale back" as needed is extremely important because Web-enabled workloads ebb and flow — with many peaks and valleys that are driven by time of day, marketing promotions, special events, and holiday seasonality.)

Today, in response to these concerns about how to achieve "green IT," a new generation of servers is being designed with energy efficiency built in and is being measured by the manufacturer's performance/watt and Energy Star ratings in the United States as well as other measures across the globe. Two new organizations, The Green Grid and Climate Savers, have formed in recent years, promoting green IT technologies that can be leveraged across the computer industry by many vendors.

Midsize IT Staff Considerations

Midsize companies can see the importance of energy use — and its costs — in monthly utility bills and in the need to replace or to consolidate inefficient IT systems that, if left running, would drive up everyday costs. This is why midsize companies, working with value-added resellers, systems integrators, and consultants, need to track their ongoing energy use for computing systems over time — and to prioritize which systems and storage and peripherals are most in need of improved efficiency. Indeed, systems are only part of the problem: Aging UPS and other power-supply systems may need to be replaced — and cooling may need to be applied to selected "hot spots" that have developed within the datacenter or computer room. This requires ongoing analysis and ongoing oversight to address emerging issues as they arise over time.

Both server management and ongoing maintenance directly impact IT staff costs. IT staff are finding that much of their available time is taken up by maintaining the servers and storage devices that are already in place.

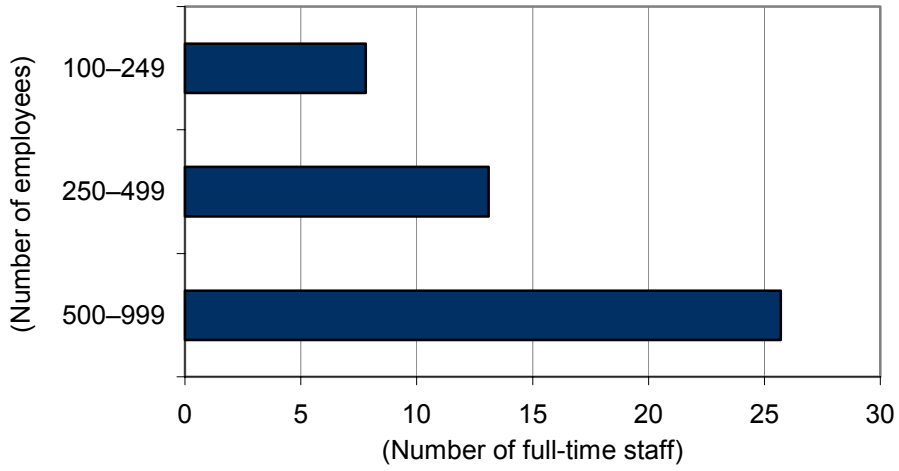
Complexity in many of IT's current deployments — such as the need to apply software updates and security patches to each server very manually by walking CDs to each server and applying them one by one or by doing individual software downloads for each server — is both a time sink and a cost driver for midsize IT.

For midsize companies, this becomes a pressing problem because IT staff is limited due to budgetary pressures. Often, midsize companies look to other, outside providers, such as value-added resellers, systems integrators, and consultants, to handle IT tasks so that in-house IT staff can focus on new systems development or on customization. When this happens, the ongoing maintenance costs can be avoided so that IT resources can more rapidly respond to changes in the business (e.g., building new systems, deploying more applications).

As Figure 2 shows, the number of full-time IT staff in midsize firms almost doubles as firms grow from one size category to the next, but that doesn't mean that the need for outside support decreases. In fact, the average number of PC seats (30–40) supported by each IT staffer is remarkably consistent as firms grow; this fact remains, despite the increased drain on resources due to ongoing support chores and other tasks such as supporting new technology deployment and coordinating branch office activities. The net result is that midsize firms, even the most advanced, are often challenged to find the IT resources they need. Channel partners represent a natural solution for firms that do not have all the IT staff assistance they need.

FIGURE 2

Average Number of Full-Time IT Staff in Midsize Companies



Source: IDC's SMB Survey 2008

SUN-AMD SERVER SOLUTIONS

Sun Microsystems and AMD began a partnership in the x86 server market in 2004, with the announcement of the first Sun servers based on the AMD Opteron processor. Initially, this led to introductions of several rack-optimized servers in 2005, but the line was later extended to include two-socket, four-socket, and eight-socket servers, as well as several server blades that are housed within the Sun Constellation blade server chassis.

What began as a brand-new line of x64 servers for Sun has become a server line with more than 10 point products, starting with low-cost servers priced around $3,000 and

extending to larger servers priced at $40,000. (IDC notes that Sun's name for its x86 servers is x64 servers; however, this series of papers describes them as Sun's x86 server products.) This expanded portfolio meets a wide range of customer requirements for price/performance, capacity, operational flexibility, and affordability.

For midsize firms, these servers can host a wide range of workloads — including applications and databases — that support key business processes. Typically, midsize firms have 100 to 1,000 employees and a full-time IT staff to support computer systems. However, these IT organizations are typically small, which means that Sun's channel partners offer an important, indirect way to support as well as acquire Sun servers worldwide. This approach speeds configuration and deployment of the hardware systems at midsize companies, combining the hardware with off-the-shelf packaged software and customizing the entire solution to meet specific needs within vertical markets (e.g., manufacturing, retail, energy).

Market Context

As mentioned, Sun has been participating in the x86 server space since 2004 — and it has a growing portfolio of x86 servers based on AMD and Intel processors, shipping in a variety of form factors, including rack-optimized servers and blade servers. IDC supply-side data shows that unit shipments for the Sun x64 servers have been growing steadily for the past three years (2006–2008).

The following section focuses on Sun's AMD Opteron–based x64 servers and on the way in which they address the IT and business needs of midsize customers.

Sun x64 Servers

Sun is shipping a series of x64 systems (as Sun terms its x86-based servers) that are based on the new Quad-Core AMD Opteron processor — expanding its portfolio of Sun-AMD x64 servers. These systems are available in a variety of form factors, including 1u, two-socket rack-optimized servers and blade servers that "plug into" a Sun blade server chassis for unified management of all of the blades and sharing of storage and network resources. They complement Sun's other Opteron-based servers, including the four-socket Sun Fire X4440 server and the eight-socket Sun Fire X4600 M2 system.

At the same time, IDC notes that these Sun-AMD systems are part of the overall Sun Microsystems portfolio, which also includes servers based on Intel x86 processors and servers based on SPARC processors made by Sun and by Fujitsu Ltd. This means that the Sun-AMD servers described in this white paper represent one set of products that customers can choose to deploy in the context of the broader competition within the worldwide server market.

Meeting the Needs of Midsize Businesses

SMBs in general and midsize firms in particular have specific business requirements related to overall budget for facilities and IT equipment and specific IT needs related to limited budgets and IT staff resources. Sun is providing systems, both directly and through its channel partners (indirectly), that recognize these business and IT needs and address them in several dimensions:

- Less "space" required in the computer room for deploying the servers

- Lower power/cooling requirements than for earlier Sun-AMD based designs so that many servers can be packed closely together without overheating
- Support of lights-out operations and remote monitoring/management by channel partners or by Sun
- Protection of earlier investments in Sun-AMD servers, through software compatibility and field-level upgrades from servers based on AMD Opteron processors based on Socket F designs (supporting AMD's quad-core processors, which are code-named Barcelona and Shanghai)

Sun-AMD x64 Server Product Line

All of the Sun-AMD systems are designed to support both large memory and optimized I/O for demanding computing environments. This is especially important for x86 virtualized computing environments, which need large amounts of memory for processing and large amounts of virtualized I/O to support growing enterprise workloads.

All of the models support 10 Gigabit Ethernet (10GbE), which is being installed in longtime 1GbE sites to gain greater I/O bandwidth for business applications. All of the models have four network ports in the back of the system, providing built-in I/O that takes the place of add-on network interface cards (NICs) in many cases.

In customer sites, typical configurations of these systems include servers running database workloads (e.g., MySQL open source database, Microsoft SQL Server, Oracle database); business applications, including those that are running in a VMware ESX virtualized computing environment; and Java-enabled applications.

Operating systems supported on these Sun x86 servers include Sun Solaris; Microsoft Windows; and Linux distributions from Red Hat (RHEL), Novell (SLES), and others. For virtualization, these x64 servers support VMware ESX Server, Microsoft Hyper-V, and Sun xVM hypervisors.

The Sun-AMD x64 server product line, based on Quad-Core AMD Opteron x86 processors, includes the following models:

- **Sun Fire X4600.** This eight-socket system is designed to support scalable workloads, including highly virtualized computing environments supporting high-density VMs. In this way, the X4600 supports virtualization/consolidation projects that consolidate workloads onto fewer server "footprints" in order to save business-oriented operational costs relating to power/cooling, management of workloads, and IT staff costs related to maintenance. The eight-socket servers are positioned at the high end of the Sun x86 server line, which is designed to support large databases and large numbers of end users as well as highly virtualized workloads.
- **Sun Fire X4440.** This four-socket system is designed to give growing applications headroom in the form of additional memory and I/O slots that can be leveraged, as needed, as computing demands increase over time. This four-socket design provides more scalability than two-socket models as it delivers more processing power, more memory, and more I/O bandwidth for growing workloads.

- **Sun Fire X4240 and Sun Fire X4140.** These two-socket systems are in the high-volume market for two-socket servers worldwide. As such, these systems are optimized for rack-dense deployments and for low power/cooling requirements. The X4140 is a 1u rack-optimized system, while the X4240 is a 2u rack-optimized system. Both can be deployed in racks that contain customers' current x86 server systems, with no special requirements for cooling or packaging.
- **Sun Blades.** The X6240 and X6440 blades fit within Sun's Constellation Sun Blade 6000 blade server chassis for unified management of all blades and shared access to network and storage resources. Blade deployments, often paired with virtualization software, are often implemented to gain IT flexibility so that workloads can be shifted to alternate computing resources, as needed. This allows IT to address the peak-and-valley characteristics of many Web-enabled workloads — mapping applications to available resources and avoiding situations in which overprovisioning of servers results in underutilized systems during nonpeak processing times.

Product Features for Midsize Companies

Sun servers have many features that address the specific business and IT requirements of midsize firms and SMBs in general. For example, Sun's x64 server models are designed for rapid deployment and simplified management, which addresses the relatively small IT organizations found in those companies. Many times, channel partners not only sell the Sun servers into SMB sites but also manage them remotely on behalf of SMB organizations.

System attributes allow "dense packing" of the Sun-AMD systems into industry-standard "racks," generally housed in a computer room, or in several computer rooms, in a midsize company's buildings. Servers based on energy-efficient designs will allow closer packing into smaller spaces, which also results in less floor space devoted to housing computer systems. All of this directly addresses IT concerns regarding operational costs, space requirements, and IT staff time. IDC server research has shown that, in recent years, the costs for power/cooling of servers have grown four times faster than the costs of acquiring the servers themselves.

For enterprise customers, power/cooling, availability, and computer room "space" requirements are the top 3 datacenter challenges, according to IDC demand-side, customer-based research. For midsize customers, the concerns are similar, but refer to the limited space available in computer rooms and "closets" in which servers and storage are housed. For midsize sites, space is always at a premium, IT staff is limited in terms of headcount, and energy costs are high on the facilities manager's radar.

These operational cost concerns speak to CFOs, as well as to CIOs and IT managers, and are increasingly important during the current economic downturn. AMD estimates that the CPU idle power consumed by 45nm Quad-Core AMD Opteron processors (code-named Shanghai) can be up to 35% lower than it was for the earlier generation of 65nm quad-core processors (code-named Barcelona). In multiserver racks, this difference in power requirements can translate into less heat being dissipated by the systems and result in a smaller thermal "envelope" that is more energy efficient in terms of cooling requirements.

Larger midmarket companies typically acquire Sun x64 systems from Sun's channel partners, but management is more often handled in-house. Channel partners often play a key role in configuring the systems on behalf of midmarket customers, which greatly reduces the IT staff time needed to deploy the new servers. For those midsize firms, deployment of new servers within the existing computer room is supported by a combination of factors: the Sun ILO lights-out management capabilities, tape management and IPMI management tools, networking capabilities, and interoperability with other networked systems. This appeals to midsize firms because it avoids a "rip-and-replace" approach to installing new technology by allowing the new servers to coexist with, and to exchange data with, installed servers within the organization.

Quad-Core AMD Opteron Processors

AMD introduced the enhanced Quad-Core AMD Opteron processor based on the 45nm process in November 2008 as a follow-on product to the earlier 65nm process Quad-Core AMD Opteron processors. The new 45nm processor is socket compatible with the previous series via AMD Socket F designs. (IDC notes that sockets are the feature in servers into which processors can be "plugged" and that Socket F designs support both the 65nm and 45nm processor hardware.) This means that a new Shanghai-generation processor can replace a previous-generation Barcelona processor through a field upgrade to a system, along with a minor BIOS software update.

Sun Servers Leverage the New Opteron Technology

For new servers, the new processor's design fits more processing capability into a smaller space, helping increase the compute density of the servers that are powered by it. What the enhanced processor brings to AMD-based x86 servers is faster performance, along with deeper support for virtualization, including virtualization of the server hardware itself, and support for virtualized I/O to improve overall server throughput. For example, the new 45nm variation of the processor was optimized to support faster handoff between "guest" operating systems running on virtualized systems (on top of a hypervisor).

The enhanced Quad-Core AMD Opteron processor includes an extended Level 3 cache memory of 6MB, which is three times the size of the Level 3 cache offered in Barcelona. Further, the enhanced version processor supports AMD HyperTransport version 3.0 and provides a direct connection for cores, caches, and I/O subsystems, with a top speed of 17.6GBps. Importantly, it is a low-power processor, which operates within a 75 watt power envelope, providing improved performance for the same power levels, compared with previous generations.

All of the new Quad-Core AMD Opteron processors support four 512KB Level 2 instruction caches — one dedicated to each processor core; one 6MB Level 3 on-chip cache (shared among all four processor cores); and an on-chip memory controller, supporting two 64+8 bit channels of DDR2-800 memory.

Addressing IT and Business Needs

Sun-AMD server and storage solutions can be delivered to midsize companies directly or through Sun's channel partners, improving the logistics of acquiring and deploying systems. These systems are built with high-volume components offered within the x86 server ecosystem, such as AMD Opteron processors, which reduces

the initial acquisition cost. Operational costs are addressed through energy-efficient designs and the combination of server and storage features within the same system, improving overall access time to data.

Sun is leveraging its abilities to design network-ready, highly manageable servers in its x86 server designs. The series of Opteron-based servers can be used in a number of ways, supporting high-performance computing (HPC) workloads for engineering and manufacturing, virtualized workloads for workload consolidation and simplification of IT infrastructure, and line-of-business (LOB) applications to run a midmarket company. IT considerations include ease of use, rapid deployment, and low-cost maintenance of these "open storage" devices within the existing IT infrastructure. Volume economics associated with producing the systems keeps pricing competitive, a key consideration when acquiring any new systems during the economic downturn.

From a business perspective, any new systems being acquired in 2009 must fit into a plan to reduce, or slow the growth of, operational costs. If new systems do not provide that kind of value, then they may not be considered at all as aging systems stay in place and server life cycles are lengthened. However, the trade-offs between capex and opex must also be considered. As we have seen, older systems are often characterized as being less energy efficient than newer ones — and managing large numbers of dedicated systems is not as efficient as managing smaller numbers of highly efficient systems.

The energy efficiency built into Sun's Opteron-based servers directly addresses the customer's need to reduce power/cooling costs — and enables server deployments within the relatively small computer room and datacenter spaces that midsize companies have assigned for housing computer systems and storage. The drive to reduce the total number of server "footprints" in these spaces is key, as midsize companies look to cap, or to control, the rise in IT-related operational costs.

Optimization for Virtualization

One of the key technologies enabling this transformation in the datacenter is the industrywide move to virtualization of x86 server infrastructure. This move, which began in 2005 with the release of VMware ESX, has continued with the introduction of more virtualization technologies that support the same technology trend to improve resource utilization of each physical server through the use of hypervisors.

Virtualization adoption within the x86 server space is increasing rapidly, with the average number of VMs more than doubling from 2006 to 2008 and with more important business applications being deployed into the virtualized x86 server infrastructure. When customers virtualize their server and storage hardware, they are looking for increased IT flexibility and business agility that provide the freedom for the business to move in new directions, along with easier and less costly maintenance and risk reduction.

For virtualized servers, some of the database workloads are running in test/development scenarios, but many others are running in production, whether in a virtualized environment or in an unvirtualized environment. Sun has designed the systems to support workloads for both SMB/midsize companies and large companies — two sets of customers with very different operational requirements. For enterprise customers, these systems often take on the role of consolidation platforms for workloads that have been running on large numbers of small x86 servers.

Virtualization Benefits

For many customers with older x86 servers, a combined virtualization/consolidation project brings near-term benefits in the form of reduced operational expenses for power/cooling, server management, and IT staff time. The drive to break down barriers or silos within the computing infrastructure is strong during the current economic downturn because of the need to reduce operational costs related to provisioning and management of workloads (applications and databases). Because workloads run on virtualized servers, rather than on dedicated servers, they can be reprovisioned easily and quickly as business needs change. This supports the organizational needs of many businesses as they reprioritize initiatives to better address today's economic realities.

The Sun-AMD systems address virtualization in multiple ways — through optimized performance for hypervisors running on the hardware platform and through support for improved I/O throughput, which is needed to address application performance constraints requiring improvements in virtualized I/O. Many of the most I/O-intensive workloads, such as line-of-business applications (ERP and CRM) and intensive database workloads, are deployed today on unvirtualized platforms. With improved I/O, more of these important workloads can be brought into the virtualized server infrastructure, where they can be flexibly reassigned to available computing resources and support enterprisewide IT consolidation efforts that are aimed at reducing everyday operational costs.

Enhanced Quad-Core AMD Opteron processors, which leverage the on-board HyperTransport channel technology and AMD's Direct Connect Architecture (DCA), are optimized to improve server I/O. This makes it possible to efficiently link server resources (processor and memory) to other servers across the network and to storage (SANs and NAS devices). As virtualization technologies mature and become increasingly adopted in the x86 world, I/O capabilities will be key in improving performance for enterprise workloads now being run on x86 server platforms. Improved I/O bandwidth will provide more access to outside resources for both "guest" and "host" virtual machines running on physical servers.

IDC customer-based survey research in virtualization has found that the average number of VMs is rising, from an average of two to four VMs per physical server just two years ago to an average of eight or more in 2008. (In some sites, which have widely adopted x86 virtualization technology, the number of VMs per physical server can range from 10 to 12, or more, depending on the types of workloads supported.) That increased density on each physical server increases IT requirements for performance, availability of applications, and security, all of which must be addressed by platform vendors.

CHALLENGES AND OPPORTUNITIES

Today's x86 server market is highly competitive. It is focused on price and price/performance — and product updates are frequent, based on technology refresh cycles. Yet, product differentiation is also valued, especially where those points of differentiation make the x86 servers easier to manage and more efficient to operate, both with respect to power/cooling and with respect to overall IT staff costs.

Sun Microsystems has designed — and brought to market — a number of rack-optimized servers and blade servers in the x86 server market that are designed for lights-out management, energy-efficient operation, and ease of use for system administrators. When combined with price/performance and performance/watt, these features are ways to evaluate the value proposition that Sun is providing to the broader server marketplace. As noted, Sun is among the top six x86 server vendors by factory revenue, with its x86 server unit shipments growing in 2008.

IDC notes that Sun-AMD systems compete in the marketplace with other vendors' x86 server systems — in all, the worldwide x86 server market (servers based on x86 processors from Intel and AMD) generates more than $25 billion annually. IDC also notes that Sun offers other solutions to customers and has a series of Sun servers based on SPARC RISC processors — scaling from volume servers to high-end enterprise servers for the datacenter — and a line of x86 servers based on other x86 processors from Intel.

Sun is looking to compete in the midmarket with the product feature sets it provides, on energy efficiency, and on supporting customers' growth requirements by providing "headroom" for growing applications and high levels of memory and I/O for virtualized workloads. For midsize businesses, these are important aspects that preserve investments in new servers, provide capacity for growing applications and databases, and can help reduce the frequency of upgrades. Energy efficiency is a requirement for all vendors/providers and is seen as an important consideration for all future server investments, given rising energy costs.

CONCLUSION

Empowering sales staff and remote workers with the right information at the right time is key to midmarket business success. This helps technology users deliver effective customer support, helps sales staff with calls to prospective buyers, and helps the entire business grow sales in an increasingly intense competitive environment. Easily deployable server solutions reduce programming/developing costs in midsize companies that have limited IT staff, or no IT staff, available to customize server installations. For this reason, a system vendor's channel partners are often the ones that help midmarket customers select the ISV software that will be paired with the next deployment of server product hardware. Vendor support, whether provided directly or through channel partners, is often needed to keep overall computer room operations, and datacenter operations, running smoothly.

Aging IT infrastructure has resulted in two IT challenges for midmarket companies: older servers that are not energy efficient and those that are underutilized. Sun and AMD have designed server solutions that address both of these issues. By optimizing the performance and performance/watt characteristics of these systems and by supporting virtualization technologies, these systems support consolidation initiatives that are aimed at reducing server footprints in midsize companies while improving the resource utilization for new servers brought into the IT organization. As such, these servers align well with the IT technology trends described in this paper.

While server life cycles are lengthening at many IT sites, some firms are gaining near-term operational benefits by identifying inefficient servers and by replacing some older servers with next-generation computing technology. This new technology is designed to support energy efficiency, higher performance/watt metrics, and

workload consolidation — in which multiple applications are "consolidated" onto fewer server footprints. The use of virtualization software and the associated support for workload consolidation efforts result in more fully utilized servers as well as greater IT flexibility to map computing resources to ever-changing business needs in the midmarket.

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